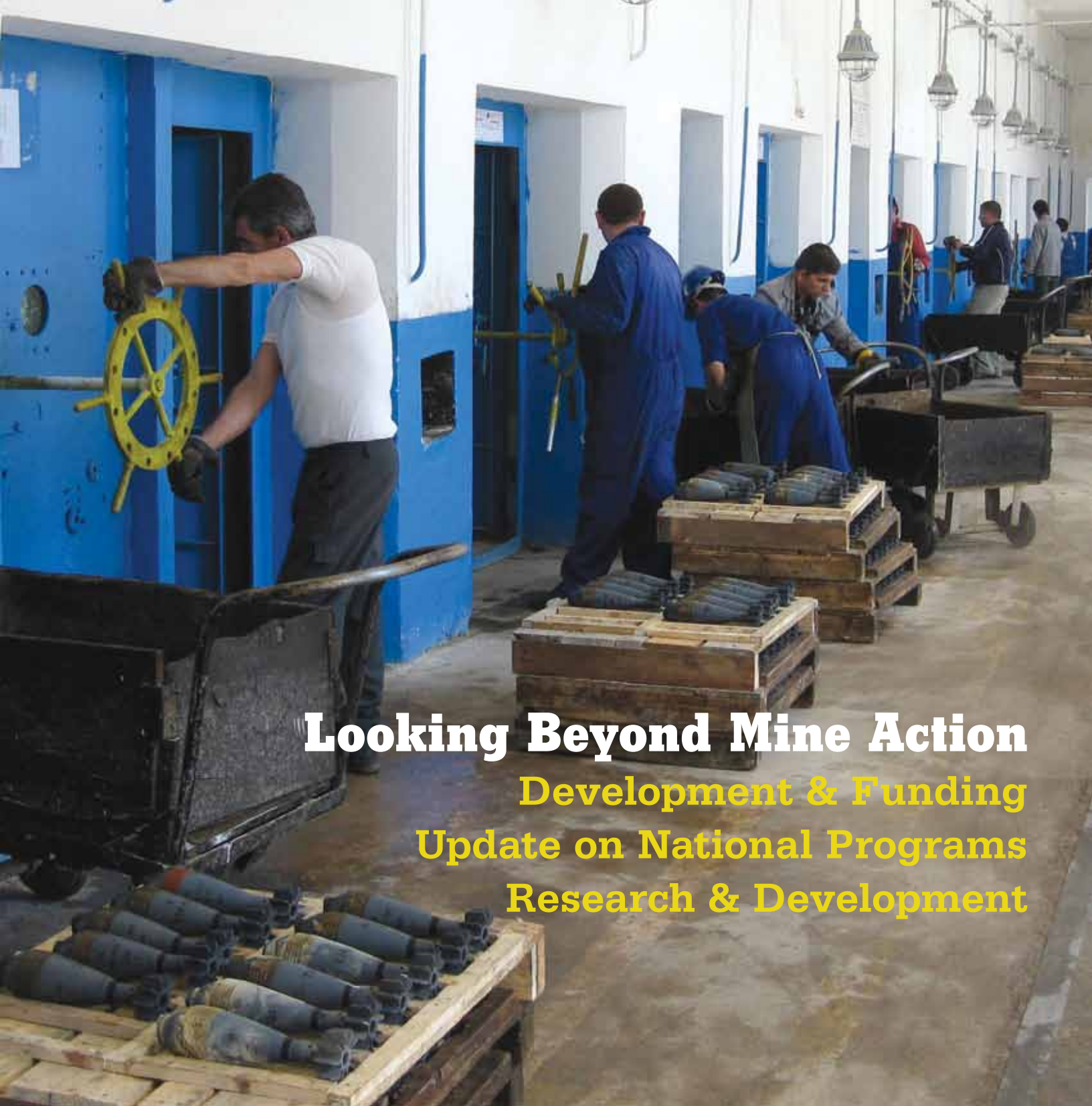


# THE JOURNAL

OF ERW AND MINE ACTION

Issue 14.3 | Fall 2010



**Looking Beyond Mine Action**  
**Development & Funding**  
**Update on National Programs**  
**Research & Development**



*The Journal of ERW and Mine Action*  
Mine Action Information Center  
Center for International Stabilization and Recovery  
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The Mjekes demilitarization facility in central Albania.  
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Dr. Kenneth R. Rutherford, Director

#### DIRECTOR'S MESSAGE

Dear Readers,

For nearly 15 years, *The Journal of ERW and Mine Action* has been a fundamental information source for the ERW and mine-action communities by generating conversations; providing useful and timely information from a variety of viewpoints; sharing project successes, challenges and failures; and creating an historical record.

*The Journal* provides interesting content written by field experts. Like any periodical, we do our best to verify information, question inconsistencies and provide clarity. Since our staff is not embedded with demining organizations, we have no way to verify if figures are absolutely correct. We expect our authors to provide content in good faith, having confirmed and documented the information and quotations in their articles. We leave technical critiques to our readers.

Recently, however, online fora have been ignited with unfair and often spurious comments about *The Journal* and its work ethic. The conversation regarding an article in Issue 14.2 (pp. 40–45) raises important questions about the sad state of global information management; however, it incorrectly frames the question of responsibility for the article's content. All of the facts and figures within it were furnished by the authors using internal organizational documents. Consequently, the responsibility for the numbers lies with the authors.

With all this in mind, I want to share with the community what our publication is and is not. All sections of *The Journal of ERW and Mine Action* are dedicated to those involved in making the world safer. *The Journal* covers innovations in technology and research, lessons learned in programming and development, and current trends in humanitarian intervention. It has contained a section on Research, Development and Technology since 2004, and this section has been peer-reviewed since Issue 8.2 (November 2004). In the interest of keeping *The Journal's* publication timely and affordable, the remainder of its articles are not peer-reviewed but rather depend on the authors to provide accurate information.

I invite those disaffected by any article's content to use *The Journal* as it is intended—to drive conversations, ask questions, support your peers and challenge the community by writing an article or letter to the editor. All submissions to *The Journal* will be considered under the same unprejudiced conditions all authors receive from our editorial staff.

If we are to advance as a community, those with the knowledge to write articles and critique the work of others must take responsibility for their comments and suggest improvements. We look forward to receiving your contributions.

Sincerely,

Ken Rutherford

PHOTO COURTESY OF MISSOURI STATE UNIVERSITY PHOTO SERVICES



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# Integrating ERW Programs: The Case for Consolidating CWD Activities

For years, the mine-action community has been revising its definition of explosive remnants of war. Viewing unexploded ordnance, landmines, ammunition stockpiles, and small arms/light weapons as individual threats, the mine-action community has created distinct budgets, programs and policies to address each of them. What we're beginning to realize, however, is that a more integrated approach allows for greater progress in reducing the ERW threat.

by Mark Adams [ PM/WRA ]



A technician throws away remnants of surplus weapons destroyed by the Congolese Armed Forces (FARDC) at the central logistics base during a collaboration project between Mines Advisory Group and the FARDC.

ALL PHOTOS COURTESY OF J.B. RUSSELL/MAG

In the last 20 years, the organized support for humanitarian mine action has allowed us to make great strides in reducing the landmine threat worldwide. Now, however, we find ourselves in a position where the traditional lines between mine action and the threat of excess and poorly secured small arms/light weapons and other conventional weapons have blurred.

The traditional approach to taking mines and unexploded ordnance out of the ground has evolved. The mine-action community has begun widening its scope to focus on armed violence and the problems caused by aging stockpiles, remaining landmines and UXO, and the removal of all of this hazardous debris of conflict to make the land safe. We now actively

work to eliminate the unintended consequences of unstable ammunition detonation or loss of control of poorly secured government stockpiles of weapons, which are just as dangerous as explosive remnants of war. Mine-risk education and risk management have now broadened to become “armed-violence risk” or “ERW-risk education/risk management.”

Wisely, our community has refined and revised its views about ERW. Perhaps it is time to consider revising and refining our strategies as well. I believe these new ideas should be reflected in integrated approaches to programs, policies and budgets for dealing with ERW. Since we no longer think about UXO, landmines, aging ammunition stockpiles or abandoned ordnance as separate entities, why do



Members of MAG loading munitions stockpiled at a FARDC central logistics base onto trucks to be transported to a demolition ground.

we have separate budgets, programs and strategies for dealing with them? Is there perhaps a better, more efficient way of doing business?

## Integration

At this time of global financial downturn and international donor fatigue toward HMA activities, I argue that finding a way to better deal with the ERW problem in affected countries will allow us to more effectively justify budgets to our lawmakers and donors. I often discuss with many of my counterparts “eating the elephant” one bite at a time. I have nothing against elephants, but the analogy is that we can only solve the problem one piece at a time by collectively putting together all of our problems related to ERW and integrating our efforts regarding policy, programs, resource management and direct action. This

process allows us to deal with a very serious problem over time in a well-thought-out, systematic way.

An integrated, centralized strategy for dealing with ERW allows us to more effectively and compellingly demonstrate our needs and objectives. An integrated approach to ERW brings together similar skill sets related to explosive ordnance disposal under one umbrella. It streamlines communication. It can accelerate decision-making. It allows us to be more nimble and responsive. It ensures a unified, rather than competing, agenda for ERW. It improves our visibility across related programs. It enhances our ability to see and monitor the totality of our efforts, and track and measure our successes. It improves cost-effectiveness. And at a time when we are being asked and often required to do more with less, these benefits seem

to be worth the effort involved to consolidate and integrate our interests and missions as follows: HMA + SA/LW = ERW. Thus, the action of dealing with ERW can be called “conventional weapons destruction.”

Perhaps we should rethink national strategies and review our collective ERW strategy. This review would run the gamut from where to place the “Office of ERW” to appeals for donor support to the development of a new ERW national strategy. This approach is radical and even anathema to many governments compared to the way we have conducted business in the past, but I believe it helps develop a national vision and provides better synchronization and synergy in the program and project management of all ERW activities.

Although there will always be issues of how to resolve different ministries’ equities (usually mine action





Members of MAG and the FARDC prepare a demolition pit to destroy stockpiles of munitions as part of a MAG-FARDC project to eliminate munitions stocks and reduce the risk of accidents.

is conducted by the Ministry of Foreign Affairs or Ministry of Interior and SA/LW/ammunition destruction is relegated to the Ministry of Defense), an integrated approach allows one office or one ministry to take the lead. Whether Defense or Foreign Affairs, it doesn't matter, but having it all under one roof allows for a more streamlined decision-making process to deal with a huge, multi-level problem.

In the early years, the international community always encouraged affected governments to develop their own mine-action capacity and a national mine-action center, as well as to develop a strategic, integrated mine-action plan.

Progress was measured by one or more of these yardsticks:

- Area cleared
- Decreasing numbers of civilians injured or killed
- Area of roads opened up
- Any similarly appropriate measuring tool

Now, the international community can do the same by also measuring the number of weapons/tons of ammunition destroyed or the number of facilities strengthened with better security systems.

#### The Challenges of Integration

A national strategic plan that conducts humanitarian mine action and executes the reduction of stockpiles of excess weapons and unstable ammunition could be managed by an "Office of ERW Removal" or "Office of Conventional Weapons Destruction." Below is a sample list of challenges that office might face:

- Preventing loss of life (since civilian communities have grown up around ammunition storage sites)
- Reducing the amount of weapons and high stocks of unstable ammunition accessible to criminal elements by improving inventory control
- Designating stockpiled ammunition as "excess" if unassociated with a host-nation's weapons system
- Identifying old weapons systems no longer required by defense forces
- Developing a destruction plan for SA/LW and ammunition to reduce loss of control and accidental explosion risks
- Managing and protecting the appropriate amount of weapons necessary to meet host-nation security and defense needs
- Conducting an adequate defense

modernization review to indentify real war-fighting needs.

- Initiating strict security for at-risk weapons systems (such as shoulder-fired missile systems) to prevent civilian and commercial impacts

This sounds great in theory, but how does it "play" in the real world?

In 2004, the U.S. Department of State's Bureau of Political-Military Affairs merged the program offices of Humanitarian Demining and SA/LW Destruction to form the Office of Weapons Removal and Abatement (PM/WRA). The next step in this evolution will integrate all aspects of ERW into one program budget, thereby focusing a single lens on the global human-security problem of ERW. Our consolidated budget will be called Non-proliferation Antiterrorism Demining and other Related Conventional Weapons Destruction. With this consolidated budget, we can better focus on the most severe ERW problems in the world. We will continue to be fully engaged in severely mine-/UXO-affected countries such as Afghanistan, Angola, Bosnia and Herzegovina, Cambodia, Iraq, Laos and Vietnam, and further strengthen our efforts to reduce excess stockpiles of weapons and destroy old, unstable ammunition in these and other countries.

The United States is not the only nation or organization that has seen efficiencies in merging CWD programs. The International Trust Fund for Demining and Mine Victims Assistance has developed a five-year strategic plan envisioning the expansion of its role from HMA in the Balkans to global ERW remediation. I salute the Slovenian government for its great vision and huge

undertaking. Similarly, James Madison University's Center for International Stabilization and Recovery has changed the name of this publication to *The Journal of ERW and Mine Action*. Other examples exist; these are but two.

Change takes time. New national policies and mine-action organization objectives won't happen overnight. For that reason, when I talk to groups of landmine experts, I encourage embracing the problem of inventory control, destruction and security of SA/LW and ammunition. Likewise, when I talk to SA/LW experts, I encourage them to talk to and coordinate with their mine-action counterparts.

I realize the difficulty for those in some countries to talk laterally to their counterparts in the Ministry of Defense, Ministry of Foreign

Affairs or Ministry of Interior, but reaching across ministries is the way of the future. With a unified, ERW strategic plan the global CWD community can increase its outreach and access to the donor community and, ideally, reduce the ERW impact on civilians.

#### Conclusion

Whether you work in government or a regional organization, I encourage you to review your achievements over the past years, embrace an expanded view of dealing with ERW and reinvent your organization. I believe our great collective community has a wealth of knowledge and capacity for innovation that can carry us far into the future to better handle the ERW problem and, thus, make our world a safer place. ♦



**Mark Adams** is Senior Advisor for U.S. Conventional Weapons Destruction, U.S. Department of State. Prior to his retirement from active duty as a Colonel in the U.S. Marine Corps, Adams served as the Marine Corps Advisor to the U.S. Secretary of State and the Deputy Director, Office of Humanitarian Demining Programs, a position he held from 1998–2001. In his current assignment, Adams has negotiated numerous small arms/light weapons/man-portable air-defense systems (MANPADS)/ammunition-destruction agreements worldwide.

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## Letter to the Editor

Dear Ms. Carter Fay,

I would first like to take this opportunity to introduce myself. I have recently been appointed as Geneva Call's Coordinator for Landmines and other Explosive Devices. I will therefore be the main contact person for all related issues within the organization.

I would also like to inquire whether the authors of the article "Non-state Actors and Mine Action: Complications and Solutions," in the most recent issue of *The Journal of ERW and Mine Action* (Issue 14.2), have any illustrations of where humanitarian engagement with NSAs have led to their enjoying "a new bargaining position that they may in turn use to advance their international standing," or use "to their advantage by recruiting new members or securing new resources from interested sponsors"? As you are probably well aware, this is an issue that is potentially of great concern to Geneva Call, and which we endeavour to mitigate. It is also one side of an argument used to discredit such humanitarian engagement. We'd therefore be very keen to receive any supporting evidence where this proved to be the case.

Thank you very much for your attention.

Best regards,

Katherine Kramer  
Programme Director (Asia)  
Acting Coordinator on Landmines and Other Explosives  
Geneva Call  
E-mail: [info@genevacall.org](mailto:info@genevacall.org)





# Subscriber Survey Results

by Lois Carter Fay [ Center for International Stabilization and Recovery ]

The staff of *The Journal of ERW and Mine Action* wants to thank you, our subscribers, for telling us what you think about our publication. We want you to know, “We heard you!” Over the next few issues, we will implement several changes as a result of this feedback. For instance, we plan to do the following:

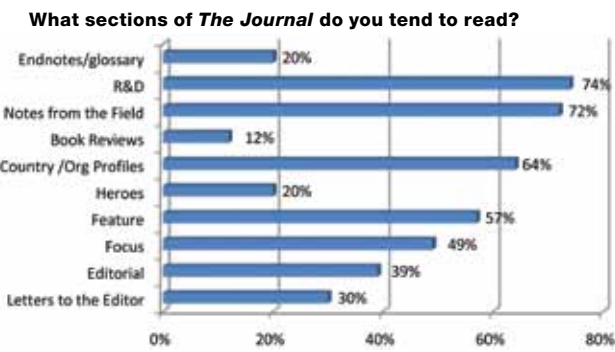
- Create a discussion-driven forum rather than a topic-driven publication
- Redesign and relaunch the CISR website, better integrating it with the MAIC website
- Emphasize popular content (Notes from the Field, R&D and more articles about victim assistance)
- Create new sections (several ideas were given) and publish some of the less popular sections (Book Reviews, Unsung Heroes) online-only
- Target specific authors to provide in-depth content from experienced field personnel
- Limit or eliminate the student-written articles

In total, 176 readers completed the survey, which is an outstanding 10-percent response rate. Contrary to what we believed, we discovered that *The Journal* is being delivered in a timely manner, with 64 percent of the respondents saying they receive it within one month of mailing. In addition, although we do not plan to implement a subscription fee, we were pleased to learn that 59 percent of those responding would be willing to pay US\$10 or more to continue receiving *The Journal*.

When asked, “Which topics do you find most helpful?” several sections/topics were listed multiple times. In particular, many readers noted they like the R&D articles, Notes from the Field, and articles dealing with risk education and victim assistance. Case studies, hero profiles and organization profiles were also mentioned repeatedly, with some respondents loving them and others not liking them at all.

On the other hand, when asked, “Which sections provide the least value?” readers again repeatedly said hero profiles. Book reviews, country profiles and “sob stories” were also mentioned. One respondent said, “I think every now and again, you have an ‘odd’ article that could have been approached from a different perspective; however, overall, any article that makes it to publication is worth the time to read it.”

We found that many of our readers are sharing their *Journal* copies with others; some share it with as few as one other person while others share it with as many as 20 people. Several readers mentioned that they never let their printed editions out of their offices because they find the content too valuable to lose and they refer to past



articles frequently. One respondent commented, “I cite the article and make a photocopy of the article. I don’t want to lose my copy.”

Below are selected responses\* to the question, “What do you like best about *The Journal*?”:

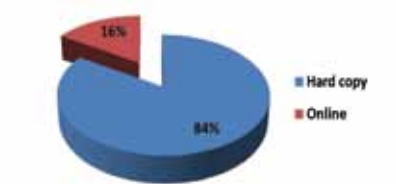
- The focus on various regions and topics of current concern or interest.
- Accuracy and details.
- Some useful articles, like a recent issue on ERW had one very good article from Arms Control people. Top quality paper.
- Electronic availability and maintenance of links; also historic links (i.e., online links to archived articles).
- Good mix between text and pictures; easy to read.
- Focus on content relating to mine action and its various pillars of engagement (clearance, mine-risk education, survivor assistance, program development, etc.).
- It’s keeping the community together, allowing us to share experiences.
- It’s all industry-related. No distractions and nothing too political.
- Articles on actual experiences in mine action and explosive remnants of war.
- I feel *The Journal* presents a balanced and technical response regarding the issue of demining.

“What do you like least about *The Journal*?” elicited these (selected) responses:\*

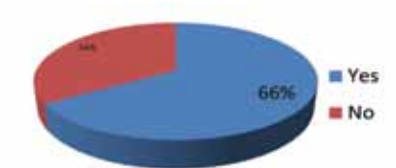
- Sometimes the articles are a little irrelevant and self-promotional. Time lag between article development and publication.
- *The Journal*’s use of the term “mines” is inexact, considering the amount of UXO and also improvised explosive devices encountered.
- I miss the discussion of the future need for MA and the discussion of how to integrate MA in development and reconstruction.
- The lack of discussion forum.
- The lack of editorial rigour or peer review. It appears more like a magazine than a journal.
- Articles are too theoretical.
- Sometimes, I see some articles that are written in a very high level of literacy and technical language that is not easy to understand.
- Same sources for articles.

We also received several interesting ideas from our readers regarding what new sections or topics they would like to see. One reader suggested adding more photo essays to the printed edition and more video on the website. Another said he

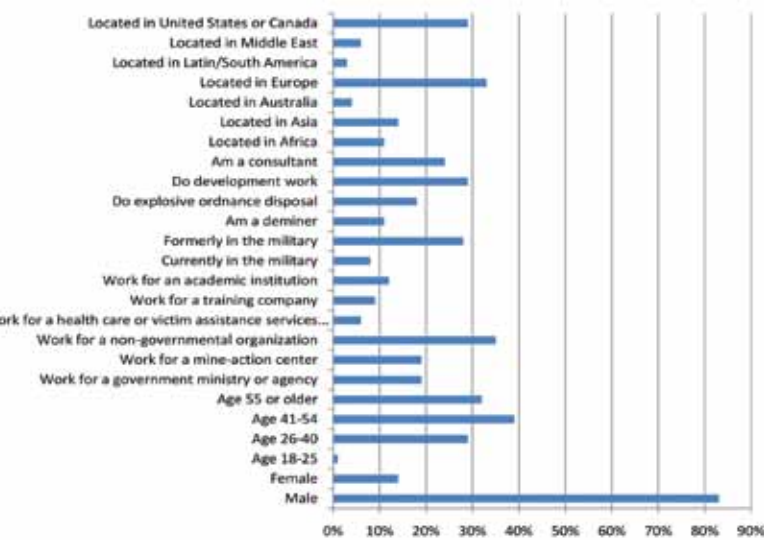
**Which format do you prefer when you read *The Journal*—hard copy or online?**



**Do you share your copy of *The Journal* with others?**



**Profile of *Journal* Subscribers:**



would like to see more topics related to the betterment of deminers’ lives (working conditions, problems, benefits, etc.), and topics exposing sloppy UXO removal work. Other suggestions were:

- Guest editorial or op-ed, trends, “Where Are They Now?,” historical essays, victim assistance, more integration of conventional weapons destruction
- New developments in standards and procedures; new equipment developments
- Things from a social-scientific perspective, incorporating an understanding of how politics, economics and social issues impact the manner in which mine action is carried out
- Straightforward articles dealing with successes and failures
- Updates on the global landmine/ERW situation
- Personal stories of people in the field; this is an unforgiving business and it’s nice to read stories about others whom I have met
- All in all, we feel we have received valuable survey feedback. We will take your suggestions to

heart and evaluate which ones are feasible as we chart our future course. Thank you for your time and ideas! ♦

\*Note: All responses have been edited for grammar, spelling and clarity.



**Lois Carter Fay, APR**, is Editor-in-Chief of *The Journal of ERW and Mine Action* and Project Manager on other publishing projects, including *To Walk the Earth in Safety*. Prior to joining the MAIC in 2005, Carter Fay was self-employed with MarketingIdeaShop.com, a consulting and publishing company, and today she continues this activity part-time.

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## The Bridge from Hold to Build

In Afghanistan, the United States and United Nations are developing a new approach to community-based demining by funding local nongovernmental organizations. The use of these Afghan NGOs has not only allowed clearance to begin more quickly and continue more effectively, but has also helped the local population along the path to recovery and supported overall counterinsurgency efforts.

by Colonel Yori Escalante [ United States Marine Corps ]

Now Zad, located in the district of Helmand province that bears the same name, was once the second largest city of the province with a population of more than 30,000. Although somewhat isolated in the northern part of Helmand, it had everything that an Afghan needed to flourish, including fertile farmland and bustling bazaars. However, in early 2006 the Taliban took control and drove away the entire population of Now Zad. Many of the residents moved as far away as Lashkar Gah, an arduous 125-kilometer (48-mile) journey on rough roads through Taliban-infested areas, and wondered if they would ever return to their homes. After taking over Now Zad, the militants filled the homes, shops, schools and streets with mines and improvised explosive devices, much as they had done in many other areas.

The second major offensive in Helmand province for Task Force Leatherneck (the 2<sup>nd</sup> Marine Expeditionary Brigade), Operation Cobra's Anger in December 2009, was to remove the Taliban from Now Zad. Once cleared, Now Zad was a prime candidate for immediate assistance and the type of international development critical to the United States' counterinsurgency strategy of "Clear-Hold-Build." This strategy involves clearing a target area of insurgents (Clear), providing security and infrastructure to locals while screening the population for insurgents (Hold), and establishing or re-establishing essential services using both NGO and local workforces (Build). The only problem was

that the explosive remnants of the battle for Now Zad and the large number of mines and IEDs left by the Taliban still littered the area.

### The Strategy

The Office of Weapons Removal and Abatement in the U.S. Department of State's Bureau of Political-Military Affairs (PM/WRA) manages and executes the work required to create the "bridge" from hold to build within the U.S. counterinsurgency strategy. Known as Conventional Weapons Destruction, the effort addresses humanitarian mine action, battle-area clearance and small-arms and light-weapons destruction. CWD has enabled the United States to be the international leader in this important aspect of humanitarian assistance and development. Since 1993, the United States has provided more than US\$1.8 billion to more than 80 countries to conduct demining and unexploded-ordnance clearance, and since 2001 has destroyed more than 1.4 million weapons and 80,000 tons of otherwise at-risk, unstable or unsecure weapons and ammunition that could find their way into the militants' hands.<sup>1</sup> In Afghanistan alone, the United States has funded projects totaling nearly \$200 million. PM/WRA provides funds to U.S. contractors and international nongovernmental organizations to conduct clearance and destruction operations, develop survivor and educational services, and establish capacity for the host nation to eventually take ownership of the effort.



Recruiting and training a local workforce is vital to community-based demining.

PHOTO COURTESY OF ALEX HENEGAR

### Community-Based Demining

A concept now being used by the United States and the United Nations in Afghanistan is one of community-based demining. Often, when contractors and international NGOs establish demining and clearance operations in an area, the workforce is recruited from the local area, trained and employed to execute the project, and later dispatched to other areas needing clearance. Thus, in a way, all demining and clearance operations can be called community-based. However, CBD in Afghanistan is different in many ways because the approach uses Afghan NGOs that have worked in Afghanistan for 20 years or more. The Afghan NGOs have built a relationship with the population and are able to recruit individuals who will remain after the project is complete. The NGOs can also enter an area very soon after combat operations have ceased. Often, international NGOs will not be welcomed or cannot gain access to those areas due to the security situation. This aspect is important since in the past, demining and clearance operations have only been attempted after conflicts have ended. In the conflict in

Afghanistan, quick action is vital to rebuilding trust and confidence with the local residents. The United States currently funds five Afghan NGOs—Afghan Technical Consultants, Demining Agency for Afghanistan, Mine Clearance Planning Agency, Mine Detection Center, and Organization for Mine Clearance and Afghanistan Rehabilitation—that are uniquely positioned to implement these community-based projects quickly and effectively.

CBD differs from other demining and clearance efforts; organizations work closely with the local leadership in a specific village, district or province. The local leaders identify projects and assist in informing the residents of the impact of CBD and the need for a local workforce. This workforce, many times consisting of young men who would otherwise be recruited by the Taliban for insurgent operations, is then trained in the skill of demining. Often the men are put through vocational training during their off-duty hours to ensure they have a relevant trade once the project is complete. This in turn builds confidence and a sense of ownership in the overall project, as well as a sense of pride that the lo-

cal populations are involved in the improvement of their village or district. Such examples of CBD reinforce local governance and reduce the influence of insurgents.

### Successes of CBD in Now Zad

PM/WRA regularly makes an effort to coordinate closely with U.S. or Coalition Forces in an area, and Task Force Leatherneck was no exception. The U.S. Marines quickly understood the importance of demining and clearance operations and the benefits that CBD could provide. Soon after the completion of the operation, Brigadier General Lawrence Nicholson, the Commander of Task Force Leatherneck, along with members of the U.S. Embassy in Kabul, Helmand Provincial Governor Mangal and leaders from Now Zad, as well as representatives of the five Afghan demining NGOs funded by PM/WRA, conducted a demining *shura*. *Shura*, the Arabic word for consultation, is the way most Islamic tribal leaders meet to resolve problems and issues. The purpose of this *shura* was to highlight the need to implement a CBD project in Now Zad, one that would address the most urgent clearance needs of



the village and enable further development projects to begin. Brigadier General Nicholson stressed that residents and local leadership needed to step up and take control of Now Zad or risk the town being returned to the Taliban. As a result of the *shura*, close coordination and planning commenced between the Marines, PM/WRA, U.S. Embassy, United Nations Mine Action Coordination Center for Afghanistan, local leadership and the NGOs.



U.S. and local leadership must be involved to ensure the "bridge" from hold to build is successful.  
PHOTO COURTESY OF THE AUTHOR

Vital to the NGOs and the leaders of Now Zad were assurances of security from Task Force Leatherneck—security that was not visible, but effective. What eventually materialized was a collaborative effort for a \$1.8 million project with three of the five NGOs (Mine Clearance Planning Agency, the Demining Agency for Afghanistan and the Mine Detection Center) where the strengths of each organization were leveraged. The project began in March 2010 and is scheduled to be completed within 12 months, employing more than 120 local staff, benefitting more than 1,350 families and clearing 594,000 square kilometers (229,345 square miles) of land covering the four most affect-

ed communities in and around Now Zad: Ali Zai, Barakzi, Deh Meyan and Sarkani.

Over and above the initial benefits, the project includes the establishment of a clinic, primarily for the medical care of the deminers, but also to serve as a source of health support for the citizens of Now Zad. As the word spread that deminers were starting their work, many of the displaced members of Now Zad started to return, some for the first time in four years.

CBD has been conducted in Afghanistan for several years, with projects funded and executed in Kunar, Nangahar and Kandahar provinces. The projects' workforce was recruited from the local area and included vocational training. Unlike the projects that began several years after fighting had ceased in the Kunar, Nangahar and Kandahar provinces, however, the project in Now Zad commenced within weeks of combat concluding, giving development agencies the opportunity to provide relief to the Now Zad area sooner than expected. The project in Now Zad is seen as a model for future uses of CBD, especially since it uses Afghan NGOs and beginning work early with local authorities means clearance operations can allow relief and development to arrive quickly. This further builds the population's confidence in the NATO International Security Assistance Force's work, and more importantly, in the local Afghan government.

#### Conclusion

Confidence is key to successful counterinsurgency operations. The local population must have confidence in the forces in its area and in

the agencies and organizations providing relief and development. The Marine Corps' approach to counterinsurgency stresses building this confidence through close coordination and partnering with local forces, government officials and the citizens of the areas for which they are responsible. In order to provide relief and development quickly, the time between hold and build must be as short as possible. Many times, due to combat operations recently concluding, this time is delayed in order to clear the area of explosive remnants of war. This delay could potentially result in a loss of confidence by the local communities in the forces operating in their area. CBD is yet another way for the United States to insure that the "bridge" from hold to build is as short as possible. ♦

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## Destruction of Cluster Munitions in Moldova

For some countries affected by cluster munitions, the obligations to demilitarize that accompany ratification of the Convention on Cluster Munitions may appear daunting. In 2009, however, Norwegian People's Aid undertook a pilot project in Moldova to find a cheaper, more efficient alternative-disposal method. They discovered that not only can destruction of cluster munitions be done more effectively, but also that by using locally administered programs, international organizations can promote capacity building and increased employment while also bolstering national pride and commitment to the Convention on Cluster Munitions.

by Colin King [ C King Associates, Ltd. ]

During the Oslo Process, it became clear that several nations were concerned about their obligations to destroy cluster munition stockpiles under Article 3 of the Convention on Cluster Munitions. In fact, it soon became apparent that this might be a significant obstacle to signing or ratification for some countries.

Industrial demilitarization plants exist in several developed nations; however, costs are high, and most are running at or near capacity. Even if the resources were available, it would be uneconomical for an industrial unit to gear up for the disposal of small quantities of cluster munitions, especially if these were unusual types. A new process would involve a great deal of additional effort, including research on the ammunition, development of a new procedure, fabricating or adapting existing machinery, retraining the workforce, development of adequate quality control measures and so forth.

The need for another option led Norwegian People's Aid to examine alternative-disposal means on a national or regional basis. One possible benefit of using locally administered programs was program ownership. This ownership, or increased national involvement, brings with it tangible gains, such as capacity building and increased employment, as well as

intangible gains, such as a strong demonstration of commitment to the CCM and a sense of national pride. Other potential advantages of utilizing locally administered programs included lower cost and faster completion. During the 2008–09 period, a preliminary study established that locally administered, alternative-disposal options were realistic.

#### Moldova Pilot Program

The concept of small-scale regional programs was presented at the 2009 Berlin Conference on the Destruction of Cluster Munitions;<sup>1</sup> here, Moldova was among a small number of delegations that approached NPA to express an interest in a pilot project.

An NPA assessment team visited Moldova in October 2009 and identified five types of Russian cluster-bomb and submunition payloads in the Moldovan inventory. The submunitions included three types of anti-armor bomblets (PTAB-2.5, PTAB-2.5M and PTAB-10-5) and two types of fragmentation bomblets (AO-ISCh and AO-2.5RT). Externally, the bombs were in reasonably good condition, suggesting that the submunitions would be well-preserved.

**Unloading of cluster bombs.** The NPA team conducted all work at a Bulboaca military





Moldovan soldiers, under supervision, removing the tail from an RBK-500 cluster bomb.  
ALL PHOTOS COURTESY OF THE AUTHOR

facility, which includes a demolition area. Bomb disassembly was carried out in two adjacent tents, despite extremely cold weather and heavy snow. A team of Moldovan soldiers, trained in demolition under NPA supervision for unloading the submunitions from the bombs and assembling the demolitions, mainly used the first tent. The NPA team used the second tent for submunition disassembly.

The two types of bomb containers, RBK-250 and RBK-500, were similar in structure and were easily unloaded once the tail section was removed. After refining their technique, the Moldovan soldiers successfully conducted the unloading procedure in approximately 20 minutes per bomb.

**Submunition disassembly.** One of the primary objectives was to create simple, practical processes to remove bomblet fuzes, thereby exposing the explosive filling in order to make subsequent demolition simple and safe. This objective was achieved with four out of the five submunition types, with the AO-2.5RT as the exception. A number of these bomblets were also dismantled and defuzed; however, the process was considered too delicate, and therefore dangerous, for inclusion in a regional destruction program.

In keeping with the concept of regional program ownership, locally available tools were used wherever possible. The few exceptions included hook-and-pin wrenches and a chain vice, which was particularly useful for securing the bomblet bodies.

**Explosive demolition.** Successful explosive demolition of cluster munitions is notoriously difficult, as unexploded submunitions tend to be “kicked out.” Bom-

blets may become armed as they are ejected from the demolition, risking widespread site contamination with hazardous ordnance.

The relatively straightforward process of removing the submunitions from the bomb body makes successful demolition substantially easier. Furthermore, taking the additional step of defuzing the bomblets before demolition not only eliminates much of the residual hazard, but also exposes the high-explosive filling, thus further increasing the likelihood of complete detonation.

Once defuzed, demolitions were prepared by placing the bomblet bodies in wooden ammunition crates and covering them with a layer of TNT demolition blocks. This allowed the indoor preparation of shots, minimizing the time needed for final preparation at the demolition grounds. The efficiency of this process indicated that this technique could be employed successfully on a far larger scale.



AO-1Sch bomblet bodies after the explosive charge has been burned out.

**Burning.** Burning has a number of potential advantages for bomblet destruction, including avoidance of the noise and shock involved in demolition, elimination of the need for large stocks of high explosives, minimizing metallic contamination, and the retention of steel scrap.

Burning normally requires detonator extraction and exposure of the main explosive filling, which was easily achieved in a single step by removal of the fuze-assembly from all of the bomblet types, except for the AO-2.5RT. Once defuzed, the bomblet bodies were stacked

into wooden ammunition crates and covered with a propellant layer that had been salvaged from artillery ammunition. The bomblet bodies were then ignited remotely using electrical squibs placed into small bags of black powder.<sup>2</sup>

The A-IX-2 explosive used in the AO-1Sch bomblet was particularly difficult to ignite, and burning out these bomblets required careful preparation. A number of successful burns were conducted, once again indicating the technique could be applied within a large-scale process.

**Inerting.** A selection of each bomblet type was designated free from explosives for use as demonstration and training aids. This involved complete disassembly of the fuze-system to locate and remove all components containing energetic material and refitting the now free-from-explosive fuze assembly to a bomblet body from which the explosive had been burned out.

A simple quality-control system was implemented for the inerting process, involving two people independently confirming the absence of explosive components, with each marking the assembly using paint. The finished training aids were then marked clearly in blue, the NATO color code for inert items.

**Re-use of warheads.** Fuze and tail-assembly removal offers the possibility of retaining the shaped charge warhead for non-hostile applications, such as explosive-ordnance disposal, demolition or engineering. This option was highlighted during early program proposals and is especially relevant to the warheads used in PTAB bomb-lets; it may also be applicable to dual-purpose improved-conventional



Removing the fuze from a PTAB-2.5.

munition, such as the US M42, M46 and M77 series.

PTAB-2.5 and PTAB-2.5M-bomblet disassembly confirmed the achievability of this option. However, a complication in the PTAB-2.5M-shaped charge is the presence of a flash-receptive detonator, which must be pressed out to make it safe.

## Conclusions

The research-and-development phase of Moldova's pilot program was a great success despite extreme weather, a difficult operating environment and a restricted time frame. The operation confirmed that regional demilitarization programs involving Russian cluster bombs require minimal resources and could, therefore, be implemented anywhere.

As an unexpected bonus, Moldova quickly announced its intention to ratify the CCM, having been commended for its positive engagement and encouraged by its ability to achieve the demands of Article 3. Moldova subsequently became the final state needed to trigger the CCM's entry into force.

In addition to the immediate results, the availability of such a national capability may well prove valuable for further regional cluster-munition destruction programs. Furthermore, the facilities and expertise in ammunition disposal may be utilized or adapted for other ammunition types, which will inevita-

bly require attention as aging Soviet ordnance becomes unusable.

Currently, the NPA team is liaising with a number of other countries that are interested in developing their own locally administered cluster-munitions destruction programs. The question is whether the principle can be applied safely to more complex or challenging ammunition, such as cargo projectiles, rockets and NATO cluster bombs. ♦

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*Note: Since this article was written, Moldova has concluded the final phase of this project, in which their entire stockpile of cluster bombs was destroyed. The work was carried out by Moldovan soldiers under the supervision of NPA and C King Associates Ltd, making them the first nation to achieve compliance with CCM Article 3 using a “self-help” demilitarization program.*

see endnotes page 80



**Colin King** served 14 years in the British Army, mostly in explosive ordnance disposal, including operations in Bosnia, the Falklands, the Persian Gulf and Kosovo; and he also led the first British team to train Afghan deminers. He worked as a British EOD school instructor and an EOD intelligence analyst before his final tour with the Gurkhas and starting his EOD consultancy. His recent work includes mine clearance on the Falkland Islands, studies into the effects of aging on mines and regional cluster-munition stockpile-destruction programs. King also writes two reference yearbooks, *Mines and Mine Clearance* and *Explosive Ordnance Disposal*, for Jane's Information Group.

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# Albania Makes Progress in Demilitarization

With the goal of destroying all excess munitions by 2013, the Albanian government is working to eliminate stockpiles of excess military munitions. Following a 2008 deadly explosion at a munitions dismantling factory, the government established safer mandates and successfully destroyed thousands of tons of munitions.

by Captain Matt Goodyear [ United States Army ]

Two years after the 2008 deadly explosion<sup>1</sup> at a demilitarization<sup>2</sup> facility on the outskirts of Tirana, Albania's capital, the Albanian government has made significant progress in reducing excess stockpiles and demilitarizing hazardous and obsolete ordnance. Although ridding the country of more than 100,000 tons (9,072 metric tons) of outdated and dangerous munitions and weapons has been a formidable challenge, the government's efforts, in conjunction with the international community, have resulted in a robust and effective demilitarization program. Another 5,000 tons (4,536 metric tons) is expected to be destroyed by the end of 2010. This notable improvement in the management of Albania's excess munitions stockpiles reflects the government's commitment to the process and illustrates the impact of international contributions and collaboration.

## Albania's History of Explosives

The communist period of Albania's history (1946–91) was marked by a massive build-up in munitions and weapons of Albanian, Chinese and Soviet origin. Hundreds of depots were placed in every corner of Albania and were stocked with more than 100,000 tons (9,072 metric tons) of munitions. Each depot housed various types of munitions that became potentially dangerous after years of degradation. With the fall of communism in 1991, maintenance and management of the depots was neglected, and when anarchy enveloped the country in 1997, many depots were damaged, destroyed or looted. After stability was restored, the return of reclaimed munitions to depots was not handled systematically, further exacerbating an already dangerous storage environment. Now, two years after the explosion, ordnance has been consolidated into 44 depots. Because of their age, poor maintenance and lack of proper storage, some of these

munitions are unstable. In addition, due to residential encroachment, several depots are located close to civilian populations, endangering the lives of many people.

## Gërdec Depot

Some demilitarization efforts began in 2001, including an assistance project by the NATO Maintenance and Supply Agency, which destroyed more than 8,700 tons (7,892 metric tons) of munitions between 2002 and 2007. Then, on 15 March 2008, a massive explosion occurred at an ammunition dismantling facility in Gërdec, 30 kilometers (19 miles) west of Tirana and 3 kilometers (2 miles) from the national airport. Previously home to a tank division, the site had been converted to allow a private company to demilitarize ordnance and sell the scrap residue. The residents of the area were unwittingly living too close to the factory, and the blast killed 26 people, injuring more than 300.<sup>1</sup> The explosion's exact cause is still unknown; however, unsafe standards and practices were clearly being used at the Gërdec facility. As a result of this disaster, the Minister of Defence, along with 29 other people, was subsequently charged with abuse of office. The explosion and the public outcry that ensued brought demilitarization efforts in Albania to a standstill and created an atmosphere of paralysis in the Albanian Ministry of Defence. During the months immediately following the disaster, Albania, with technical assistance from the international community, worked to establish the necessary legal framework to demilitarize munitions and upgrade the decrepit facilities to reduce risk.

## The National Plan

In the summer of 2008, the Albanian government established a plan to demilitarize the remaining 85,000–90,000 tons (77,111–81,647 metric tons) of various



Shells from demilitarized 82mm mortars.

PHOTO COURTESY OF WILLIAM WADE, STERLING INTERNATIONAL, LLC

ordnance types. According to the plan, three primary factories would be used for industrial dismantling and destruction, including cutting open the mortars and removing the explosives, and eight demolition ranges would be used for open detonation<sup>3</sup> and burning. To realize this goal, significant financial and other contributions would be needed not only by the Albanian government, but also by foreign donors and international institutions. An ongoing demilitarization project managed by the Office of Weapons Removal and Abatement in the Department of State's Bureau of Political-Military Affairs (PM/WRA) was expanded to provide an additional US\$2 million for the Gërdec munitions clean-up.<sup>4</sup> In addition, the international community<sup>5</sup> offered financial support and expertise to safely clear the explosion site and demilitarize the remaining stockpiles. Industrial demilitarization finally commenced in January 2009 and open detonation began several months later. Since then, the Albanian government has prioritized its demilitarization efforts.

## Mjekes Explosives Factory

During its 2001–07 project, NAMSA developed part of the communist-era Mjekes explosives factory (just east of Elbasan in central Albania) to destroy small-arms ammunition. As a result of the project and a successful business in reprocessing explosive material, the Mjekes explosives factory received significant investment and was developed into a modern facility. In 2008, the Mjekes factory purchased two band saws to destroy 3,400 tons (3,084 metric tons) of 160mm mortars. After cutting the mortars and revealing the explosives, the workers used a steam generator to remove the explosives, and the shells were either discarded or sold for scrap. The explosives were then either burned or reprocessed to sell as low-grade explosives.

The Mjekes factory began processing the 160mm mortars in January 2009, and by June 2010, had successfully completed the project without incident. The factory line is now being adjusted to dismantle the approximately 11,000 tons (9,979 metric tons) of excess





The Mjekes demilitarization facility.  
Photo courtesy of Anthony Baird

120mm rounds. The government of Denmark through the Organization for Security and Co-operation in Europe recently donated to Mjekes four more band saws to establish a second dismantling line to handle other large-caliber munitions.

#### Polican Munitions Factory

While the communist-era Polican munitions factory near Berat in Southern Albania was part of the original NAMS project, it did not receive capital investment, and its technology and upkeep were significantly behind Mjekes. PM/WRA assisted the government of Albania by funding a U.S. contractor, Armor Group, to supervise demilitarization operations there. Polican did not have the capital to buy band saws, and thus, demil-

itarization occurred through simple dismantling (unscrewing the heads and steaming out the explosives). In May 2009, Polican began the demilitarization of 82mm Chinese-made mortars with TNT explosives. In early 2010, Polican received a donation of four band saws from Denmark. With these band saws, the factory is developing a dismantling line to demilitarize the more sensitive Amatol-filled Soviet mortars. So far, Polican has destroyed 2,300 tons (2,087 metric tons) of Albania's 15,000 tons (13,608 metric tons) of 82mm mortars.

Polican also benefits from a PM/WRA-funded portable incinerator for use in destroying small caliber ammunition, beginning with 7.62mm bullets. The incinerator heats the bullets until the gunpowder explodes, leaving the melted brass and lead for scrap.

The incinerator, which went into use in January 2010, can burn between five and eight tons (5.54 and 7.26 metric tons) of bullets per day. To date, it has destroyed approximately 360 tons (327 metric tons) of 7.62mm bullets.

#### Gramsh Factory

Solely run by Albania, the Gramsh factory also does industrial demilitarization. The government has established a line there to demilitarize 37mm ammunition. Due to its proximity to the local population, the factory must maintain a very low production rate and explosive-storage capacity. The process does not use band saws and involves manually dismantling the 37mm projectile from the fuze and steaming out the explosives. The Albanian government expects to complete destruction of all 4,000 tons (363 metric tons) of 37mm projectiles before the end of 2010, when the plant will retool the line to handle up to 100mm projectiles.

#### Albanian EOD and Ranges

Due to previous accidents on ranges, all open detonation of munitions in Albania was suspended in 2007. However, open detonation plays an integral part in the new national demilitarization plan. Thus, in 2009, the government of Albania designated eight ranges and began training its explosive ordnance disposal unit for detonation activities. The Albanian Armed Forces EOD units also received training from the U.S. Defense Threat Reduction Agency and U.S. EOD Navy experts. Despite various setbacks (including sometimes resistant civilian populations, theft of scrap and minor accidents on site), the EOD company

has made impressive progress, destroying up to 900 tons (817 metric tons) of ordnance per month. With support from the Dutch government, AAF EOD received three electrical firing devices to improve its safety on demolition ranges. Additional EOD safety and personal protective equipment was provided to Albania by the U.S. European Command. This equipment was used to train EOD operators, and it will increase safe operations through communication and positioning data with GPS-enabled radios. Since beginning work in 2009, the AAF EOD teams have destroyed approximately 4,400 tons (3,992 metric tons) of various size munitions.

#### The Way Forward

In 2009, Albanian Prime Minister Sali Berisha announced the demilitarization of all hazardous ordnance by 2013. With 75,000 tons (68,037 metric tons) of ordnance identified for destruction, experts concur that this is an ambitious goal. To support demilitarization, the Albanian government and PM/WRA jointly funded a NAMS project built upon the success of its 2002-07 project. In March 2010, NATO members approved the project and opened a NAMS office in Tirana in September 2010. While the memorandum of understanding between NAMS and the government of Albania is still under review, experts anticipate demilitarization under this long-term project will begin in January 2011, funded primarily by the United States, following the signing of the MOU.

Through these projects, Albania is developing specialized EOD and demilitarization capabilities that are

in high demand throughout the region. As the country completes its national demilitarization plan, the Albanian government and military will end up with a viable skill set that could be beneficial to NATO and other countries with deteriorating stockpiles. Likewise, the Mjekes factory, with minor upgrades in equipment and training, could become a regional hub for demilitarization. While the prospect of regional weapons destruction cooperation may seem ambitious, a regional approach to stockpile reduction is beginning slowly to take shape. By taking advantage of assistance from the international community, Albania is strengthening its expertise, gaining proficiency in munitions and ordnance handling, and is establishing appropriate munitions dismantling and destruction facilities. ♦

*see endnotes page 80*



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# The Terter Regional Vocational Training Center

Recently, International Eurasia Press Fund helped to form the Terter Regional Vocational Training Center to provide computer, business and vocational training for mine victims and their family members. The victims are also given medical and legal help by the Azerbaijan Mine Victims Association. The VTC and the AMVA both work to help war victims reintegrate into society.

by Nick Nwolisa [ International Eurasia Press Fund ]

The Azerbaijan National Agency for Mine Action was established in 1998 and since then, has carried out mine-clearance operations and humanitarian support in several regions and communities in Azerbaijan. Beginning in 2000, the International Eurasia Press Fund joined ANAMA in conducting various surveys to determine the impact of landmines on Azerbaijani territory. The survey results indicated that mine victims predominately resided in Agstafa, Fizuli, Goranboy and Terter.

In 2004, ANAMA worked with IEPF to conduct the Mine Victims Needs Assessment project. The project documented some of the challenges mine victims faced, such as:

- They were in urgent need of financial assistance.
- The families that had lost their bread-winners in the war needed assistance in establishing small-scale businesses to support themselves.
- Mine victims often faced legal challenges, particularly while trying to obtain their disabled status, citizenship registration card, etc.
- Both victims and people residing in mine-affected regions needed mine-risk education because accidents continued to occur due to lack of information.
- Mine victims, their families and the local population residing in mine-affected regions needed access to urgent medical attention following mine accidents.
- Mine victims required assistance in community and mainstream-society reintegration.

In order to help mine victims overcome some of these challenges, IEPF decided it should first bring the mine victims together through the creation of an association. This association would serve as a platform where

different initiatives and programs related to victim assistance could be developed through ideas contributed by the mine victims themselves. Terter was the first region identified for bringing together victims because of the high number of mine victims residing there. More than half of the Terter region's territory remains under Armenian occupation, and landmines and unexploded ordnance affect a large portion of the land.

## Azerbaijan Mine Victims Association

The Azerbaijan Mine Victims Association was formally established and registered with the Azerbaijan government in May 2007. Through its various achievements, the AMVA Terter branch was evaluated as a success by a committee within IEPF's executive board, and was highlighted by several international and local news outlets. Some of the achievements from AMVA Terter's project activities were:

- More than 50 mine victims received assistance in various legal matters, such as changing their federal disability status so their pensions aligned with the severity of their injuries and documenting marital status to allow access to family benefits.
- 140 mine victims actively participated in various training courses on small-scale business management, computer literacy and first aid.
- Three mine victims worked in various capacities in the regional IEPF offices.
- 27 mine victims received advanced medical diagnoses from specialists, which helped them access federal disability benefits.
- More than 30 mine victims received varying amounts of social assistance.

In 2008, based on AMVA Terter's success in assisting mine victims, the Office of Weapons Removal and Abatement in the U.S. Department of State's Bureau of Political-Military Affairs (PM/WRA), AMVA's original donor, financed the replication of similar actions in the Fizuli and Agstafa regions, and assisted AMVA in Terter with pursuing more activities. Most of the AMVA-Terter members joined the project working group, assisting mine victims with their legal issues and also providing courses in business training. Moreover, PM/WRA approved seed capital for providing microcredit loans to the mine victims. With this initial capital, the IEPF established the Avrasia-Kredit, Ltd., a non-banking organization distributing small loans to the less fortunate people in Agstafa, Fizuli and Terter. Additional financial donors, including CredAgro, AzerStar and AzerCredit, have increased the coffers of Avrasia-Kredit from an initial donation of US\$45,000 to \$600,000 recently, and Avrasia-Kredit is ranked among the top non-banking organizations allocating microcredit loans in the region, with more than 1,300 beneficiaries.

The mine victims who benefited from microcredit loans were mainly concerned with the expansion of their existing businesses, although some were interested in starting new businesses. IEPF and AMVA continued to provide business advice and entrepreneurial skills training to the mine victims and to a larger extent, the inhabitants of the communities in the regions. As the demand for microcredit swelled, a need to create a viable and sustainable source for



Trainees at the Terter Regional Vocational Training Center. Trainees are mine victims, spouses or family members of war victims.

ALL PHOTOS COURTESY OF THE AUTHOR

job creation grew; hence, the IEPF programs-development team established the Terter Regional Vocational Training Center.

The VTC was designed to not only help mine victims and their families gain the skills they needed to become self-sufficient, but IEPF suggested retired mine-clearance workers were in need of retraining, as well. Due to the extremely stressful nature of their work, mine-clearance workers normally retire from their positions at approximately 45 years of age; however, the law does not regulate the retirement age. IEPF noticed that many demining retirees had a difficult time finding other work and becoming financially independent because of the difficulty in transferring their unique skills into other professions. Vocational training is needed to help them find employment in other fields and reintegrate into society. Consequently, deminers were encouraged to attend the training courses.

## Training Center Goals and Strategies

On 30 March 2010, the VTC officially announced its opening. IEPF, in close collaboration with the Terter region's local municipalities, organized the ceremony, and many dignitaries attended, including PM/WRA's Azerbaijan Country Program Manager, Katherine Baker, and Michael Gaunt, the military attaché for the U.S. Embassy in Azerbaijan, along with a large number of community members. ANAMA's Information Manager, Murad Rahimov, also attended the opening ceremony to express ANAMA's desire to ensure mine-free zones in Azerbaijan's border territories. During the ceremony, Vudadi Isayev, the head of the local authority, expressed his delight with the continuous financial support of the United States.

The Terter Regional Vocational Training Center is unique, teaching food and nutrition skills; domestic skills such as painting, carpet weaving and decorative design; and tech-





IEPF Chairman Umud Mirzayev and the project working group meet with staff of the Terter Regional Vocational Training Center.

nical skills like electrical wiring, carpentry, and advertising and graphic design. VTC also provides training on agricultural practices, business skills and microfinance management. The first participants were drawn from the Terter region, but VTC expects others will come from the Agdam, Goranboy and Goygol regions. Presently, the two-story VTC building has various offices, restroom facilities and two training rooms that can seat up to 20 persons per room.

In the future, VTC will enroll war victims and retired deminers, irrespective of their locations. To accommodate the needs of these remote victims, VTC envisions having approximately six lodging rooms for participants and trainers from more distant regions of Azerbaijan, as well as a conference hall that can seat approximately 120 people.

During the opening ceremony, the chairman of IEPF, Umud Mirzayev, outlined the VTC's overall goals, which include developing income-generating skills for war victims, their family members and retired humanitarian mine-action personnel, as well as integrating those trained into mainstream society. To succeed, IEPF will assist with constructing and equipping the VTC, operating the VTC (train-

ing component), and finding job placements or business opportunities for the mine victims and the retired deminers.

Various local and international specialists and experts were involved in creating the VTC's training curriculum. The curriculum designed for VTC is modeled after best practices recommended by the International Labour Organization, and IEPF also has adopted several curriculum materials from Western Australia's Department of Education and Training and various similar institutions in the United States. Although VTC will use local experts as trainers, it will also work with established international organizations, particularly U.N. agencies with similar practices.

The training procedure followed by the trainers will be conducted using three learning approaches as outlined in the document, "Professional Development Framework for Vocational Skills of Vocational Education and Training Practitioners."<sup>1</sup> The three teaching methods are:

- **Formal learning:** a program of instruction emphasizing theory through classroom materials and shared documents
- **Non-formal learning:** a program of instruc-

tion in which learners put into practice all theorized learning processes. The learners begin to develop actual vocational skills in this stage.

- **Informal learning:** At this stage, learners are encouraged to practice skills outside VTC's walls, through their daily work and social, family or leisure activities.

#### VTC's Operations and Activities

In the first week of May 2010, VTC officially opened its operations, with the commencement of four vocational training courses including carpet weaving, food and nutrition, advertising and graphic design, and agricultural practices. Participants were from 18 to 50 years of age. Most of the male participants joined the agricultural courses, while the women took the carpet weaving and food and nutrition classes. The advertising and graphic design course attracted younger participants, both male and female. The first group of VTC participants were either mine victims or the spouse/other family member of a war victim; two mine-clearance workers enrolled in the subsequent class.

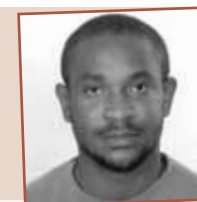
As VTC's main focus is providing participants with the skills to help them attain gainful employment, the VTC manager will closely collaborate with IEPF to find suitable places where the VTC graduates' newly acquired skills will be needed. Some of the graduates will be encouraged to start their own small businesses or even joint ventures. Microcredit loans from Avrasia-Kredit are easily accessible to VTC graduates.



One of the participants in the carpet weaving class displays her skills on knitting.

IEPF plans to expand and improve the VTC. Hopefully, international agencies and organizations will take advantage of the unique building housing the VTC. War victims, refugees, internally displaced people, local communities and deminers still need assistance. The VTC is a collective community resource, functioning to benefit the general public. In addition, VTC plans to diversify to also include the promotion of agricultural practices as one of its core activities, since this is the primary trade of the region's inhabitants. Although VTC has taught agricultural classes for quite some time, it plans to extend the training program to its commercial farm and provide on-the-job training for mine victims and their family members. The sales generated from the farm would be used for salaries and running the farm. ♣

see endnotes page 80



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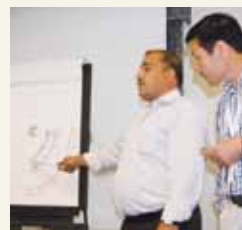
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## Mine Action Development Funding in Bosnia and Herzegovina

Mine action seeks to eliminate the lingering effects of contamination from landmines and explosive remnants of war, but the need for development in these communities often trumps clearance and mine-risk education activities. In Bosnia and Herzegovina, where clearance activities are expected to continue until 2019, the Swiss Development Cooperation and Handicap International are exploring new ways for mine action to integrate development efforts into more traditional mine-action efforts.

by Michael Carrier [ Handicap International ] and Dr. John Powell  
[ Community and Countryside Research Institute ]

The Bosnian War took place from 1992–1995 during the breakup of the former Yugoslavia and principally involved Serbian ethnic groups fighting against Muslim and Croatian groups in Bosnia. During the war, Bosnian and Croatian groups also turned against one another for the small part of Bosnia still in their control. As a result of these bitter conflicts, Bosnia and Herzegovina is one of the most mine-affected countries in the world.

Despite massive humanitarian mine-action funding during the past 15 years, the suspected hazardous area covers 1,620 square kilometers (626 square miles) or 3.1 percent of BiH.<sup>1</sup> The development of a new Mine Action Strategy (2009–19) aiming for a country “free of mines” by 2019 means it is officially recognized that the struggle to remove landmines will continue for at least another decade in BiH. Humanitarian donors will not likely commit funding in the required quantities to achieve the mine-free objective within that timeframe. Mine-action organizations, therefore, will need to use funding that is specified for more general development activities and operate mine-specific development activities in parallel with humanitarian assistance.

This article reflects on a pilot project currently being implemented in BiH. Funded by the Swiss Development Cooperation and Handicap International, the project aims to develop and test innovative ways to improve the links between mine action and development. This endeavor provides an opportunity to explore how the use of development funding can have a beneficial impact on more traditional mine-action efforts.<sup>2</sup>

### Development Approach Complements Mine Action

The term “mine action and development” does not mean “mine action” versus “development.” As a country moves from an humanitarian crisis to a development phase, a transfer takes place from the traditional mine-action humanitarian assistance to a mine-action development approach. This evolution potentially opens the door to new types of cooperation as a development donor may support “development activities” involving mine action, whereas it would not support demining activities alone.<sup>3</sup> Such donors would expect any mine-action intervention to be an integral part of, or at least closely linked with, a development project. Funding is unlikely to be earmarked specifically for mine action but more likely to be based on sustainable effects that any type of intervention, including mine action, would have on identified development priorities. Mine-action organizations will have a difficult time applying for this type of funding without stronger cooperation with other development actors. On the other hand, without a mine-action contribution, development actors would not be able to undertake work addressing social exclusion of a mine-affected population. Mine action—often thought to be dominated by military personnel and ways of thinking—and development stakeholders—often viewed by those in mine action as “civilian”—will therefore need to work together if they want to secure development money for mine-contaminated areas.

Cooperation between the mine-action and development worlds can be difficult and raise a number of questions, ranging from the existential “what is a ‘mine-action





Mine-affected inhabitants actively involved in reconstructing the existing road leading to the community of Burmazi, Bosnia and Herzegovina.

PHOTO COURTESY OF HANDICAP INTERNATIONAL

development approach?” to practical issues such as “who is in charge?” Linking mine action and development inevitably creates friction and requires both groups to be aware of their differing needs and requirements in order to achieve synergistic benefits from linked activities. A key finding in the BiH project discussed below is that most of the traditional development and mine-action interventions do not need any major institutional modification, as long as individual organizations focus on their own mandates within a coherent program of activity. Project outcomes suggest the following:

- Development donors will select the most relevant, efficient, impact-oriented and sustainable project, irrespective of whether a mine-action element is included
- A mine-action center can effectively supervise the five official pillars of mine action without the need to control development interventions in mine-contaminated areas.<sup>4</sup>
- All practitioners should maintain leadership of their core activities, while at the same time creating stronger linkages with other stakeholders.

Strong project management is required, with both sides involved from the beginning in a process of project planning that identifies clear goals, actions and evaluation criteria to measure overall effectiveness. An integrated approach requires:

- A risk-benefit approach in which risk assessment incorporates immediate local community social and economic objectives within long-term regional and national goals. The current risk-assessment approach needs modification.

- Demining and other mine-action operations prioritized on the basis of local needs. Prioritization already occurs, but integrating demining more frequently with development priorities is needed.
- Local-level processes to enable identification of social and economic benefits. These practices might need to be created from scratch but can be staged to identify key priorities early on and more complex concerns later.
- Mine action (e.g., fencing, education) delivered alongside development activities (provision of employment and income assistance, enhanced local services, road rehabilitation, etc.) requires a higher level of communication between mine-action and development organizations.
- Institutional processes enabling compromise between differing objectives. Mine action and development must adapt institutional goals and practices to allow for cooperation and coordination.

The emphasis is twofold, on both project planning and management, and on a deeper understanding of community development needs. The approach may result in a slower start to mine-action activities on the ground, but the outcome would be more effective intervention that simultaneously develops a community and releases it from the wider impacts of mines.

When the BiH project started in 2007, local community members from the mine-affected municipalities of Stolac and Berkovici identified road rehabilitation as a key priority. They realized that better accessibility within their community was necessary to obtain benefits from future mine-action intervention. Mine action would release land for agricultural purposes, thereby increasing local production, while the rehabilitated road would ensure that the agricultural products could be taken to regional markets, thus enhancing local income streams.

#### The Best Way to a Mine-free World?

The concept of mine action needs enlargement in order to encapsulate a country’s evolution from humanitarian needs and immediate survival to development and sustainable livelihood, as well as a concept that enables movement from a risk-focused to an impact-oriented approach. Instead of taking the traditional mine-free approach—where all possible resources focus on removing all mines before development can occur—an intermediary mine-impact-free goal may be needed.



IMAGE COURTESY OF NAVID BULBULJA

Questions then arise as to what such a term might mean on the ground and how a potential donor might interpret it.

We define *mine-impact-free* as freedom for local communities to attain sustainable livelihoods (i.e., economic, social and environmental benefits) provided through two broad sets of actions: first, by removing fear and uncertainty about what actions can and cannot be undertaken in a specific area, and second, through support for developing alternative livelihoods. Providing concrete examples of links between traditional mine-action outputs—mine-risk education, humanitarian demining, victim assistance, stockpile destruction and advocacy—and human-development goals will ultimately be more convincing to potential donors.

The adoption of an intermediate mine-impact-free target would undoubtedly delay the ideal time when all mines would be fully eradicated, as resources formerly devoted to demining would be diverted to social and economic development activi-

ty. In the long run, however, it may be the best possible way toward a mine-impact-free world, as it could secure longer-term funding and ensure mine action is only undertaken if the community benefits. In addition, to obtain local community support by enabling current generations to engage in rewarding and sustainable employment is more likely to occur than waiting for some future promised land that may never materialize in their lifetime.

#### Development: An Effective Response

If the concept of mine action is expanded beyond its current narrow focus on simply removing mines to consider a wider set of options for managing and removing the negative impacts of mines first, development intervention could become a very effective mine-risk response.

More than 15 years after the conflict, the majority of new mine/UXO victims in BiH are adults entering into known hazardous areas for economic reasons.<sup>5</sup> Without sustainable employment alternatives, they face bitter choices between neglect-

ing their families and risking their lives to meet their basic needs. Evidence from a field study implemented through this pilot project in May 2009 in the mine-affected communities of Stolac and Berkovici reveals that 24 percent of households surveyed continue to use marked mine areas. These are people fully aware of the risk, but they see entering the minefields as the only alternative to sustaining their incomes; therefore, no amount of risk education will curtail their actions. Project efforts to integrate mine action and development in these communities have revealed a local capacity to engage in bottom-up development activities that enhance the inhabitants’ social and economic lives, largely through redirecting the focus away from mine removal and instead toward prioritizing development activities in safe areas.

Prioritizing action, based on the limited resources available in a mined area can ensure that the most important local issues are dealt with first. Mine-risk management has a role to play, including the traditional





Despite the request of the Handicap International team, this local mine-affected inhabitant refused to move out of the marked suspected hazardous area.

PHOTO COURTESY OF HANDICAP INTERNATIONAL

mine-action threat-reduction activities (demining, fencing, marking), but in order to ensure behavioral changes, it must also link standard mine-risk education with actions to create development alternatives. In BiH for example, providing an uncontaminated community space for collecting wood, or temporarily exchanging suspected hazardous areas with safe agricultural land until clearance is completed, would alleviate financial pressures on locals who knowingly use mine-affected land. Thus, these activities would be safe, cost-effective and complementary approaches to mine action.

In the municipality of Berkovici, an association of hunters is one of the most high-risk groups in BiH and is currently involved in an innovative mine-risk management approach. After being accredited to conduct mine-risk education and carrying out a participatory, community-needs assessment, the association identified priorities for development, demining and mine-risk education. The priorities are being formalized into the existing mine-action system while a specific development alternative starts. With the support of local institutions, hunters will manage a specific hunting zone in a safe area, mark safe

paths that any type of visitor could use (not just hunters) and promote the area to local inhabitants, as well as foreigners, in order to enhance the area's tourism. Such an approach requires a deeper understanding of local communities and how they function but will potentially enable access to development funding for a more holistic form of mine-risk management intervention.

#### Conclusion

The traditional humanitarian-mine-action assistance alone cannot fully erase the impact of landmines and the related social exclusion factors evident in post-conflict zones. Traditional technical mine-action inputs, such as mine clearance mine-risk education and survivor assistance activities, are not sufficient. In order to improve quality of life and access development funding, mine action must also become part of a development response. It must include the setting of intermediary mine-impact-free targets and consider a wider set of intervention measures, from the recognized standards of mine action to innovative actions including institutional change, community appraisal, and support for alternative social and economic opportunities. ♦

see endnotes page 80



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## Mine-action Funding: GICHD Survey of Donor Countries

A recent survey of donors conducted by the Geneva International Centre for Humanitarian Demining found that, while short-term donor support remains strong, levels of funding may decrease and become more unpredictable over the coming years.

by Jean Devlin [ Consultant ] and Sharmala Naidoo [ GICHD ]

In May and June 2010, the Geneva International Centre for Humanitarian Demining commissioned a survey of 25 donors that have contributed to mine-action programs. The study's objective was to gain insight into the donors' motivation in funding mine-action programs, the issues that play a role in driving their continued support and the factors that will influence future funding. The findings indicate that short-term commitment and financial support remain strong. However, the sustainability of the current level of support for mine action beyond 2015 is difficult to ascertain.

A few donors responding to the survey indicated that in the near future they would be subject to program reviews, multi-year approvals for the renewal of funding for mine action or broader-defined programs that include mine action, anticipated budget cuts this year or in the next, and planned reductions in expenditures in mine action. Nevertheless, The majority of donors responding indicated that their commitment level would stay about the same for the next two to three years. Support will likely decrease beyond the next five years, with increasing unpredictability in funding. The study concluded that if less money will flow to mine action in the future, more cost-effective methods that result in concrete progress will be necessary.

In the future, a number of factors will converge, posing challenges and offering opportunities to officials concerned with mine action. Growing competition for financial resources in the broader peace and security field, a more pronounced desire to integrate mine action in the security-development nexus, reduced human resources in donor administrations dedicated to mine action and greater affected-country ownership

and capacity for dealing with residual mine and explosive-remnants-of-war contamination demand new approaches to a continual problem. Officials will need to work on strategies for integrating capacity-building into government priorities in affected countries, ensuring maximum protection of at-risk populations, reducing the size of suspected areas and concentrating on priority areas for socioeconomic development.

These elements constitute a strong argument for sustaining dialogue between donors and affected countries on how to assist the countries in their gradual takeover of Ottawa Convention responsibilities and obligations. The current explorations, such as those of GICHD into the best way of instituting this dialogue, are a positive step in this direction.

#### What Led to the Current Study?

Mine action has traditionally benefited from generous donor funding. According to the *Landmine Monitor Report 2009*, total funding for mine action amounted to US\$626.5 million through May 2009. Of this amount, \$517.8 million<sup>1</sup> came from international sources and \$108.7 million from mine-affected countries themselves. Despite recent adjustments, this amounted to some of the highest levels of investment to reduce the landmine threat since financial contributions to mine action were first recorded in 1992. Despite minor fluctuations in donor data, the *Landmine Monitor* has also recorded constant growth in annual mine-action contributions since 1996. Contrary to this encouraging trend, concerns remain about the effectiveness of mine-action programs, the uneven distribution of support and the sustainability of funding. While funding for



mine action has remained relatively high and donor commitment has been positive, there is some concern that funding over the coming years might be limited and difficult to secure. This is particularly true for less developed countries that have applied for deadline extensions to fulfill their clearance obligations.

#### Methodology

The study carried out between May and June 2010 consisted of a written questionnaire sent to 25 donors, including the European Commission, as well as telephone interviews with 10 donors selected from the study group.<sup>2</sup> The findings are based on the answers 18 donors (85.3 percent of total external funding) provided and a review of donor documents and websites.

#### Key Findings

##### 1. Broader environment and mine action.

Even though the Ottawa Convention remains the central anchor of donor policy-making, it is no longer the only point of reference. Most donors view mine action as part of broader development cooperation, which includes humanitarian assistance. Donors no longer view mine contamination strictly as an emergency issue requiring an immediate humanitarian response.

##### 2. Policy and strategic planning for mine action.

Donors are pragmatic in the way they relate to mine action. Donor policy language is now more nuanced and realistic in terms of what is achievable. Thinking has shifted toward placing greater emphasis on socioeconomic impact, protection, reintegration, livelihoods, gen-

der equality and care for survivors than on the number of mines found and destroyed.

Unless there is an unexpected turn of events, donors are unlikely to launch new initiatives and increase mine-action funding levels.



A female deminer in Jordan.  
PHOTO COURTESY OF ERIK TOLLERSEN/GICHD

This could well be the preview of a leveling off in programming. It also presents a challenge and an opportunity for mine-affected countries and mine-action operators to adjust programming during these strategically important next five years, in order to not only prioritize funding, but also to improve efficiency and transparency in mine action.

Donors are increasingly concentrating their support on a smaller number of countries. Fifteen out of 18 donors said that to varying degrees, the countries receiving assistance for mine action are also partner countries for other forms of aid. This is consistent with the

calls made by the Paris Declaration on Aid Effectiveness and the Accra Agenda of Action<sup>3</sup> for donors to focus their development assistance on a smaller number of partner countries. It is also in line with the desire expressed by

donors and recipients to ensure all government departments involved offer a coherent and consistent approach in providing assistance. For fragile states and states coming out of conflict, this means placing greater attention on ensuring that security and development programs are planned in tandem, which further supports the argument not to isolate mine action.

Putting these principles into action is not an easy task. Donors generally favor coordination among themselves and mine-affected countries but are not proactive in pursuing this coordination. They tend to respond to invitations from

national authorities to become part of a joint evaluation or assessment rather than initiate the project (with the notable exception of Japan which has emphasized this aspect in its recent aid policy). They remain divided about instituting new structures like a standing committee on international cooperation and assistance.

##### 3. Budget and program management.

The budget process varies considerably from country to country. In most cases, mine-action allocations are not highlighted as specific line items in budgets, but rather are subsumed in humanitarian, development, security or other related programming. Eight donors of the 18 that provided answers choose to dedicate a portion of their budget allocations for mine action or a mix of mine action and ERW/cluster munitions. Two of these donors dedicate part of their budget allocation for mine action for a specific purpose such as victim assistance.

The majority of mine-action funding is channeled bilaterally (directed to a specific country), typically through a multilateral organization, a nongovernmental organization or an operator. Most donors provide some un-earmarked funding, for example, core funding through multilateral channels (the United Nations Mine Action Service, GICHD), and through NGOs (International Campaign to Ban Landmines, Geneva Call, International Committee of the Red Cross), but these amounts are substantially smaller. The preference for bilateral funding is based on foreign policy and strategic reasons, as well as a desire to focus aid on those countries most in need. This partly explains why the majority of mine-action funding focuses on less than 10 mine-affected countries: Afghanistan, Angola, Bosnia and Herzegovina, Cambodia, Iraq, Jordan, Lao PDR, Lebanon and Sudan.<sup>1</sup>

Within donor agencies, the growth of competing fields, such as peacebuilding, security-sector reform, and conflict prevention and recovery, have affected mine-action programs. Competition for time and budgets has become a serious challenge. As a result, fewer people are tasked with primarily mine-action responsibilities than in previous years, and there has been a rapid turnover of mine-action personnel, resulting in a loss of corporate memory and in-house expertise.

Donors typically channel their support for mine action through a small number of intermediaries with limited direct support provided to national mine-action authorities. Of the 18 responses, only two donors mentioned clearly that their funding decisions took consultations



A village development committee in Cambodia.  
PHOTO COURTESY OF SHARMILA NAIDOO/GICHD

with mine-affected governments into consideration. This is at odds with the general trend by donors calling for greater national ownership and enhanced national mine-action capacity.

The main criteria that donors take into account when considering funding proposals and making funding decisions include:

- Measurement and prioritization of needs, i.e., focusing on clearing areas that yield the most measurable benefit
- National ownership and capacity
- Commitment to meeting Ottawa obligations
- Measuring the developmental outcomes resulting from mine action
- Measuring the experience and the capacity of local and international partners
- Aid effectiveness factors (coherence, coordination, sustainability, capacity development, etc.)
- Gender equality
- Proven effectiveness and experience of local and national mine-action programs and agencies

##### 4. Relationships with mine-affected countries and mine-action organizations.

Due to competing demands and reduced capacity, donor engagement at international mine-action meetings and at field level is weak. Donors typically function in response mode, reacting to proposals submitted to them as opposed to developing their own programs. Visits from donors are few and far apart, and are typically for monitoring and evaluation purposes. Most of the liaison work is left to embassies.

Donors tend to have a light footprint in host countries in terms of informing mine-affected governments of their decisions to fund a mine-action project, with



the exception of the United States and the European Commission. Direct contacts with central agencies occur more frequently when countries integrate mine action with development, such as in the case of Australia and Sweden.

### 5. Funding trends and prospects.

While the total flow of official assistance to developing countries may still be growing despite the current economic climate, there is little evidence that mine-action funding will follow this trend. On the contrary, mine action's relative importance, combined with mounting donor interest in other global challenges, and the fact that the Ottawa Convention has delivered tangible results, will probably mark a turning point in the next three to five years. Beyond the next five years, the picture becomes difficult to predict. However, it is quite plausible that funding will take a further downward trend.

Donor reaction to the recent extension process is prudent. As other countries join the extension process with their list of additional resources needed, the gap between needs and available resources will likely widen considerably.

In terms of change between channels, programming types and modalities, donors do not anticipate any major changes in the way they do business. Donors are open to integrating mine-action projects in broader development programs if mine-affected countries take the lead in raising the issue. Opportunities within donor administrations for initiating new funding avenues for mine action are marginal.<sup>4</sup>

In terms of commitment to support mine action, 17 donors stated their commitments (which differ from actual expenditures) would hold until the end of the current funding period (usually part of an official strategy, a mine-action plan or a public commitment of some sort). Donor funding for mine action may well have peaked in 2008–09 and has reached a new plateau for the immediate future (2010–11). In the medium-term (2012–15), funding will likely fall to a lower plateau. This situation could change during the 2014–15 period, as some major donors review their multi-year, mine-action assistance.

Many reasons explain this slow but predictable trend toward gradually reduced funding levels including lack of transparency and progress on clearance, lack of value for funds invested, extension requests with unreasonable financing estimates, budget restrictions, and competition for limited funding. Many donors and experts, however, contend that it is not the level of funding that counts as much as the effectiveness of assistance programs, socioeconomic impact, national authorities demonstrating ownership and pace of progress in land release. ♦

*The full report will be available for download through the GICHD website (<http://gichd.org>) by late 2010. For further information, contact Sharmala Naidoo at [s.naidoo@gichd.org](mailto:s.naidoo@gichd.org).*

*see endnotes page 80*



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# The United Nations Portfolio of Mine Action Projects

In Xieng Khouang, Lao PDR, an all-female demining team assesses and clears unexploded ordnance-contaminated land. In Bogotá, Colombia, a team of practitioners nationalizes a plan to train local health personnel about the psychosocial needs of explosive-remnants-of-war victims. In Banja Luka, Bosnia and Herzegovina, primary schoolchildren attend educational puppet shows about small-arms-and-light-weapons risks. At the heart of each initiative is a collaborative resource-mobilization system called the *Portfolio of Mine Action Projects*, and in 2010 it gives life to 277 projects in 27 countries.

by Chad McCoull [ Center for International Stabilization and Recovery ]

The U.N. *Portfolio of Mine Action Projects* allows government agencies and nongovernmental and international organizations in the field to publicize their plans to deal with local mine-action issues and to seek financial assistance for these plans. The annual appeal also serves as a compendium of global mine-action accomplishments and as a catalog for potential donors to browse. In addition, it is a reference and capacity-building tool, providing a snapshot of global funding requirements, the status of countries/territories' strategies and whose submission process helps appealing agencies hone their skills in proposal writing and strategic planning.

Simply submitting a project to the *Portfolio*, however, rarely gets it funded. In reality, the politics of aligning voluntary donors' interests with those of the manifold field agents often involves complex negotiations. Routine communications between stakeholders are necessary to strategize the yearly process of approving, funding, facilitating and publicizing country projects.

The process begins when an appealing agency identifies an outstanding need for which it requires external funding. For example, DanChurchAid, operating in the Democratic Republic of the Congo, may lack the resour-

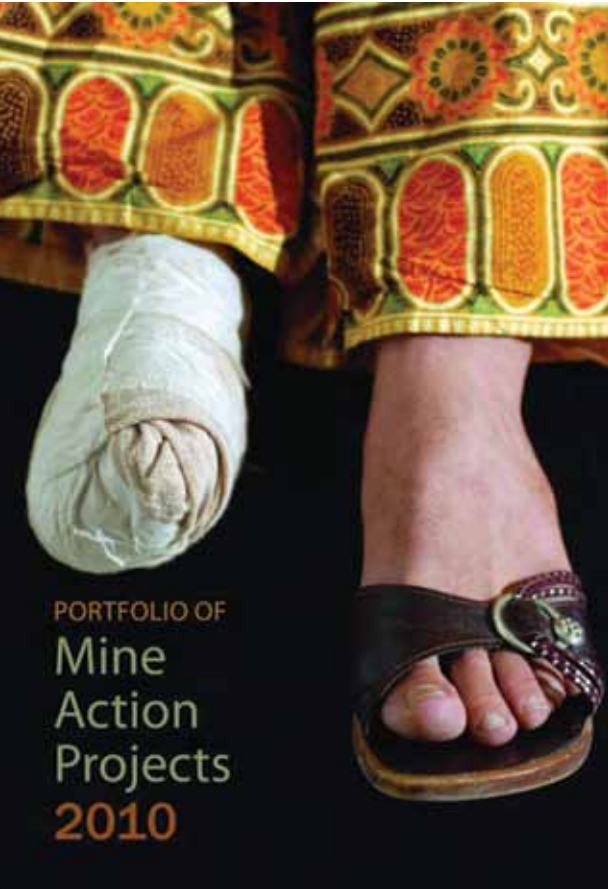
ces and personnel necessary to clear minefields in the Katanga province. The appealing agency must carefully articulate and submit a request to its respective Country Portfolio Coordinator who then liaises with the Portfolio Team at the U.N. headquarters. Getting indexed in the *Portfolio* requires that an appealing agency work with its implementing partners to formalize a detailed project proposal. In this example, DanChurchAid arranges for one implementing partner to provide mine-detection dogs and mechanical assets while another implementing partner conducts advocacy activities.

The U.N. Headquarters Portfolio Team—an interagency group of staff from United Nations Mine Action Service, United Nations Development Programme and UNICEF—vets the project proposals to ensure consistency and coherence with the stated requirements by the Country Portfolio Team. Finally, donor representatives select projects to fund, specifying budget timelines and accountability measures. Throughout the predetermined duration of project implementation, the applicant (in the above example, DanChurchAid) and its partners report progress to all relevant stakeholders. Once a year, the Portfolio Team publishes a new *Portfolio* online, refreshing the register of new requests and ongoing projects.



Thirteen Editions and Counting

Originally called the *Portfolio of Mine-Related Projects* in 1998, the *Portfolio* first arose from UNMAS' imperative to appraise and monitor the global mine problem's funding requirements. The first edition only acknowledged official U.N. programs, eight integrated mine-action programs and 10 countries' proposed projects lists. During the first five years, increasing numbers of NGOs and national authorities began to participate, some even actively replacing U.N. officials as Country



Cover of the 2010 Portfolio of Mine Action  
COURTESY OF THE UNITED NATIONS

Portfolio Coordinators.<sup>1</sup> Since its inception, the proposal process has evolved from a top-down approach to a decentralized approach in which field agencies chiefly assess needs and draft proposals. Today more than ever, the national strategies, priorities and coordinated processes of the 95 appealing agencies currently included in the *Portfolio* guide its content.

More recent in its history has been the 2007 debut of the invaluable Automated Portfolio System, which streamlines data submission and funds tracking and reporting in real time. The web-based AP System has been

instrumental in accommodating *ad hoc* electronic updates and biannual progress reports. According to the Portfolio Team, such efforts promote greater local and national ownership of the *Portfolio* process and support capacity development in terms of outreach efforts, especially to donors.

Linking Mine Action with Development

Following the Anti-Personnel Mine Ban Convention, victim rates have receded, consequently enabling the global mine-action community to pay greater heed to issues of community development. Recent studies have proven the importance of linking mine action with development,<sup>2</sup> and an increasing number of mine-action entities have begun aligning their efforts with the U.N. Millennium Development Goals<sup>3</sup> and Development Assistance Frameworks.<sup>4</sup>

The *Portfolio* is a testament to this trend. According to the Portfolio Team, “The benefits of mine action are seldom singular. A road made passable reduces victims, but also promotes the return of displaced populations and stimulates trade.”<sup>5</sup> With priorities shifting toward development-conscious mine action, the *Portfolio* has reflected a “more explicit elaboration of development aspects, where they may previously not have been highlighted.” In recent years, appealing agencies have increasingly partnered with development practitioners to attract the interest of progressive donors.

Matching Agencies with Donors

The track records of some appealing agencies show years of experience while others have only recently begun to grapple with mine-action issues. Despite such complexity, the United Nations and donors have been encouraged by the increase in national authorities asserting their right to oversee their own countries' multifarious activities.

Some appealing agencies have held the misconception that simply participating in the *Portfolio* will guarantee them funding from the international community. Programs that have not received funding in a particular year have thereafter withdrawn their proposals. While the *Portfolio* ultimately strives to connect the donor and implementer and serves as a reference tool for many donors, both parties must align regional and topical priorities before plans can be discussed. For this reason, not every project can receive funding. In 2010, for example, most projects did not receive funding. Out of the

US\$589 million requested for the combined projects, only \$24 million was secured at the time of publication, amounting to a record shortfall of \$565 million. In December 2009, UNMAS director Maxwell Kerley announced, “It is unlikely with our best efforts that funding would be attained, but it does not mean that the job won't get done—it will just take longer and more people will die.”<sup>6</sup>

The United Nations hypothesizes that some of the reasons for this shortfall include deficient reporting, the global economic downturn and new directions in donors' earmarking decisions. In addition, while the *Portfolio* has expanded from 10 countries in 1998 to 27 countries in 2010, donor interest in the mine-action field has stagnated. Though global support for mine action has remained constant, forecasts from *The Landmine Monitor Report*<sup>7</sup> indi-

for its flexibility in expressing the dynamic needs of a particular community. Japan, one of the major donors, annually references the *Portfolio* to inform earmarking decisions. Donors also gain greater awareness of the plights of lesser publicized countries, such as Mauritania.

When stakeholders meet to solve a problem, assess local needs and strategize a plan of action, the *Portfolio* empowers these parties to communicate uniformly and globally. According to the U.N. Portfolio Team, Albania often cites the *Portfolio* as invaluable for coordinating partners and attracting funds. In the Democratic Republic of the Congo, all national authorities, international agencies and NGOs found the *Portfolio* to be a useful means to coordinate activities. Amid Sudan's civil war, the call to compile the *Portfolio* brought together stakeholders from

delayed for some months as a result of this review. To learn more about the *Portfolio of Mine Action Projects*, visit <http://tinyurl.com/36gfzuy>. ♦

*Note: Information presented in this article was provided by the UNDP, UNICEF and UNMAS, members of the UN HQ Portfolio Team, interviewed in July and August 2010.*<sup>5</sup>

see endnotes page 81



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“It is unlikely with our best efforts that funding would be attained, but it does not mean that the job won't get done—it will just take longer and more people will die.”

cate that donors may decrease funding in future years.<sup>8</sup> To gain donor attention, the Portfolio Team recommends that appealing agencies respond by “recognizing the wider funding interests of traditional and non-traditional mine action donors and to partner with wider thematic and geographic funding sources.”<sup>9</sup>

Building upon Assets

Donors praise the *Portfolio* both for its utility as a reference tool and

both the North and South in confidence-building roundtables, long before the 2005 Comprehensive Peace Agreement.<sup>9</sup>

These success stories underscore the prospect that the *Portfolio* will continue to serve the mine-action sector as a permanent fixture. Currently, the Portfolio Team is reviewing inefficiencies and assets, listening to stakeholder feedback and improving objectives for the upcoming years. The 2011 *Portfolio* is expected to be



# The Mine Action Programme of Afghanistan

The Mine Action Programme of Afghanistan, coordinated by the Mine Action Coordination Centre of Afghanistan, faces a unique set of challenges in combating the national mine/explosive-remnants-of-war contamination problem. The ongoing war and changing political climate force the country to adapt its mine-action plan to meet new demands as they emerge. The following summary of MAPA's activities highlights these challenges and their implications for the continued humanitarian effort in Afghanistan.

by Dr. Mohammed Haider Reza [ MACCA ]

The Mine Action Programme of Afghanistan is one of the oldest and largest mine-action programs in the world.<sup>1</sup> Coordinated by the Mine Action Coordination Centre of Afghanistan, more than 10,000 individuals in commercial and noncommercial entities work in Afghanistan's mine-action field.<sup>2</sup> MAPA's implementing partners vary in size from large organizations with thousands of employees to smaller organizations with few personnel. MAPA covers all mine-action pillars,<sup>3</sup> including demining (survey, marking and clearance), mine-risk education, victim assistance and advocacy.

MAPA began in 1988 as a United Nations Office of Humanitarian Affairs coordinated operation based in Peshawar, Pakistan. After the Taliban's fall in 2001, the new government of Afghanistan delegated program responsibility to the United Nations to coordinate mine-action activities in the country. Since its inception, MAPA has grown in size and expanded its area of operation to every mine-affected province. In 2000, MAPA received only US\$17 million<sup>4</sup> in funding; since 2001 the overall budget of bilateral and multilateral funding has averaged \$140 million per annum.

The additional funding received since 2001 has allowed for some significant achievements. For example, the number of victims has been reduced by 75 percent from its high point in 2002, when the International Committee of the

Red Cross reported more than 1,200 casualties from landmines, unexploded ordnance and cluster munitions.<sup>5</sup> More than 12,000 minefields have been cleared and the land has been made available for productive use. The initial priorities were to clear the areas blocking access to schools, universities, hospitals, residential areas and farmlands. Although many of these priorities have been completed, as more refugees return and resettle in Afghanistan and the country slowly works toward building a modern infrastructure, mine action will continue to play a crucial role in the country's post-war development, such as in the clearance that was necessary to allow electricity lines to run from Tajikistan to Kabul. Despite the fact that the amount of funding received has increased, current funding is insufficient for Afghanistan, as it is in many other countries, if Ottawa Convention and Afghan Compact deadlines are to be met on time.

As the number of known minefields is reduced, MACCA works with implementing partners to annually review the planning criteria against which priorities are set and publishes an Integrated Operational Framework<sup>6</sup> detailing these priorities. This handbook outlines mine-action sector policies, details data analysis of the current hazard areas and contains a compilation of the aspirations of all implementing partners. Although more than 600 square kilometers (231.7 square miles)

of contaminated area remain, MAPA can eliminate high-impact hazards relatively quickly, clearing approximately 80 square kilometers (30.9 square miles) each year. Furthermore, having cleared the high-impact minefields in the last 20 years, MACCA and its implementing partners must begin to consider how to restructure over time in order to meet the next decade's challenges. For example, 40 percent of the existing contamination covers relatively large areas, with low-density contamination of minimal-metal anti-tank mines outside urban centers. Although once not considered a priority, the impact of these minefields on Afghanistan is increasing as the country's infrastructure and industry develop, particularly those associated with natural resources. Therefore, the priority for clearance of these sites must also adapt.



Mine-risk education is now taught by 17,000 trained Ministry of Education teachers throughout Afghanistan.

ALL PHOTOS COURTESY OF MAPA

## Afghanistan's Goals and End States

In 2003, Afghanistan became a signatory to the Ottawa Convention which commits the country to:

- Clear all emplaced anti-personnel mines by 2013
- Destroy all known AP-mine stockpiles by 2007 (this goal was achieved in October 2007)
- Provide mine-risk education to Afghans and assist mine survivors

In addition, mine-action goals were included in the Afghan Compact, namely:

- Land area contaminated by mines and ERW will be reduced by 70 percent by March 2011.
- All stockpiled AP mines will be located and destroyed by March 2007.

## Future Goals

The Afghan government's end-state vision is "a country free from landmines and explosive remnants of war, where people and communities live in a safe environment conducive to national development, and where landmine and ERW survivors are fully integrated in the society and thus have their rights and needs recognized and fulfilled."<sup>7</sup>

In order to realize the end-state vision, the following end goals must be achieved:

**Goal 1: Demining.** The end goal for demining will be achieved when all known mine/ERW-contaminated areas have been cleared. Once this goal is achieved, an effective demining capability will continue and respond to unknown residual risk and raise public awareness. Mapping of cleared areas will be complete and accurate, and this data will be available as needed to the public and designated institutions. All post-clearance documentation will be complete, and all cleared land will be handed over in accordance with national standards.

**Goal 2: Mine/ERW-Risk Education.** The end goal for MRE will be achieved when a comprehensive and sustainable system is in place to educate and raise awareness throughout communities nationwide regarding the residual mines/ERW threats. This includes providing the public with sufficient information to recognize and report these suspicious items to the appropriate authorities.

**Goal 3: Stockpile Destruction.** The end goal for mine-stockpile destruction will be achieved when all known illegal, abandoned or otherwise unwanted munitions are destroyed or disposed of in addition to the AP-mine stockpile destruction already completed.

**Goal 4: Mine/ERW-Survivor Assistance.** The end goal for mine/ERW-survivor assistance





Creative mine-risk awareness techniques capture children's imaginations

will be achieved when mine/ERW survivors are reintegrated into Afghan society, with support provided through a national system that incorporates the rights and needs of people with disabilities.

**Goal 5: Advocacy and Coordination.** The end goal for advocacy and coordination will be achieved when relevant institutions and civil society cooperate and support the fulfillment of Afghan commitments to mine/ERW eradication and acknowledge the importance of mine action for communities and national development.

#### Meeting Milestones

Clearly, the challenge of reaching these end states in a country as contaminated as Afghanistan, and where conflict is ongoing in many areas, is a major one. Nonetheless, MAPA has met a number of significant milestones. In addition to the achievements highlighted earlier and the completion of stockpile destruction in line with the Afghan Compact goals, significant steps have been made in the areas of MRE and victim assistance. These are the two areas where the transition to the government of Afghanistan has made the most significant progress.

Mine/ERW-risk education messages have been incorporated into the national education curriculum, and more than 17,000 Ministry of Education teachers have been trained and provided the resources to teach MRE in classrooms. In order to ensure the sustainable quality of this teaching, Child Protection Officers in all provinces have been certified as

MRE trainers and also trained in monitoring and evaluation. MACCA currently supports this transition by providing the external monitoring and quality management of this system.

The Ministry of Labor, Social Affairs, Martyrs and Disabled, and the Ministry of Public Health are leading victim/disability assistance activities, ensuring that landmine survivors and others with disabilities have their rights and needs addressed alongside all Afghan citizens.

#### Adapting to Change

Afghanistan faces particular challenges: the ongoing conflict in many parts of the country and the security threats presented by the widespread use of improvised explosive devices by Opposition Forces. In some communities, IEDs have been laid around villages in strategic patterns resembling traditional minefields, although without the density of the minefields laid by, for example, the Soviet Forces in the 1980s.

MAPA is dealing with the IED issue carefully to ensure it maintains its humanitarian neutrality and does not deal with IEDs in active conflict areas, which would lead to the deminers being perceived as parties to the conflict. However, it is important to heed the humanitarian imperative of clearing fields of abandoned IEDs in areas where conflict has been concluded.

As the nature of Afghanistan's armed conflict has changed over the last 20 years, MAPA has adapted and adjusted the delivery of mine-action services. In the last few years, community-based demining has been reintroduced to the program. Community-based demining projects are designed by the traditional Afghan implementing partners working closely with community *shuras* (or leadership committees) and the National Solidarity Programme Community Development Councils. These implementing partners work to develop projects that clear mines from the community by training local people from within that community. The traditional implementing partners also provide expert oversight and quality management.

The program is proving to be a successful way of enabling access to less secure areas as local recruitment and strong community involvement enhances deminers' security. An additional benefit of the community-based demining program is the economic boost provided to the small rural communities through the deminers' wages and other income, and through building rentals, etc., over a two-year period, which empowers them to take advantage of land development once it has been cleared.



A demining team walks toward a minefield.

#### The Road Ahead

Looking to the future, the program's major challenge is the requirement to make significant progress toward completely removing the impact of mines and ERW. There are a number of aspects to consider in order to achieve this objective: continued careful and strategic planning, investigation into new technologies (for example, those needed to clear very large minefields), continued adaptation of the program's structure, and a significant influx of donor funds.

#### Risks Remaining

MACCA believes no risk level is acceptable in areas communities regularly use. If the community fears certain areas, this will have a negative impact on its livelihood and ability to develop. Therefore, the fear must also be addressed. One of MACCA's 2010 tasks is to attempt to create a list of hazards that do not cause problems for communities and therefore could be managed in a different way.

In the same way that buried bombs from World War II are still discovered in Europe, the issue posed by ERW will be a problem in Afghanistan for many years to come. However, these concerns should be managed in a very different way, within the realm of a small national mine-action capacity by potentially partnering with the Afghan National Army and police.

#### Conclusion

MAPA and its partners have made tremendous strides toward ridding the country of landmines and other ERW, and in clearing the way for its country to develop and prosper. This progress has been achieved through increased focus and priority-based strategies, more funds to expand the workforce and support from the Afghan and international community. Many challenges lie ahead if the Afghan government's vision is to be achieved. That vision will require even greater commitment and focus than exhibited thus far. ♦

*see endnotes page 81*



**Dr. Mohammed Haider Reza** is the Programme Director of the Mine Action Coordination Centre of Afghanistan (MACCA), which coordinates the work of more than 40 implementing partners working throughout one of the world's most mine-affected countries. Prior to joining the MACCA, Reza served as a Deputy Minister in the government of Afghanistan's Ministry of Foreign Affairs and Ministry of Commerce and Industry. While Deputy Minister of Foreign Affairs, he was pivotal in Afghanistan becoming a signatory to the Ottawa Convention and ensuring mine action received the attention it deserved.

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# Bosnia and Herzegovina Demining 15 Years Later

This article outlines the demining steps taken by the United Nations and national authorities following the war in Bosnia and Herzegovina in the 1990s. The author further explores the shortcomings and successes of the demining projects and laws, with attention to preparations for the state's next decade of mine action.

by Zoran Grujić [ Bosnia and Herzegovina Mine Action Information System ]



A deminer in action.

ALL PHOTOS COURTESY OF BHMAC

In 1995, the Dayton Agreement put an end to three-and-a-half years of war in Bosnia and Herzegovina (BiH) following the dissolution of Yugoslavia. The first minefields in BiH were placed in late 1991 across the border with Croatia in the north. At that time, the United Nations Protection Force<sup>1</sup> was deploying in the country. Later, with a U.N.-instituted no-fly zone,<sup>2</sup> the Implementation Force<sup>3</sup> helped significantly reduce pollution from aircraft submunitions.

According to the Dayton Agreement (Annex 1-a), former warring factions were obliged to submit war documentation to the Implementation Force under the code name Operation Joint Endeavour. Initial information reported 16,500 minefields and enabled IFOR to begin clearance.

As it was too complicated, logistically and politically, to involve the existing three armies—ABiH (Bosniac), HVO (Bosnian Croat Army) and VRS (Bosnian Serb Army)—in demining, the Dayton Agreement tasked local armies to remove all of the minefields within their area of responsibility, but results failed to assure that the land could be used safely afterward.

## Getting into the Game

Following the conflict's end, BiH had no resources to begin the arduous task of clearance. In January 1996, the Council of Ministers of BiH requested the assistance of the United Nations to start demining activities. As a result, during the same year, the United Nations Mine Action Centre was founded. The BiH demining project started in 1996 with the center taking responsi-



A deminer begins activities in a new lane.

bility for mine-action coordination in July 1998. The following three “chapters” detail the U.N.-, international community- and state-led projects in BiH demining.

## Chapter One: U.N.-led Project

The United Nations Mine Action Center was established in Sarajevo in May 1996. RONCO, an American contracting company, was awarded a bid to equip, staff, train and start demining activities. Its first task was to assess the problem.

Some 16,600 minefield records were entered into a database. At that time, mine-action centers in Cambodia and Afghanistan had database systems, but they were custom-tailored to suit their own needs. BiH's situation was different: a small area dense with contamination.

In the early days, the BiH demining effort was a U.N. Department of Peacekeeping Operations program, and all activities were targeted toward establishing a mine-action-center structure. Nevertheless, the need for action was pressing as the landmine incident rate reached nearly 50 per month. Reporting procedures were still in their development phase, and demining reports from this time had to be resurveyed.

Another part of the initial demining efforts was instituting mine awareness. Risk education started as a joint venture between the International Committee of the Red Cross, UNMAC and UNICEF.

The initial programs' results were significant. The rate of more than 50 mine accidents per month in 1995 was reduced to fewer than 30 in 1998. BiH's problem was that all of the available procedures at the time had been developed for sandy areas such as Afghanistan and the Persian Gulf. In response to its unique situation, BiH modified procedures, shifting from a “retrace your footsteps” to a seven-step procedure, with the primary aim to avoid entering a dangerous zone. This procedure was later used worldwide.

Close to the end of the U.N. demining period (August 1996–July 1998) in BiH, UNMAC had five regional offices in Tuzla, Banja Luka, Mostar, Pale and Bihac, and was employing close to 40 trained, local mine-action center staff to conduct mine-action activities on their own. UNMAC also had four fully equipped teams capable of demining approximately six square kilometers (2.3 square miles) per year.





A deminer uses a metal detector in preparation for Technical Survey.

Information systems successfully followed activities, and maps were produced accurately depicting minefields. The program was slowly moving toward chapter two.

#### Chapter Two: State/International Community-led Project

On 31 July 1998, UNMAC was transferred to BiH authorities. To achieve this, structural changes had to be made. Project financing for demining operations was conducted mostly through the International Trust Fund for Demining and Mine Victim Assistance and the United Nations Development Programme. The staff was increased to 63 local staff members and approximately 20 international advisors and consultants.

The tripartite structure required strong coordination, which was lacking because resources were not sufficient to support all demining activities. With a changed mandate, it was illogical for the MAC to maintain its own demining team, so these teams were reassigned to survey and quality-control tasks. A number of the deminers, wishing to remain active with clearance, joined one of the three nongovernmental organizations that were established during this time—Pale's Stop Mines, Sarajevo's BH Demining and Mostar's Pro Vita. Further, to improve better territorial coverage, the regional offices in Sarajevo and Travnik opened.

Information systems were refined and mapping standards were established, increasing the MAC's effectiveness. An emphasis was placed

on planning and coordination among the members of the Mine Awareness Working Group.

As time passed, it became increasingly obvious that the tripartite structure could not achieve the maximum efficiency. In February 2002, the state parliament adopted the first demining law, moving BiH demining to chapter three.

#### Chapter Three: State-led Project

BiH took responsibility for enacting the demining law and appointed the Ministry of Civil Affairs and the Demining Commission to be the national authority responsible for instituting the law. BHMAL's role was to coordinate and plan BiH mine-action activities, including establishing a mine-detection dog center and conducting systematic landmine impact surveys. With the new demining law, the former tripartite structure unified and former entity offices became operational offices within their territories. While UNDP originally covered BHMAL's operational costs, BiH eventually assumed responsibility for the costs, and donor countries continued to send funds through ITF.

BHMAL decided to use Technical Survey to release demined areas rather than focusing solely on the complete clearance of demined areas; this resulted in an increase in productivity. Rather than clearing 10 square kilometers (3.9 square miles) per year, figures went up to 150 square kilometers (57.9 square miles) cleared in 2009. Also, with the exception of 2008, there has been a decrease in landmine accidents. Estimated annual productivity has grown to 35–40 square kilometers (13.5–15.4 square miles) for area clearance and Technical Survey and 80 square kilometers (30.9 square miles) for General Survey area.

#### The Way Forward

BHMAL has begun to revise the current demining law and create new legal documents that would enable greater involvement of local authorities in mine action. Having recognized the need to plan the next decade of mine action, the Council of Ministers evaluated the mine-action strategies employed from 2005–09 and

drafted a new strategic document for 2009–19. With the new strategy, at the 9<sup>th</sup> Meeting of the States Parties of the Mine Ban Treaty, BiH submitted an application for an extension to clear landmines; the extension was approved.

With the adoption of the first demining law, BiH accepted responsibility for mine action and developed standard operating procedures and quality assurance procedures for mine-risk education. These actions enabled strict quality control and allowed MRE field work to be evaluated. The law's creation also resulted in an increase in mine-safe areas and a continual reduction (with the exception of 2008) in landmine incidents. ⬇

*see endnotes page 81*



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## Mine Action in North Sudan

North Sudan's National Mine Action Centre is making great strides toward clearing all known mined areas in Sudan's northern regions by April 2014. In this article, the author, a Quality Assurance Officer for NMAC, explores NMAC's work, future plans and how it has linked mine action to development and recovery in North Sudan.

by Khalid Ibrahim Hamed [ National Mine Action Centre ]

More than 20 years of conflict between North and South Sudan, ending with the Comprehensive Peace Agreement,<sup>1</sup> has left Sudan riddled with landmines and explosive remnants of war. Based on the CPA, the northern region of Sudan consists of 15 states including the Blue Nile, Gadaref, Gezira, Kassala, Khartoum, Northern, North Darfur, North Kordofan, Red Sea, River Nile, Sennar, South Darfur, South Kordofan, West Darfur and the White Nile. Nine of these states in North Sudan reportedly have varying degrees of landmine and ERW-contamination with the Blue Nile, Kassala and Southern Kordofan being the most-affected regions.<sup>2</sup> Despite several years of intensive mine-action operations, landmines and ERW continue to threaten civilians and impede economic recovery and development. Contaminated land reduces productivity, thereby negatively affecting the sustainable livelihoods of rural communities. Furthermore, landmine and ERW contamination on key logistical supply routes continues to hamper safe and free movement of citizens, trade and humanitarian interventions. It also endangers the lives of local communities, internally displaced persons and refugees, as well as the staff of humanitarian operations. The presence and perceived threat of landmines/ERW prevents and delays IDPs and refugee populations from returning to their hometowns, and

as a result, constrains recovery, reconstruction and development efforts in mine/ERW and war-affected areas.

### The National Mine Action Centre

The National Mine Action Centre is the government body mandated to plan, coordinate and oversee all mine-action operations in coordination and collaboration with the Northern Region Office of the United Nations Mine Action Office in North Sudan. NMAC also serves as an implementing arm of the National Mine Action Authority.

As of June 2010, of the total 1,559 recorded dangerous areas identified in Sudan's nine affected northern states, 1,164 were cleared or verified while 395 dangerous areas remain to be addressed. During clearance/verification operations, a total of 2,625 anti-personnel mines, 686 anti-tank mines, 347,472 small-arms ammunition and 35,736 items of unexploded ordnance were identified and destroyed.

As a State Party to the Ottawa Convention, Sudan's northern regions are meeting their envisioned end state for mine action, as well as their obligation to clear all known mined areas by April 2014. Mine-action operations commenced in North Sudan in 2004, and since then, North Sudan has met a number of key milestones in reaching its mine-free end state, including the establishment of the mine-action authority and its substructures, adoption of the North Sudan mine-action law, inclusion of mine action in the state budget and the train-



A victim-assistance project under NMAC VA supervision.

ALL PHOTOS COURTESY OF NMAC MEDIA DEPARTMENT

ing of more than 40 mine-action management staff. Furthermore, North Sudan has developed and resourced national landmine/ERW clearance assets, including 120 deminers and technical staff. They are part of the Joint Integrated Demining Units that are actively engaged in mine/ERW clearance activities in partnership with several international mine-action operators in North Sudan, and that also manages a number of projects independently.

Although North Sudan continues to receive assistance from the United Nations and other donors, mine action has also been included in the state budget. Approximately US\$13.5 million has been allocated to mine action since mid-2006. This has encouraged other donors to continue supporting North Sudan to address its landmine/ERW contamination problem.

With the capacity-development assistance provided by the United Nations Development Pro-

gramme and United Nations Mine Action Service, the national mine-action authorities are actively engaged in the planning, coordination, priority setting, accreditation, quality assurance and oversight of mine-action operations in North Sudan.

### Development and Recovery

North Sudan has been very successful in linking mine action to recovery and development activities. The Government of National Unity has secured funds from the state budget, the Multi-Donor Trust Fund and the World Bank for the rehabilitation and reconstruction of 446 kilometers (277 miles) of railway lines, and approximately 200 kilometers (124 miles) of main roads have been cleared and verified to be free of landmines and ERW in the country's central and southern regions.





The Sudan Joint Integrated Demining Units go to a field at Babanusa-Waw for a railway clearance project.

Socioeconomic rehabilitation and reintegration of landmine and ERW victims remains a high national priority. Furthermore, North Sudan has signed and ratified the Convention on the Rights of People with Disabilities. Since 2007, 22 community-based projects have been implemented for the socioeconomic rehabilitation and reintegration of the landmine and ERW victims in various parts of the country with generous contributions from Canada, Japan and the state budget.

The North Sudanese authorities, UNDP and the UNMAO have embarked on a broader and more practical partnership in various areas of mine action in support of the implementation of the mine-action transition plan, and look forward to further expanding this cooperation and partnership in the future.

#### Future of Mine Action in North Sudan

From August 2010 until April 2014, the key challenge for North Sudan will be to clear known-mined or suspected-mined areas under its Article 5 obligations. In the future, North Sudan envisions producing an experienced mine-clearance staff capable of fulfilling its local role of mine clearance while offering support to other countries through sharing experiences and lessons and deploying trained staff.

With the engagement of all relevant stakeholders, a mine-action transition plan was concluded in November 2008. In 2009, based on the provisions of this plan, the national authorities

made significant progress toward transitioning by strengthening and consolidating their institutional and management capacities. As part of its long-term planning process, North Sudan's National Mine Action Authority, together with the UNMAO, UNDP and other stakeholders, has developed a three-year operations plan, covering 2009–11 to implement the Cartagena Action Plan. North Sudan aims to clear 80 percent of all known high- and medium-priority affected areas by the end of 2011 at an estimated cost of US\$120 million.

#### Conclusion

North Sudan is committed to fully implementing the Cartagena Action Plan. As it reaches the Article 5 mine-clearance deadline, North Sudan will put all necessary measures in place to achieve all the goals and objectives set forth in the action plan. To fulfill its Article 5 obligations, North Sudan's national demining teams, which are the nation's most cost-effective and sustainable assets, need continued and generous support from the donor community. This will enable North Sudan to realize the goal of being mine-free by 2014. ♦

*see endnotes page 81*



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## Mine-action Program in Southern Sudan

Following more than two decades of civil war between Northern and Southern Sudan, much of Southern Sudan has been left contaminated with landmines and explosive remnants of war. As a result, the Southern Sudan Demining Authority, along with the United Nations Development Programme, United Nations Mine Action Office and other organizations, have been diligently working toward clearing 80 percent of the mines in Southern Sudan by 2011.

by Margaret Matthew Mathiang [ Southern Sudan Demining Authority ]

The 21-year north-south civil war in Sudan that killed an estimated two million people, uprooted four million and caused 600,000 to take refuge outside of Sudan<sup>1</sup> has left Southern Sudan littered with landmines and explosive remnants of war. The contamination poses a serious challenge to the Government of Southern Sudan's development plans and is considered a serious threat to the successful implementation of the Comprehensive Peace Agreement signed in 2005 and ending in 2011. In 2011, in accordance with the CPA, a referendum will determine whether Southern Sudan will remain a part of a united Sudan or become its own separate entity. Based on the CPA, in 2005, Southern Sudan gained the right to self-determination in Bahr El Gazel, Eastern Equatoria, Jonglei, the Lakes, Northern Bahr El-Ghazal, Warab, Western Bahr El Ghazal, Western Equatoria, Unity and Upper Nile. All of its 10 states are reported to have varying degrees of landmine/ERW contamination.

As with the rest of the country, the civil war has left Southern Sudan with a large-scale landmine/ERW contamination problem. Despite several years of intensive mine-action operations, landmine/ERW contamination continues to threaten civilians and impede economic recovery and development. Contaminated land reduces productivity and thereby the sustainable livelihoods of affected communities.

Landmine/ERW contamination on key logistical supply routes continues to hamper safe

and free movement, trade and provision of humanitarian assistance. Contamination also endangers the lives of local communities, internally displaced persons, refugees, staff of humanitarian missions and the personnel of the United Nations Mission in Sudan. The presence and perceived threat of landmines/ERW prevents and delays IDPs and refugee populations from returning to their hometowns, and as a result, constrains recovery, reconstruction and development efforts in mine/ERW- and war-affected areas.

#### Mine-action Assistance

The Southern Sudan Demining Authority is the mandated government body established in 2006 through presidential decree number 45/2006<sup>2</sup> to plan, coordinate and oversee all mine-action operations in Southern Sudan with assistance from and in coordination and collaboration with the National Mine Action Centre based in Khartoum and the southern regional sub-office of the United Nations Mine Action Office in Sudan.

Other partners in UNMIS who assisted SSDA include the United Nations Development Programme in the area of capacity building, UNICEF in support of mine-risk education initiatives, international nongovernmental organizations (Norwegian People's Aid, Mines Advisory Group, Danish Demining Group) and national organizations (Operations Save Innocent Lives, Sudan Landmine Response, Sudan Integrated Mine Action Service), as well as oth-





A mine was found along a well-traveled path.  
ALL PHOTOS COURTESY OF THE AUTHOR.

er national and government institutions.

#### Achievements

Since 2004, when mine-action operations started in Sudan, Southern Sudan has met a number of milestones, including the establishment of the SSDA and its substructures, drafting of the mine-action bill, inclusion of mine action in the state budget and the training of more than 80 management staff in different technical and specified fields. Additionally, five senior personnel from SSDA completed the James Madison University Senior Managers' Course in Mine Action, thereby contributing to improved managerial performance. Furthermore, Southern Sudan is supporting the Joint Integrated Demining Units (national landmine/ERW clearance support) and has provided 120 deminers and technical staff to the JIDU.

As of June 2010, 4,206 of the 4,733 recorded dangerous areas identified in Southern Sudan have been cleared or verified as mine-safe, while another 527 dangerous areas are waiting to be addressed. During clearance/verification operations, a total of 17,023 anti-personnel mines, 2,290 mines, 779 landmines of unknown origin, 836,355 small arms ammunition and 575,382 pieces of unexploded ordnance have been found and destroyed.<sup>2</sup>

With the capacity development assistance provided by UNDP and the UNMAO, the SSDA is now actively engaged in the planning, coordination, priority setting, accreditation, quality assurance and oversight of mine-action operations. In addition to assistance provided by the

United Nations and others, 5 million Sudanese pounds (US\$2.11 million)<sup>3</sup> has been allocated by the GOSS to mine action since mid-2006. This has encouraged other donors to continue to support mine-action operators in Southern Sudan to address its landmine/ERW contamination.

#### Mine Action and Development

Sudan has been very successful in linking mine action to recovery and development activities. Northern Sudan's Government of National Unity and the GOSS have secured funds from the state budget, the Multi-Donor Trust Fund and the World Bank for the rehabilitation and reconstruction of 446 kilometers (277 miles) of railway lines and approximately 200 kilometers (124 miles) of main roads have been cleared of landmines/ERW in the central and southern parts of Sudan. The clearance of railway lines has been extremely important in restoring safe passage between Northern and Southern Sudan as the Babanusa-Wau railway line is the only all-season land link between the northern and southern parts of the country. In addition, the clearance and reconstruction of railway lines and roads has enabled the safe return and resettlement of IDPs and refugees.

Socioeconomic rehabilitation and reintegration of the victims of landmines/ERW continues to be a priority on the national agenda. Sudan has signed and ratified the Convention on the Rights of People with Disabilities. Over the past three years, 22 community-based projects have been implemented for the socioeconomic rehabilitation and reintegration of the victims of landmines and ERW in various parts of the country with generous contributions from Canada, Japan and the state budget.

#### Challenges

Southern Sudan is working toward becoming "impact free" as soon as possible, as achieving the status of "landmine free" is very much debatable. One of the key challenges for Southern Sudan is the clearance of known mined/suspected mined areas to provide a safe environment for returning IDPs and refugees. In addition, the SSDA in Southern Sudan faces challenges from the long rainy seasons, logistical complications and lack of enough data to determine the level, type and locations of contamination.

As UNMAO is operating under UNMIS's mandate, a reduction in international support is also expected during the forthcoming referendum period. This loss of funding calls for more financial support to national mine-action capacities, which remains a challenge for the GOSS, as it must confront conflicting development priorities in the post-war rehabilitation period.



A man walks past unexploded ordnance.

#### Transition Plan and End State

Southern Sudan faces major challenges in pursuit of clearing all known landmines by 2014; however, this might not be realistic due to the aforementioned geographical and logistical challenges.

With the engagement of all relevant stakeholders, a mine-action transition plan was concluded in November 2008. Based on the provisions of the transition plan, the national authorities made significant progress in 2009 by strengthening and consolidating their institutional and management capacities.

The aim of the process is to transition the management and coordination of the Sudan Mine Action Programme to national authorities in a systematic and gradual manner as soon as possible but no later than early 2011. The desired end state therefore is that the national authorities in Sudan manage all aspects of mine action with minimal technical assistance from the United Nations. The national authorities, UNDP and UNMAO have embarked on a broader and more practical partnership in mine action to support the implementation of the mine-action transition plan and would like to further expand this cooperation and partnership in the years to come.

As part of SSDA's long-term planning process and in its implementation of the Cartagena Action Plan, UNMAO, UNDP and all other stakeholders have developed a three-year operations plan covering 2009–11. With the implementation of the plan, Sudan aims to clear 80 percent of all known high- and medium-priority affected areas by the end of 2011 at an estimated cost of US\$120 million.

Southern Sudan Demining Authority has developed a three-year strategic plan that aims to strengthen national capacities in mine-action activities and to meet the vision of freeing the country from the effects and threat of landmines and ERW. Southern Sudan also envisions itself to one day be active regionally and globally supporting other countries with an exchange of lessons learned and deployment of trained and experienced staff. In the meantime, Southern Sudan continues to address its landmine/ERW contamination. It is in need of ongoing generous support from the donor community to all mine-action operators working in the region. ↕

see endnotes page 81



After receiving her Master's Degree in development training and education from the U.K.'s University of Wolverhampton, **Margaret Mathew Mathiang** became the Deputy Chairperson of the Southern Sudan Demining Authority in Juba, Southern Sudan in 2006. Today, she is the Undersecretary of the Ministry of Gender, Child and Social Welfare, a position she has held since September 2010.

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# Falkland Islands Demining Pilot Project: Completion of Phase 1

The United Kingdom has started to remove anti-personnel mines from the Falkland/Malvinas Islands<sup>1</sup> in order to meet its obligations under Article 5 of the Ottawa Convention. A pilot phase was completed in June 2010 to clear four suspected hazardous areas—a critical first step to inform future projects following the conclusion of the Joint U.K.-Argentine Feasibility Study.

by Robin Swanson [ Biron Associates Ltd. ]

An article in the 14.1 issue of *The Journal of ERW and Mine Action* made some observations about the completion status of the Falkland Islands Demining Program.<sup>2</sup> This article aims to articulate the program’s objectives, the problems encountered and methodologies used, and to draw on some of the key lessons learned from the experience.

## Objectives

The program’s objectives were twofold: to conduct a pilot clearance program to meet the requirements of Article 5 obligations and to inform future projects about clearance challenges. For this reason, the U.K. government selected four suspected hazardous areas in close consultation with the Falkland Islands government, which would provide different types of terrain and different mine and unexploded-ordnance threats—two SHAs near Stanley were known minefields (Surf Bay and Sapper Hill), and accurate minefield documents were held for them, while the ones in Goose Green and Fox Bay East had a less well-defined threat. The U.K. government set standards in excess of International Mine Action Standards by demanding a 200-millimeter (7.87 inches) contract depth for the clearance of mine panels. In addition, mines affected by the formation of sand dunes required excavation 300 millimeters (11.81 inches) below the 1982 profile. These increased standards were designed to address concerns within the island community about the ability of a mine-clearance program to remove all of the explosive hazards.

## The Threat

The Joint U.K.-Argentine Feasibility Study<sup>3</sup> identified the different types of landmines encountered on the islands. The majority of minefields contain plas-

tic, minimum-metal mines, which present a challenge for conventional metal-detection technologies due to the exceptionally small quantities of metal within the mines. Some of the SHAs had been subjected to BL 755 cluster-munitions strikes, but because of their high metallic content, these did not present the same level of technical challenge to detect.

## Clearance Methodologies Used

Modern metal-detection equipment struggled to detect the minimum-metal mines to the contract depth. Therefore, the demining contractor BACTEC International Ltd. used layered and full excavation techniques, depending on the expected mine threat, to meet the contract’s requirements. The mines had been laid in a very formal pattern using cord and markers at intervals, and the documents recording the two minefields near Stanley soon proved to be credible records of the mine pattern.<sup>4</sup> Therefore, once rows were encountered, the mine patterns could be followed and fully exploited using excavation techniques. This is a slow and demanding method of clearance in normal circumstances, but additional external factors exacerbated the situation further. During austral summer 2009–10, the Island recorded the worst weather patterns on record, with conditions including cold high winds, rain, sleet and snow. Additionally, much of the contaminated ground consisted of thick, fibrous peat and heavy vegetation, which was difficult to cut. This challenged the deminers<sup>5</sup> to draw on exceptional levels of patience, skill, good humor, and sheer grit and determination.

The Surf Bay Minefield was the most challenging task. The dense, mixed minefield contained more than 1,000 mines (SB33 & SB81) within a relatively small area of 3.34 hectares (8.25 acres), and the terrain also varied



Fully excavating the access lanes on Sapper Hill before the first P4Bs were encountered.  
PHOTO COURTESY OF GUY MAROT, DPO TECHNICAL ADVISER

within it. The local airport road bisected the minefield with deep peat to the west and gradually thinner peat and sandier terrain toward the beach on the east. Six mixed mine panels<sup>6</sup> straddled a previous track in sandy soil in the minefield’s northeast part where sand accumulation demanded manual excavation of 400 millimeters (15.74 inches). Two further panels, consisting of 16 anti-vehicle mines each, had been covered by large sand dunes since 1982. Conflict-aerial photography revealed that the mines had been

laid at the current beach level, which was marked by a cobbled layer of stone, but the sand dunes were between two and five meters (7–16 feet) above that level. After initially identifying the start of the first panel using manual excavation techniques, it then became a mechanical clearance task routinely operating in four to five meters (13–16 feet) of sand.

Finding mines at these depths required systematic search procedures. One early lesson learned was that a detailed, centimeter-accurate survey, used to establish exactly what had

been excavated and where the mines were located, was absolutely essential to ensure efficient use of time and resources. Fortunately, the Public Works Department on the Islands had access to Real Time Kinematic Survey<sup>7</sup> and its survey team supported the minefield mapping process very effectively.

Where the threat was less well-defined at Goose Green and Fox Bay, traditional non-technical and technical survey procedures were adopted. Much information still exists within the Falkland Islands local and military community and among military veterans concerning the events that took place during and immediately after the 1982 conflict. Fortunately for this pilot project, quality information was available. This may not be the case for many other areas where the minefield documents and records do not exist, and as time goes on, memories will fade, and key witnesses will be harder to track and interview.

## The Environment

Concerns about the project’s environmental impact were raised before it began and were a particular issue for the Falkland Islands government. The Planning Permission and consent provided by the FI government required submission of an acceptable ground remediation plan with each SHA Clearance Plan and that steps were taken to educate the deminers in the identification of rare plant species expected in the area. The Clearance Plans divided the cleared areas into three parts:

1. One area is left to recover naturally.
2. One area has the cut vegetation replaced so seeds from the cuttings can drop and germinate.





Armored excavator searching for the SB81 mines at the 1982 profile within the Surf Bay Sand Dunes.  
PHOTO COURTESY OF THE AUTHOR

3. One area is left for a different approach to be specified using natural and introduced methods. A broad plan was developed to satisfy these planning conditions.

Perfectly rebuilding the sand dunes was never an aspiration, but in close cooperation with the Environmental Planning Department, BACTEC replaced the sand to the best of their abilities, stabilizing the dunes' bases where possible using geo-textiles and aggregate bags. The area was left deliberately unsmooth in order to provide relief for natural forces to work on and to catch drifting seeds for germination purposes.

Monitoring will take place over the next two years to establish the most effective approach for future programs; not only does it need to be environmentally acceptable, it needs to be a practical, relatively simple and cost-effective procedure. These additional planning require-

ments are not always associated with mine-action programs and provided different challenges which required close liaison with local environmental bodies.

Although the tender document had been written to discourage the use of specialist mechanical systems, at the end of the process, the final result was visually not dissimilar to what might have resulted from a mechanical approach without the advantages of immediate re-germination when earth is processed and seeds are reintroduced immediate-

ly. As a result of the pilot program, these alternative approaches may be considered during follow-up phases.

#### Results

The following table represents the areas actually cleared (including additional battle-area clearance tasks associated with the four SHAs) and records the mines and UXO located between 3 December 2009 and 4 June 2010:

In order to place this into context, it is useful to note that Argentina<sup>10</sup> declared to the United Nations

SHA	AP Mines	AV Mines	UXO	Area Cleared
Surf Bay SA-008	488 SB33	568 SB81	1 M67 Grenade + 7.62mm ammo	3.34 Ha
Surf Bay BAC (Canache Wet Area)	-	-	4 M67 Grenades + 7.62 ammo	3.44 Ha
Sapper Hil SA-025	190 P4B	-	-	0.77 Ha
Sapper Hill BAC <sup>9</sup> (BL755 Strike Area)	-	-	-	6.29 Ha
Goose Green GG-011	-	-	-	2.41 Ha
Fox Bay FB-008W	-	-	-	2.3 Ha
Fox Bay BAC (Headland Area)	-	-	-	1.99 Ha <sup>9</sup>
Total	678	568	8 UXO + 7.62mm ammo	20.54 Ha

Summary of areas cleared.



The sand was replaced in a manner to provide relief for natural forces to operate.  
PHOTO COURTESY OF JOSEPHINE SWANSON

that it brought 25,000 landmines to the Falkland Islands at the start of the conflict (20,000 anti-personnel and 5,000 anti-vehicle mines) and that some 5,000 have been accounted for since the conflict ended. This means that approximately 20,000 landmines remained in the ground prior to Phase 1 clearance and that this program cleared more than 6 percent of the remaining mine contamination.

#### Confidence Building

An important part of any demining program is instilling confidence within the local community. On arrival, the Demining Programme Office<sup>11</sup> needed to reassure the community that all the mines could be removed from the areas selected, and to address a widely-held community view that the money could be better spent removing mines in other parts of the world. While this may be an honorable stance, the United Kingdom has an international obligation to clear the landmines in the Falkland Islands; therefore, the money for the Phase 1 program was allocated separately from the donations the United Kingdom provided for other international mine-action projects.

The Falkland Islands government was also concerned about the risk of injury to deminers when local demand to clear the minefields was nonexistent, no civilian injuries were sustained, and the minefields posed no human-

itarian, social or economic impact to the community. Fortunately, no one sustained injuries during the program, which can be attributed to good procedures, correct protective equipment and a strong ethos for safety adopted by BACTEC and the DPO.

The FI government and the local community were also influenced by certain historical myths that had perpetuated over time, adding to the belief that full clearance was impossible. One of these myths was that mines move in peat and would not be found. Most surface layers of peat (0–300 millimeters, or 0–11.81 inches) contain fibrous peat, or at least semi-fibrous peat, in the topsoil's lower parts, with a structure displaying horizontal laminations reflecting the gradual accumulation of little-decomposed plant debris. The large surface area and light weight of the mine would make it highly unlikely to shift within the peat and, indeed, the Phase 1 clearance program found no evidence of this. Taking Sapper Hill as an example of a typical peat minefield, no P4B mine was found deeper than 120 millimeters (4.72 inches), and 97 percent were at less than 80 millimeters (3.14 inches) or were located on the surface. The program did conclude, not surprisingly, that light, plastic anti-personnel mines can be moved by wind, water or by ground slippage, particularly when the topography, such as downhill gradients, was also a factor. Most mines were discovered at their predicted location within the documented





Surface-laid P4B with lot numbers easily visible and rubber seals intact.

PHOTO COURTESY OF GUY MAROT



The manually excavated area at Sapper Hill. (Yellow pickets indicate where P4B mines were found.)

PHOTO COURTESY OF THE AUTHOR

pattern, but natural forces had moved a very small minority. What is particularly interesting is that the condition of the majority of the mines was very good despite resting in acidic soil and damp conditions for 28 years, and we assess that most would certainly have functioned given the right pressure.

The FI government, concerned about its residual liability in the event of any future incident within the cleared areas, considered a number of proposals to keep the fences and some form of warning signs in place after clearance. The DPO made many announcements through the media to keep the community fully informed of the clearance process, encouraged visits to the minefields and held briefings to explain the detail and quality procedures associated with the clearance program. In addition, a public confidence demonstration was run after the completion of each task site. Following the last demonstration at Surf Bay, spectators swarmed onto the cleared area with their children confirming their confidence in the clearance process.

By the end of the program, all mine signs were removed from the cleared sites, but the fences remained around the former minefields at Surf Bay and Sapper Hill. The fences remained in place not to mark the areas as unsafe, but to prevent unnecessary damage during the environmental remediation period and to allow proper monitoring of the regeneration process.

#### Conclusion

One key conclusion from this program indicates that further research and development is necessary to improve the ability of manually detecting minimum-metal mines at greater depths. The program encountered many physical and philosophical challenges; however, it was an enormous success. This pilot phase will undoubtedly inform future projects about the technical, environmental and logistical challenges associated with clearance in the Falkland Islands, and will provide more accurate planning data for follow-on phases. ♦

see endnotes page



**Robin Swanson**, MBE, Director of Biron Associates Ltd., is a former British Army Bomb Disposal Officer who worked with C King Associates Ltd. for the duration of the Phase 1 Demining Program. Prior to leaving the British Army, he worked in the U.K. Ministry of Defence as a senior policy maker in International Humanitarian Law, specifically those conventions and treaties concerning conventional munitions, unexploded ordnance and landmines. He also participated in the Joint U.K.–Argentine Feasibility Study to demine the Islands.

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## Strengthening the Demining Sector Response to HIV/AIDS in Sub-Saharan Africa

In this article, the author explores how HIV/AIDS affects deminers in the African areas where the disease is most prevalent. He considers how deminers' lifestyles make them especially susceptible to HIV/AIDS and suggests mobile HIV/AIDS programs can effectively combat this growing threat.

by Dr. Martin Chitsama [ Demining HIV/AIDS Service Foundation ]

Demining began in Sub-Saharan Africa in the early 1990s, incidentally commencing just a decade after the HIV/AIDS pandemic started calling on the human race.<sup>1</sup> According to the 2007 and 2009 *Landmine Monitor Report* and national mine-action centers in Africa, at least 50 national and international demining organizations currently conduct landmine-clearance operations in Sub-Saharan Africa, collectively employing more than 10,000 deminers.<sup>2</sup> Angola's National Demining Institute alone has a contingent of 4,000 deminers organized into 18 brigades that are demining across the heavily mined southern African country.<sup>2</sup>

Considering that all the African States Parties to the Ottawa Convention are lagging behind their targets under Article 5 and are continually calling for extensions, deminers in Africa are set to clear landmines on the continent for many more years. As reported in 2009 by the Joint United Nations Programme on HIV/AIDS (UNAIDS), the region is also "more heavily affected by HIV and AIDS than any other region of the



Demining crews always have medical teams onsite. Medics could be trained to run workplace HIV/AIDS advocacy programs.

ALL PHOTOS COURTESY OF JOSEPH KILINO, MDD HANDLER, VDS ANGOLA

world." All in all, "an estimated 22.4 million people are living with HIV in the region—around two thirds of the global total."<sup>3</sup> As a result, large numbers of deminers in Africa are at a significant risk of contracting HIV/AIDS for many reasons, including worker mobility and extended separation from spouses.

For a deminer, the work-leave cycle provides for limited family time in a year. There is so much to catch up on when families reunite after long separation periods that the

question of checking on a spouse's HIV status is hardly a priority.

The demining-site remoteness means that deminers are cut off from mainstream public-health campaigns, including HIV/AIDS programs. Health workers fear traveling to suspected-mined regions in Africa, which also leaves deminers isolated in terms of outreach programs. Furthermore, deminers are usually 20 to 49 years old, sexually active and tend to have capital to spend while interacting with war-





Demining Control Points could carry HIV/AIDS-advocacy banners, reaching out to millions of people using roads being cleared of landmines in Africa.

torn communities whose sexually active youths often engage in commercial sex due to limited economic options.

To compound the situation, most demining operators in Sub-Saharan Africa only have informal HIV/AIDS policies, and financial and human resource constraints hamper the transformation of these policies into workplace programs. The inherent risk associated with demining further puts deminers at risk of occupational exposure to HIV transmission when a landmine casualty occurs. All personnel on the demining site are involved if an incident occurs and occupational exposure is probable during the handling of the injured party. Additionally, antiretroviral post-exposure prophylaxis<sup>4</sup> is largely absent in the demining industry.

#### Deminers and HIV/AIDS

In May 2002, the Interagency Coalition on AIDS and Development made observations regarding the relationship between deminers and HIV/AIDS risk and recommended that intervention programs be implemented for the sector. The Accelerated Demining Programme in Mozambique claims that while it has lost only one deminer to a mine accident, it has lost 10 to HIV/AIDS.<sup>5</sup>

The labor laws in some countries, such as Mozambique, demonstrate the difficulties that demining companies face regarding HIV tests and can result in demining operators facing legal problems. For instance, in 2005, Mozambican Labour Minister Helena Taipo rejected an appeal by the U.S.-based demining company RONCO Consulting Corporation against a fine imposed for violating Mozambique's ban on compulsory HIV tests. In June 2005, the Labour Ministry discovered

that when selecting Mozambican sappers to go on a demining mission to Afghanistan, RONCO required them to take HIV tests. Similarly, ArmorGroup was fined in Mozambique for allegedly hiring deminers destined for Cyprus on the basis of HIV results. In addition, Zimbabwe's Southern Africa Demining Services Agency had to compensate deminers loaned to BACTEC International for South Lebanon operations in 2002 when the deminers were denied deployment on the basis of HIV tests.

#### The Solution

The World Health Organization, UNAIDS and the United Nations Population Fund recommend the implementation of mobile HIV/AIDS services targeting hard-to-reach populations, including deminers. The mobile-service efficacy for hard-to-reach populations has been demonstrated by the Uganda Program for Human and Holistic Development, the success of voluntary counseling and testing in the United States Agency for International Development's outreach services in Ethiopia, New Start Centres in Zimbabwe, and through the *Journal of Acquired Immune Deficiency Syndrome's* report on increased voluntary counseling and testing uptake in mobile clinics as compared to "stand alone" clinics in Nairobi, Kenya. Similarly, the Tanzanian Military reports success stories for its four mobile HIV clinics established with the U. S. Military HIV Research Program in 25 camps along Tanzania's Lake Zone.<sup>6</sup>

#### Feasibility and Benefits of Mobile HIV/AIDS Programs for Deminers

Having worked with thousands of deminers as a medical doctor from 1998 to the present, I have inter-

acted with deminers in Luena and Menongue (Angola); Shilalo (Eritrea); Mukumbura (Mozambique); Garowe and Hargeisa (Somalia); Ed Damazin, Juba and Rumbek (Sudan); and the Gonarezhou National Park and the Zambezi Basin (Zimbabwe). I recommend implementing mobile HIV/AIDS programs for deminers for the following reasons:

- Deminers have easy access to medics at their work-sites, which would allow the medics to be trained and become part of the HIV/AIDS healthcare team.
- Demining operators will benefit from getting tested: Negative HIV deminers will want to preserve their statuses, and positive deminers will be anxious to enter into antiretroviral treatment programs.
- Circumcision is of particular interest, and if presented properly, this practice will benefit deminers and their spouses significantly. Circumcision benefits are well-documented, and instituting Kenya's Raila Odinga-inspired male circumcision program<sup>7</sup> to the demining setting would immensely benefit deminers.<sup>8</sup>
- All Sub-Saharan African states have national and regional HIV/AIDS policies, but these policies are sometimes contradictory. Forming national/regional protocols for hiring and managing deminers is practical.
- The United Nations International Mine Action Standards *IMAS 10.409* already provides for the updating of HIV lists during demining operations making it easy for the United Nations to contact deminers and provide comprehensive HIV/AIDS programs for them.

#### Call for Mobile HIV/AIDS Services for Deminers

Motivated by the success stories of mobile HIV/AIDS services programs targeting hard-to-reach groups and the feasibility of an HIV/AIDS program for deminers, a group comprised of demining experts and medical doctors who had worked in demining for the past decade formed an initiative called The Demining HIV/AIDS Service Foundation in 2009. The Foundation, a nonprofit trust based in South Africa, was specifically created to mitigate the HIV/AIDS pandemic in Sub-Saharan Africa's demining sector.

The Foundation is calling the mine-action community to partner with it in building up and implementing

the following programs for deminers and landmine-impacted communities in Sub-Saharan Africa:

- An HIV/AIDS risk-assessment profile for deminers
- An HIV/AIDS educational program for deminers and program managers
- Mobile Voluntary HIV/AIDS counseling and testing programs for deminers
- Delivery of mobile male circumcision services for deminers in Sub-Saharan Africa
- Delivery of antiretroviral treatment and care for deminers in Sub-Saharan Africa

*see endnotes page 82*

*The author is grateful for the advice he received from Robert Kingsley of the Demining HIV/AIDS Service Foundation; LifeWorks (South Africa); the U.S. Centers for Disease Control; Cal Keagle of RONCO Consulting Corporation; Andy Smith of nolandmines.com; Trevor Thompson of Security Devices; Temba Kanganga of Southern Africa Demining Services Agency; Barry Vermeulen, Steve du Preez and Thinus Putter of Vanguard Demining Services Angola; and Johannes Van der Merwe of the World Bank; and his wife, Hendrina Chitsama.*



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# The Growing Threat to Humanitarian Operations

Deminers and other humanitarian-aid workers around the world, though previously viewed as off-limits, have become targets of distrust and even violence by certain groups. This article explores the reasons for this shift in ideology, and what action humanitarian organizations must take in order to protect their personnel.

by Adrian King [ HMS, Ltd. ]

The days of showing respect to civilian humanitarian-aid personnel and organizations in the field are long gone, so that even the once sacrosanct International Committee of the Red Cross is no longer safe from attack. In recent times, increased rhetoric against the United Nations and humanitarian-aid agencies, mainly from *jihadi* groups (such as those in the call-out box below), has led to a long overdue appraisal of the vulnerability of aid workers and U.N. peacekeeping personnel as the global security situation deteriorates and risk of violent attack increases.

*“The UN is also standing with the enemy against Muslims what about the standing Muslim matters like Palestine, Chechnya, Cyprus ... and other Muslim matters, all these are evidence of the oppression of the UN against Muslim countries ...”*  
*Al Somood, The Struggle<sup>1</sup> (jihadi propaganda)*

### The Developing Mindset

Since the rise in international terrorism, providing aid has become more of a high-risk occupation than ever before. Military operations both in Afghanistan and Iraq have fueled the ill-informed and biased speculation of the *jihadists* and stirred suspicion of Western motives in these and other regions, with aid workers often seen as agents of military powers. Both the United Nations and aid organizations are now viewed in some areas of the world as being part of a Western agenda, led by the United States

and its allies, to suppress Islam, spread Christianity in the Muslim world, and support an invasion and occupation strategy directed toward Muslim countries. These views can be seen in the Afghan Talibans' monthly magazine, *Al Samood*.

One only has to look at the grim record of attacks against personnel working for U.N. agencies and other humanitarian-aid organizations to appreciate the fragile and, at times, near non-existent nature of security measures taken in the field. Humanitarian organizations and personnel must understand that deprived

populations' access to aid must be balanced against underlying security threats where, as a consequence, the susceptibility and accessibility of aid personnel and their local employees is increased, and the risk of violent compromise in certain locations is ever more likely.

### Valuable Human Assets

Personnel engaged in humanitarian work are dedicated to the work they do and the people they serve. Thoroughly committed to their vocation, these aid work-



U.S. Army soldiers assigned to the 203<sup>rd</sup> Combat Engineer Battalion of the Missouri Army National Guard use a tracked excavator to remove tons of rubble and debris as rescue workers search for victims at the United Nations Office of the Humanitarian Coordinator building in Baghdad, Iraq, after a truck bomb destroyed much of the building on 19 August 2003.  
PHOTO COURTESY OF MASTER SERGEANT JAMES M. BOWMAN, USAF

ers venture into areas and situations considered by most to have an unacceptable risk of attack or at least confrontation with hostile groups. These groups, for one reason or another, do not appreciate or support the aid work carried out, and because of their beliefs, view humanitarian-aid workers and those who support them as viable targets for aggression.

In the demining world, work is often conducted in countries where the underlying security situation is unstable or where low-level conflict is in progress. However, exceptions exist. In Afghanistan, Iraq and Somalia for example, mine-action activities continue effectively despite widespread and ongoing violence, where no peaceful resolution is in sight and the situation may escalate at any time. In the case of Afghanistan, NATO maintains that its in-country presence is for the purposes of stabilization and infrastructure development. Unfortunately, this gives the impression that the “war” has been won when it is apparent that ever more violence occurs daily in communities and organizations throughout the country.

Sanctioning the deployment of U.N.-armed military personnel to a country or region in crisis not only shows that violence is expected, but that weapons used for pro-

tection are essential to the success of legally mandated work in agreement between national governance and the United Nations. The question then has to be asked, in view of this decision to deploy an armed force, on what basis do nongovernmental organizations and private and commercial companies deploy their personnel to such areas, where the risk of attack is high and the level of protection offered is generally not commensurate with the threats that may be encountered?

As previously alluded to, many individuals are “called” to intercede on behalf of the victims of crisis through their vocation and belief, but what is their level of responsibility, both to themselves and to those who will support them in-country and be formally engaged by them in the conduct of their mission? And perhaps more importantly, what is the responsibility of the organizations that employ humanitarian workers?

The posed questions are not meant to undermine an individual’s integrity or an organization’s justification for carrying out humanitarian work, but to provoke discussion on the criteria used to guide risk assessment. This assessment should be conducted with the expatriate professionals and the local nationals involved at varying levels, from humble driver to mission manager.



Process and Procedure

The Geneva Conventions of 1949<sup>2</sup> are the legal basis for categorizing humanitarian work; they guarantee protection for humanitarian workers provided that they are not party to the conflict. The Conventions do not, however, give right of access to conflict areas; and although combatant attacks on humanitarian personnel are prohibited, providing escorts is not a requirement, including where other factions may pose a threat to safety.

This article does not provide an analysis of all attacks on U.N. or other aid personnel, but in analyzing demining specifically, it is possible to draw a loose analogy from the evidence gathered through attacks and, in some

conflict and enabling infrastructure renewal and a return to normal life activity. For the majority, mine action would be seen as an essential and normal part of a country's post-conflict recovery process, and many would perhaps struggle to understand why people would oppose such action taking place. The reality is not so simple, however, and in assessing the chronological data of attacks on demining personnel, one has to surmise that a political motive is often the basis for the incident. In Afghanistan, the Taliban see the United Nations and other aid organizations as collaborators with NATO's International Stabilization Force and corruptors of the Muslim religion, views echoed by Al-Qaeda in the Arabian Peninsula.

*“The UN is a tool of American global politics, duping people by claiming that it is a neutral international organization, where it is in fact a criminal American institution; the presidential election in Kabul is evidence enough of this. This organization has not been established to support and help people, and since it was established, it has taken part and contributed to war crimes ... In the same way the invader forces will be forced to leave Afghanistan; this institution called the UN must leave for good ...”*  
~ Al Somood. The Struggle<sup>1</sup> (jihadist propaganda)

cases, predict a continuance of the trend in some countries and regions. Since 2003, more than 50 mine-action personnel have died from non-mine related injuries, the majority in Afghanistan.<sup>3</sup> The evidence shows that, in most cases, attacks are targeted directly at the demining workers and not randomly, as some believe. In the majority of the incidents, the attacks were carried out using small arms and improvised explosive devices, the latter of which are a well-known threat in Afghanistan and a growing threat globally, and which allow precise targeting without exposure to retaliation or identification of the perpetrator(s) at the incident scene.

Deminers as Targets

Mine action is an activity built on military breaching and explosive ordnance disposal skills to remove area explosive hazards, thus allowing repatriation of displaced persons and communities following the con-

For these reasons, attacks on the United Nations and humanitarian-aid workers, including demining personnel, are justified in the perpetrators' minds, but aid workers' links with sponsors and other organizations may further strengthen motives, as in the case of the lethal attack on deminers in Kandahar province on 11 April 2010, where the Office of Weapons Removal and Abatement in the U.S. State Department's Bureau of Political-Military Affairs (PM/WRA) sponsored the victims' demining activity. This extra "link" (i.e., the sponsorship) may provide an additional motive for an attacker to target one aid group over another and should possibly be part of the risk-assessment process.

Another possible motive for attacking deminers in Afghanistan and elsewhere is because mine action removes resources from the Taliban's arsenal. Their use of explosive remnants of war as main charges in their IEDs, or even as a viable ammunition source, is well known.

This was recognized in Iraq during the height of the insurgency, where foreign contractors were deliberately used to remove explosive ordnance from stockpiles and former battle positions in an attempt to interrupt the chain of activities that led to building IEDs to attack Coalition troops.

Protecting Deminers

As employers, humanitarian demining organizations have a duty of care and responsibility toward their personnel. Top-level personnel must thoroughly investigate the risk of attack and assess and mitigate against apparent threats in the country and

the growing threat levels, aid organizations in general should take a more responsible stance in providing levels of security. If it is known that attacks are likely and that reprisals may also be visited on local workers as a result of mine action or any other humanitarian activity, the decision to deploy at all should be questioned.

The United Nations, which oversees demining and other contracts, should perhaps also play its part by ensuring organizations and individuals are aware of the inherent risks of working in a particular country or region and that they are taking the proper security precautions. Person-

*“... attacks on the United Nations and humanitarian-aid workers, including demining personnel, are justified in the perpetrators' minds, but aid workers' links with sponsors and other organizations may further strengthen motives ...”*  
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region of the proposed work activity. At the lower levels, the duty extends, through managers and team leaders, to enacting and maintaining the security plan and providing local operating procedures and resources in managing the risks described.

The threshold for conducting or suspending mine-action operations due to security concerns is usually a responsibility of the mine-action coordination center, if present in-country, normally on advice from a number of internal and external agencies. Yet is this enough? Is it sufficient, and is it justifiable in high threat-level locations such as Afghanistan and Somalia? Surely with

nel validation should begin prior to arrival in the country and should include checks to make certain that employees are sufficiently briefed and trained on safety issues, and provided with the resources, including procedures and equipment, to safely conduct their work. However, this should only happen after an organization understands the risks involved and has determined whether it is prudent to allow the commencement or sustainment of humanitarian demining activity in a specific area. ♦

see endnotes page 82



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# In Remembrance: Stephen “Darby” Allan

Stephen “Darby” Allan, a Technical Field Manager with Mines Advisory Group, died on 15 October 2010, following an explosion in which he was critically injured. The explosion took place around noon as Darby was doing mine-clearance work at a site near Kapoeta, in Southern Sudan. He died a few hours later. Darby is survived by his wife, Karen, and his children, Sarah and David.

A British national from Portsmouth, Darby Allan began his mine-action career doing underwater and shoreline mine clearance as a diver in the Royal Navy. In 2002, he began working as an Explosive Ordnance Disposal Specialist and Trainer at the Defence EOD School on Horsea Island. A year later he was promoted to Chief Instructor for the Royal Navy Clearance Diving Officers, a position he held until he joined MAG in 2006.

Darby worked as a Technical Field Manager for MAG for nearly four years, moving from the Democratic Republic of the Congo to Lebanon and finally to Sudan in September 2009. MAG estimates that the land Darby helped clear around Kapoeta, will benefit more than 7,000 people in the area who are now able to grow crops, build schools and raise telephone masts. The town’s market, a vital source of trade for the region, has also been built on land cleared by MAG teams.

During a celebration of Darby’s life, Lou McGrath, OBE, MAG’s Chief Executive, said, “He took pride in reducing the risks communities faced .... [He]



Darby Allan in a MAG vehicle with his son David during the MAG project they worked together on in the Democratic Republic of Congo in 2008.

PHOTO COURTESY OF THE ALLAN FAMILY

did not have to be in Sudan; he chose to be. He was a true humanitarian who believed in making a difference, and the world will be a lesser place without him.”

Darby Allan’s family, friends and coworkers paid tribute to his life and work as well. Lieutenant Commander Mick Beale, who knew Darby from their time together at Horsea Island, praised him as “a hugely experienced diver” and “an inspiration and a true legend in the diving branch. He was a big man with a big heart who could always be relied on to get the job done with no fuss,” he said. Andy Glesson,

a member of MAG’s technical staff who worked closely with Darby in Lebanon, called him “a great team member with a dry humor [and] a dependable, affable technician who managed several clearance teams with skill and determination.” Finally, Darby’s wife Karen said, “He was a gritty, humorous man who commanded friendship and respect from colleagues and friends, a person who was not just larger than life but was, in fact, life. We are proud to say we were part of that life and it was a great, great adventure. Thank you for the adventure.” ♦



## RESEARCH & DEVELOPMENT

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# The Effect of Reinforcement Rate Variations on Hits and False Alarms in Remote Explosive Scent Tracing with Dogs

Detection animals offer untapped potential in terms of locating landmines and explosive ordnance in the field and in the laboratory. In this study, the Geneva International Centre for Humanitarian Demining investigated the effect of low, medium, and high levels of reward on the performance of six dogs searching filters for explosive odor.

by Rebecca J. Sargisson [ University of Waikato ] and Ian G. McLean [ Consultant ]

Remote Explosive Scent Tracing—or Odor Capture—is a detection process in which odor is captured on an absorbent filter and analyzed by a detector, such as a dog or rat.<sup>1,2</sup> The detector works in a safe and controlled environment and is capable of searching large areas of ground in a short period. Odor capture has a wide range of potential applications (for example, the detection of oil-pipeline leaks and the detection of cancer or tuberculosis), but with respect to explosive detection, REST’s main value is eliminating road sections that do not contain explosive ordnance, allowing clearance to proceed more rapidly than is possible using most standard detection technologies.

	Indicate	Ignore
Positive	Correct <i>Hit</i>	Incorrect <i>Miss</i>
Negative	Incorrect <i>FA</i>	Correct <i>CR</i>

Table 1: Matrix of outcomes in a REST task.  
All graphics and photos courtesy of the authors.

REST will only be used if it can deliver consistently-high detection reliability for filters containing explosive odor (hits on “positive” filters). However, as a key use of REST is for uncontaminated land release, REST must also deliver reliable decisions on filters not containing explosive odor (correct rejection of “negative” filters). A filter analysis produces four possible outcomes (See Table 1), of

which two are undesirable—“miss” and “false alarm.” A miss means that explosive ordnance is undetected, presenting a danger to future land users. A false alarm means unnecessary additional work for the mine-clearance program. Low reliability on either of these outcomes reduces confidence in REST as a detection technology.

The typical procedure is summarized as follows. A team uses a suction pump to vacuum the air over a road section, typically 100 or 200 meters (109 or 218 yards) long and about 5 meters (5 yards) wide. The air is sucked through a filter, and careful records are kept of the road section that each filter represents. The filters are transferred to a laboratory where they are presented to trained detectors (usually dogs or rats) using a standard methodology, such as on the arms of a carousel (Figure 1) or in a line of stands (Figure 2).

The dogs are trained using filters made from controlled odor sources (“benchmark filters”). For training mine detection, most REST agencies plant test minefields, noting each mine’s location, type and depth. Filters can then be made in areas that should be contaminated with explosive odor from a known source, and areas treated as free of explosive odor. With a variety of odor sources used, it is assumed that background odor is consistently variable across filters, and the detectors must therefore use the explosive odor’s presence or absence as the determining variable in their analysis. A key benefit of REST analysis over field-based animal-detection systems is that benchmark filters can be mixed in with operational filters, allowing the continuous monitoring of each detector’s reliability during operational analysis.

All REST agencies use a training system in which hits on positive benchmark filters are reinforced, typically using a toy or food. Correct rejections of negative filters are not reinforced because they do not provide a discrete behavioral unit (the detector moves past the

negative filter without being rewarded for its correct “response”). This training methodology potentially introduces **response bias**, most likely as a tendency to give an indication response on a negative filter (a false alarm). Thus, the training procedure itself may be a source of false alarms, limiting the agency’s ability to attain the objective of minimizing false alarms while maintaining a reliably high hit rate.

Signal-detection theory<sup>3</sup> gives the issues and principles discussed above detailed technical analysis, and we use that theory’s language in this paper. With respect to REST’S two objectives of maintaining high hit and low false-alarm rates, the theory distinguishes two processes affecting accuracy:

- **Sensitivity:** The dog’s ability to discriminate between positive and negative filters can be improved in a variety of ways, including increasing the overall reinforcement rate for correct responses.<sup>4</sup>
- **Response bias:** If the training or operational experiences have asymmetries (such as only rewarding responses to positive filters during training or more abundant negative filters than positive filters, which is expected for operational filters), then response asymmetries are also expected.<sup>5,6</sup> Under signal-detection theory, all filters contain a background odor (noise).

Positive filters should carry an additional odor from the explosive ordnance (signal-plus-noise).<sup>3,7</sup> A filter’s signal strength can be placed somewhere in the area under two normally distributed Gaussian functions plotting signal intensity as a function of that odor’s probability of being present (Figure 3 on page 66). Signal availability to the left of line “C” will result in an “ignore” response (filter is negative), whereas signal availability to the right of C will result in an “indication” response (filter is positive). Sensitivity (*d'*) is determined by the separation between the peaks. Greater separation should result in greater accuracy because positive filters are less easily confused with negative.



Figure 1: Dog searching filters in a carousel-style presentation system.

Signal-detection theory assumes that each animal responds according to a response criterion (the vertical line C in Figure 3 on page 66). An animal’s responses can become biased toward one response type if more reinforcement is made available for one response type over another or if unequal numbers of positive and negative filters are presented.<sup>6</sup>

Signal-detection theory makes the following predictions:<sup>8</sup>

- If the sensitivity of the detector (*d'*) varies and the response criterion (C) remains constant, hit rate and false-alarm rate should be negatively correlated; i.e., as the functions move apart, hit rate will increase, and false-alarm rate will decrease.
- If the response criterion (C) varies, hit rate should be positively correlated with false-alarm rate. For example, if a detector is biased toward indicating, it will hit more positive filters, but will also indicate more negative filters, creating a high false-alarm rate.
- A strong correlation between hit and false-alarm rate would be a useful finding for REST.
- If hit and false-alarm rates were positively correlated, the relationship between them could be optimized by manipulating reinforcement bias, filter ratios, or the experimental method.
- If hit and false-alarm rates were negatively correlated, the training approach could focus on increasing hit rate, with the desired low false alarm-rate achieved without explicit training.

The present experiment used data from the regular training of six REST dogs in Angola to explore the relationship between hit and false-alarm rates. The overall reinforcement rate for positive-filter hits was manipulated across 28 weeks of a calendar year, according to Table 2 on page 66. The proportion of negative filters was held constant (between 94 and 99 percent of filters presented were negative).

It was expected that hit rate and false-alarm rate would be correlated. Given that only reinforcement for *hits* was varied, increasing reinforcement availability for hits could have produced a bias toward indicating, producing a positive correlation between hit and false-alarm rate. If, however, the reinforcement-rate manipulation for hits altered the dog’s sensitivity to the signal, we would expect a negative correlation between hit and false-alarm rate. In other words, increasing reinforcement for hits would either have been expected to cause a bias toward indicating or to improve the dog’s ability to discriminate between positive and negative filters.

## Method

**Subjects.** Six male non-neutered dogs, aged between 6½ and 7½ years, with several years of previous REST training participated. Five were Labrador Retrievers (Retzina, Stavros, Tan, Zante and Zulu) and one was a Springer Spaniel (Rusty). Each dog was assigned an experienced Angolan dog handler. The dogs were exercised six days a week by walking and swimming, housed in individual kennels, given free access to water, fed a high-quality dry dog food in sufficient quantities to maintain a healthy weight, and were not food-deprived.



Figure 2: Dog indicating a filter in the line-stand presentation system.

**Apparatus.** Filters were placed on a carousel apparatus (Figure 1). The carousel was a large stainless-steel wheel, mounted horizontally to the floor, which could be rotated. Filters were mounted horizontally at the ends of 12 arms that were removable for cleaning. The rooms’ walls were concrete block, and tiled floors minimized odor contamination. A stainless-steel screen inside the rooms shielded a supervisor from the searching dog. All other personnel (the dog handler and documenter) watched activities from adjacent rooms through internal one-way glass windows.

The filters were a PVC core wrapped in mosquito netting and housed inside a PVC tube (known as the “Mechem” filter, named for the manufacturer).

**Procedure Sampling.** Unused filters were contaminated with air to produce positive filters (filters believed to contain the odor from one or more landmines) and negative filters (filters believed to be free of explo-



Weeks	Reinforcement Level	Percentage of Hits Reinforced
6-10	Low	20-30
11-27	Medium	35-50
28-33	High	60-75

Table 2: Experimental conditions.

sive odor but containing other neutral odors from similar locations). Air was added to the filters by placing the filters at the end of a long stainless-steel tube subject to continuous suction via a vacuum-pump machine worn as a backpack. The filter was held close to the ground and swung to the left and the right of the pump operator as he slowly walked a 100-meter distance. Filters were considered positive if the pump operator passed within 1 meter of a buried landmine and negative if no landmines were present within 100 meters of the filter during sampling. The landmines were a range of anti-tank and anti-personnel mines commonly found in Angola. The mines were laid between 0 and 10 centimeters (0–4 inches) beneath the ground surface for a minimum of six months before they were used for sampling. A total of 275 mines were available for sampling. All sampled filters were stored inside small PVC containers, and positive filters were stored separately from negative filters until analysis to avoid odor cross-contamination.

**Analysis.** The dogs searched filters on the carousel between 8 a.m. and 1p.m., Monday through Friday, taking rest breaks when required. After preparation of the carousel, each dog was brought to the carousel room’s door in a sequential but random order. When the dog was calm, the handler instructed the dog to “search,” and the dog handler stepped behind a wall out of the dog’s view. The dogs walked unaccompanied, off-lead, in an anti-clockwise direction around the carousel, sniffing each filter consecutively. The dog exited the room after it had correct-

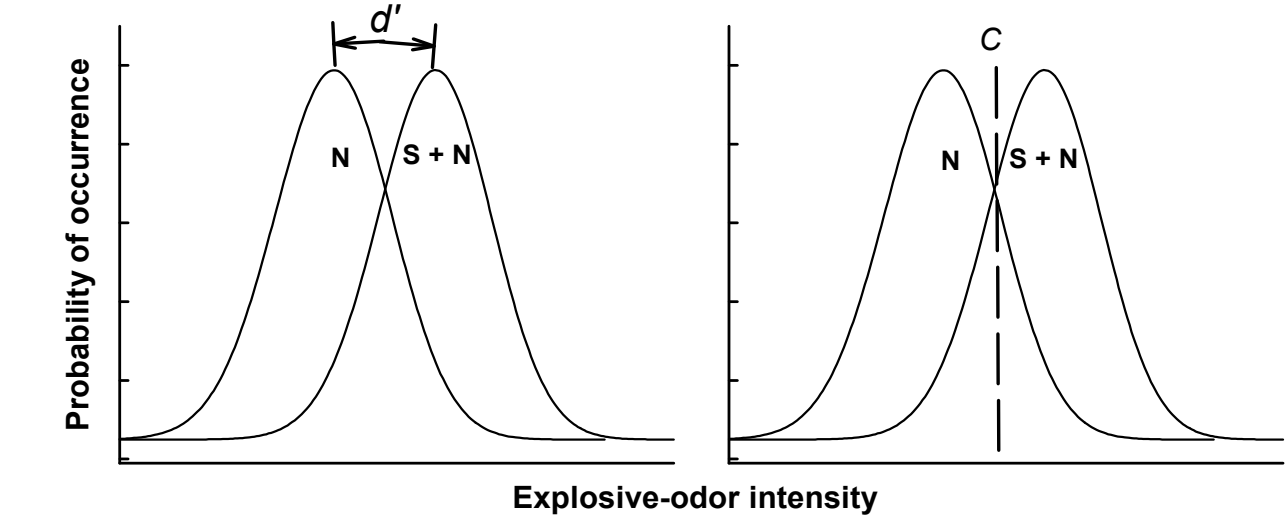


Figure 3: Hypothetical noise and signal-plus-noise distributions in a sensory discrimination task according to signal-detection theory. The left panel demonstrates discriminability ( $d'$ ) as the distance between the means of the two functions. The right panel illustrates the animal's response criterion (C), which dissects the two functions and can shift to the left and right as a function of response bias.

ly indicated a positive filter by sitting next to it and hearing the conditioned reinforcer (clicker), or when the dog handler called it from the room. Reinforcement was occasionally available for hits (indicating a known positive filter). The reward most often delivered was small pieces of dry dog food and sometimes access to a ball or squeaky toy. A reward was occasionally delivered following a “blank” run (a run containing only negative filters), if the dog correctly ignored all filters. However, the reward may not have acted to reinforce correct responses to negative fil-

ters because the reinforcer for blank runs was not contingent upon a discrete response, such as sitting. Zero to three positive filters were present on the carousel among the remaining negative filters.

After the summer break, training recommenced for all six dogs in Week 2 of 2005 and continued for four weeks before experimental manipulations. At this point, reinforcement frequency for correct indications on positive filters was manipulated by providing a reinforcer, such as a click from the clicker and food or access to a ball, on only **some** correct indications (intermittent reinforcement). This can be contrasted with earlier training stages where reinforcing **every** correct indication is common in order to aid learning (continuous reinforcement). All other variables were held constant, including the number of negative filters available on the carousel, and reinforcement for correct rejections of negative filters.

Table 2 shows the experimental conditions. From Weeks 6 to 10, hit reinforcers were held at a “low” level (20 to 30 percent of hits were reinforced), from Weeks 11 to 27 at a “medium” level (35 to 50 percent) and from Weeks 28 to 33, at a “high” level (60 to 75 percent of hits were reinforced).

### Results

A decision for each filter from each dog was obtained. Signal-detection theory terminology was used to define the four analysis results possible for a filter: hit (indication on a positive filter), miss (no indication on a positive filter), false alarm (FA, indication on a negative filter) and correct rejection (CR, no indication on a negative filter). Hits, misses, false alarms, and correct rejections were summed for each week for each dog and used to calculate hit rates [(hits / (hits + misses) \*100] and false-alarm rates [(FAs / FAs + CRs)\*100].

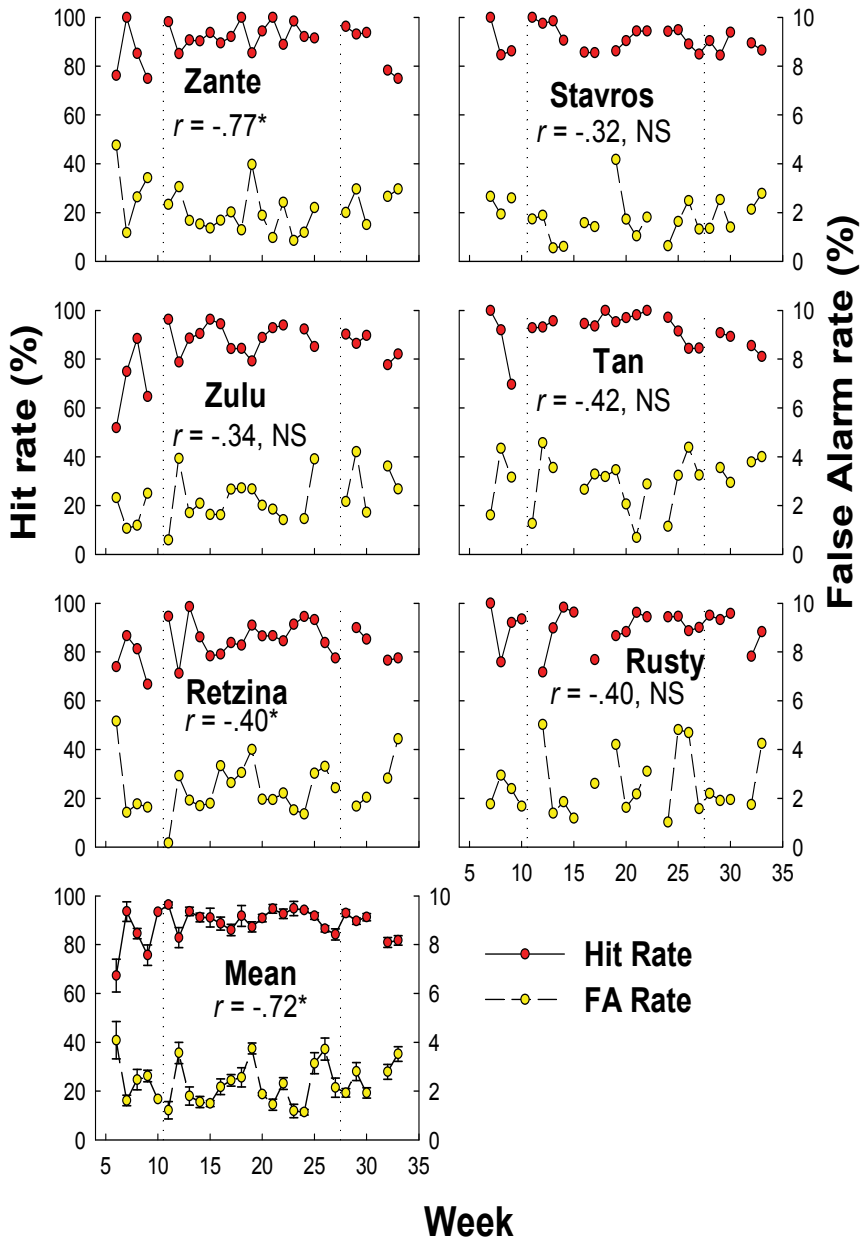


Figure 4: Hit (red circles) and false-alarm (yellow circles) rates calculated as percentages for each week for all six dogs and for the mean across dogs. Vertical dotted lines show changes in reinforcement level for hits from low, to medium, to high from left to right across the x-axis. Pearson correlation coefficients are given for each dog, and for the mean, and are significant ( $p < .05$ ) unless shown (NS).

for all individual dogs and significantly so for two of the six dogs. All  $r$  values are shown in Figure 4. Figure 5 (on page 68) displays the data used to calculate the mean correlation and clearly shows a strong negative relationship between hit and false-alarm rate, in that, as hit rate increases, false-alarm rate decreases.

Weekly hit and false-alarm rates for each dog, and for the mean, were grouped according to reinforcement-rate condition (low, medium, and high). These data are shown in Figure 6 (on page 68). A one-way analysis of variance indicated that hit rates in the three groups differed significantly [ $F(2, 15) = 5.34, p < .05$ ]. A Fisher’s LSD post-hoc test<sup>9</sup> showed that the medium and high reinforcement rates produced significantly higher hit rates than the low reinforcement rate condition, but that the medium and high conditions did not differ significantly from one another in terms of hit rate. No significant difference in false-alarm rates were found across the three reinforcement

conditions [ $F(2, 15) = 0.89, p > .05$ ]. However, Figure 6 ( on page 68) shows that false-alarm rate was lowest during the medium-reinforcement rate condition for four of the six dogs, and for the mean.

### Discussion

Hit rate and false-alarm rate were overall significantly negatively correlated.

Thus, as hit rate increased, false alarms decreased. According to signal-detection theory, these negative correlations are to be expected if the distance between the noise peaks and the signal-plus-noise functions changed. In other words, the correlations between hit and false-alarm rate were caused either by changing discriminability between positive and negative filters, or by changing the dog’s sensitivity to the odor, and not by changing response bias (decision criterion). Given that the filters’ discriminability was not manipulated, the likely reason for the negative correlation between hit and false alarm rate was the dog’s increasing sensitivity due to changes in the overall reinforcement rate for hits.

This result suggests that the experimental method’s nature, reinforcing hits and not correct rejections, does not produce changes in the dog’s response bias. In other words, greater reinforcer availability for hits did not cause a bias toward indicating. Instead, in the present experiment, low reinforcement rates for hits produced poorer performance on negative and positive filters, while medium and high reinforcement levels produced more accurate responses on both filter types. In the present experiment, performance peaked under the medium level of hit reinforcement. Increasing the reinforcement frequency beyond this medium level did not result in greater accuracy on positive or negative filters. One implication of this finding is that procedures to improve the REST system’s accuracy should focus on increasing the animals’ hit rates, and that any hit rate increase will be accompanied by a false-alarm rate decrease.

Manipulating reinforcement ratios is one way to alter an animal’s response accuracy. Another way is through the experimental procedure itself. The current procedure was a “go/no-go” procedure, whereby animals indicated, by sitting, the presence of explosive odor but made no response to filters containing no explosive odor. Such a procedure producing a bias toward indicating, rather than ignoring, is possible because ignoring is not explicitly reinforced. Alternatively, due to the greater numbers of negative filters (between 94 percent and 99 percent of filters were negative), the dog’s behavior could become biased toward ignoring because it is the most frequently-required response. An analysis of bias, using [ $\log b = \frac{1}{2} \log (FA / Hits)(CR / Miss)$ ], showed



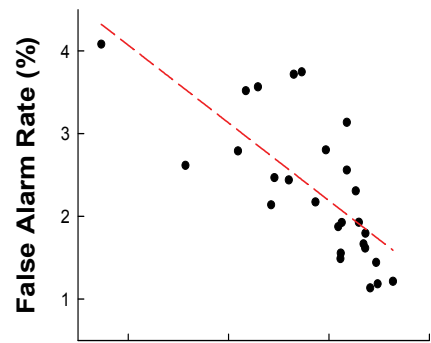


Figure 5: Mean hit rate as a function of false-alarm rate. A straight line has been fit to the data to illustrate the pattern represented by the datum points.

that the behavior of four of the six dogs was biased toward indicating, and this bias strength decreased as reinforcement for hits increased for all six dogs. The behavior of two dogs was biased toward ignoring, and this bias was unaffected by reinforcement-rate manipulations. Thus, the present procedure appeared to not produce consistent effects on response bias, nor did it produce bias in one direction over another. Instead, each dog tended to maintain a fairly reliable preference for either indicating or ignoring, and biases toward indicating were counter-intuitively reduced by increasing reinforcement availability for correct indications.

REST programs should include ongoing monitoring of response bias, so they can redress any imbalance. Manipulation of reinforcement rates can eliminate response bias more easily in procedures where responses to positive and negative filters are directly reinforced. In procedures where responses to only one type of filter are reinforced, such as in the present REST system, response bias may be eliminated by careful manipulation of the ratio between positive and negative filters. REST programs should seek to determine the optimum ratio for their procedure and animals, and maintain this ratio while continuing to monitor ongoing response bias.

Other factors which affect the overall accuracy of animals' responses concern the quality of the samples. Sampling can be optimized in terms of filter material, climatic condition, avoidance of contamination, and so on. Once collected, filters should be handled to minimize cross-contamination. By maintaining as clear a signal on the filter as possible, the animal is given the best chance to obtain high hit rates. ♦

see endnotes page 82

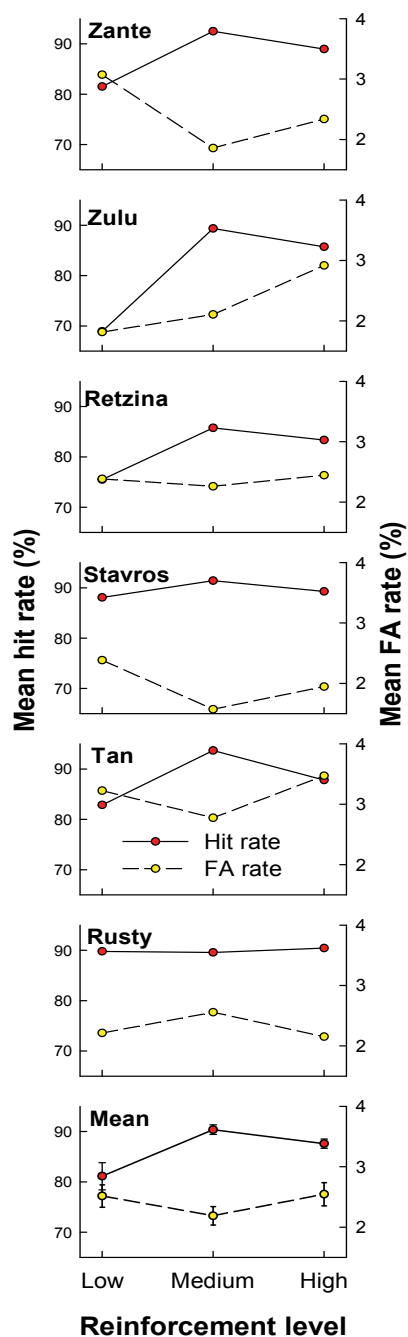


Figure 6: Mean hit (red circles) and false-alarm (yellow circles) rate for each dog and for the mean in each of the three reinforcement conditions (low, medium, and high).

*Author note: The authors conducted this research while employed by the Geneva International Centre for Humanitarian Demining. We thank members of the REST team in Angola, especially Andolosi Sanjala and Felisberto Joao, Birgitte Lauritzen and Rune Fjellanger for their help. Norwegian People's Aid, and the government of Switzerland through a grant to GICHD, funded the research.*



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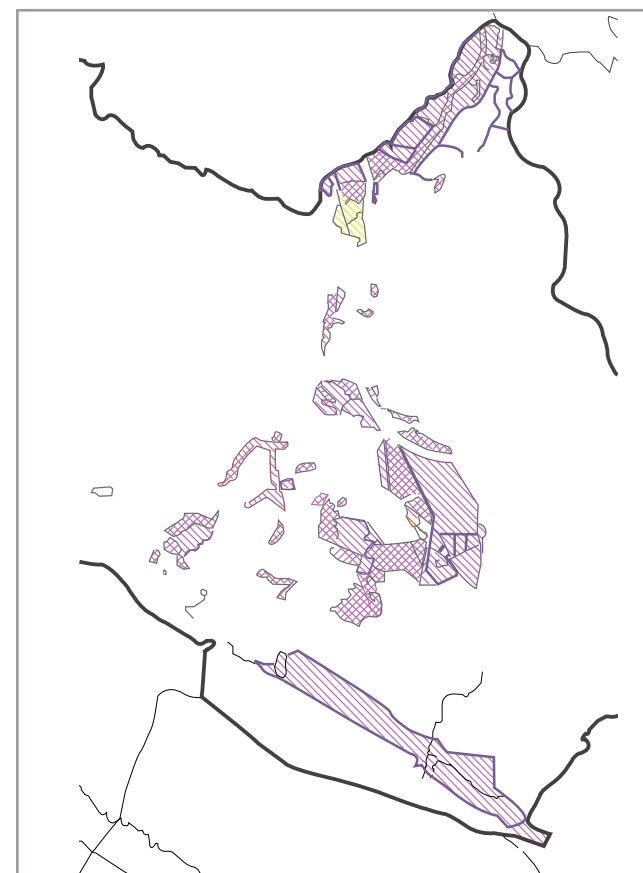
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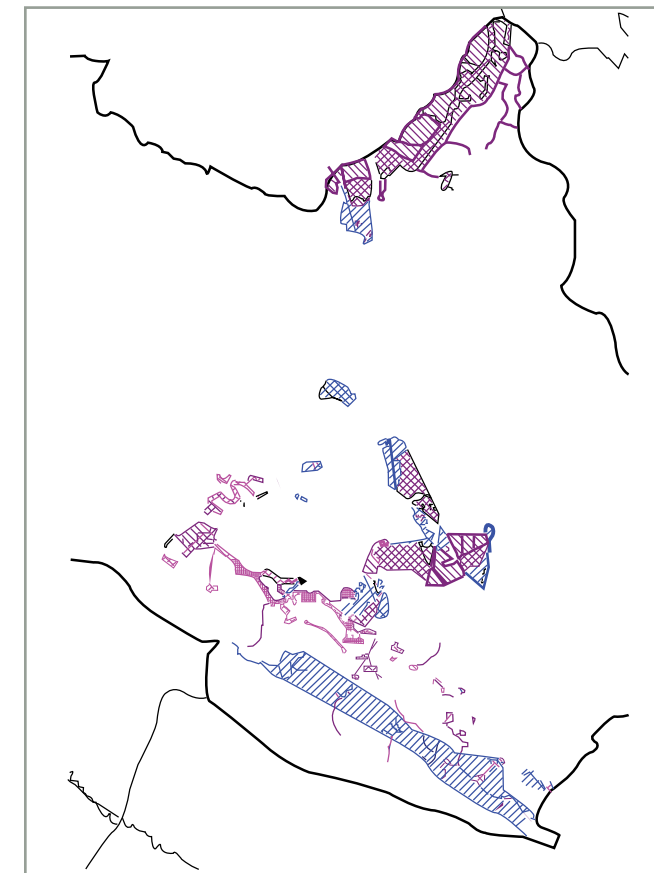
## The Advanced Intelligence Decision Support System for the Assessment of Mine-suspected Areas

Several research and development projects have been created to utilize airborne and spaceborne remote sensing for mine action, but the Advanced Intelligence Decision Support System is the first mine-action technology to successfully combine remote sensing with advanced intelligence methodology. The result is a rigorously operationally validated system that improves hazardous risk assessment for greater efficiency in land cancellation and release. This article discusses the components of the AI DSS system and its achievements in mine action.

by Milan Bajić [ University of Zagreb ]



Application of AI DSS in the community. Figure 1.1 (left): The state of the mine-suspected area (56 square kilometers) before the project. (Legend: crossed pink for undergoing clearance, striped pink for undergoing survey, yellow if used on owner's responsibility, blue if excluded from MSA.) Figure 1.2 (right): The state of the MSA after the application of AI DSS, as carried out by CROMAC. Note the MSA reduction in the southern part of the MSA polygon at the ridge of Velebit Mountain. (Legend: crossed pink for undergoing clearance, striped pink for undergoing survey, yellow if used on owner's responsibility, blue if excluded from MSA.)



Longstanding research into aerial and spaceborne remote sensing for mine action<sup>1,2,3,4,5,6,7</sup> led to the creation of the first operational system for this purpose as recently as 2008–09.<sup>8</sup> Although the remote sensing methodology and technology were the system's basis, only significant use of the general-intelligence approach, known as the Space and Airborne Mined Area Reduction Tools<sup>7</sup> (SMART) system, made its substantial operational success in mine action possible.<sup>9</sup>

Well-developed mine-action programs implement conventional technologies and standard operating procedures of General Survey (also

called Non-technical Survey) and reduction of mine-suspected areas<sup>10</sup> while International Mine Action Standards define wider and more general aspects of general mine-action assessment<sup>11</sup> and land release.<sup>12</sup>

### Development of AI DSS

The Croatian Mine Action Centre tries to reduce mine-suspected areas<sup>10</sup> by using conventional technologies such as General Surveys; however, the repeated use of these mechanisms eventually becomes ineffective and ground-based costly means (demining, Technical Survey)



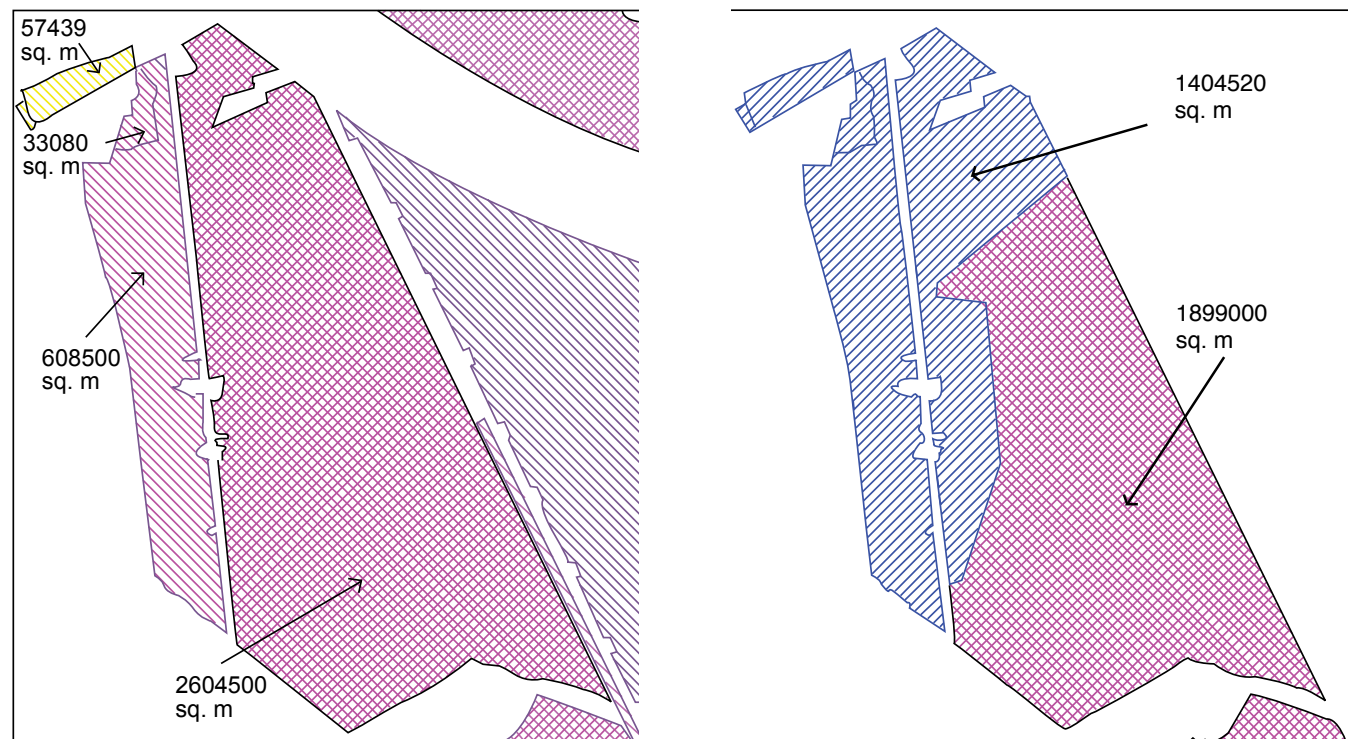


Figure 2.1 (left): Example of the area excluded from the MSA in the central part of the MSA in Gospić, shown in Figures 1.1 and 1.2. Figure 3.1 shows the state of the MSA before application of the AI DSS project. Figure 2.2 (right): The application of the project's results by CROMAC. (Legend: crossed pink for undergoing clearance, striped pink for undergoing survey, yellow if used on owner's responsibility, blue if excluded from MSA.)

must then be used. CROMAC has tried to reduce these costs by supporting the development of more efficient technologies.<sup>7,6,13</sup>

Hopes of such a cost-effective solution arose through the development of the SMART system, an advanced intelligence system that projects such as the one funded by the European Commission from 2001–04 have operationally validated.<sup>7</sup> The methodology of SMART used a general approach to the information sources, made the role of the mine-scene interpreter easier and introduced expert knowledge management, although the majority of efforts focused on processing and interpreting the aerial and satellite imagery.<sup>7,14</sup>

Unfortunately, though recognized as potentially helpful operationally, SMART was not successful as an integrated system that could be used with other mine-action technologies. In an effort to reconcile the intelligence system with operational purposes, our experience and work on several research and development or Technology Demonstration projects allowed us to develop a cost-effective solution, the Advanced Intelligence Decision Support System,<sup>9</sup> which incorporates the generic methodology of the SMART intelligence system with the processes of hazardous-risk assessment and land release.<sup>9,13,15,16</sup>

In 2008–09, the AI DSS was implemented and proved effective in three Croatian communities where conventional ground-based

technology is not applicable (excluding manual demining and Technical Survey). Satellite imagery and multisensor airborne imagery served as the data's main sources. CROMAC's use of AI DSS has resulted in increased land cancellation/release and improved hazardous-risk assessment. AI DSS was applied in Croatia, and its application is underway in Bosnia and Herzegovina.<sup>17</sup> Other countries could benefit from its use as well through regional cooperation and capacity-building efforts.<sup>9,18</sup>

#### Advanced Intelligence Methodology and Technology

The AI DSS is a system and technology that combines the following main subsystems:

- Analytic assessments and derivation of statements of operational needs about the data availability and quality, and information in the Mine Information System and Geographic Information System of the MAC. The experts within CROMAC made these assessments and derivations.<sup>8,17</sup>
- The airborne multisensor acquisition system and satellite imagery usage, which provide new data about an MSA's state, such as the indicators of mine presence and indicators of mine absence, with high accuracy and confidence.<sup>13</sup> The scientists from the Faculty of Geodesy at the University of Zagreb, in cooperation with other researchers and pilots, applied this sub-

system. This partnership proved very successful in Croatia and in BiH.<sup>8,17</sup>

- The subsystem for multi-level fusion and multi-criteria, multi-objective processing, and interpretation and production of outputs, operated by remote-sensing scientists and researchers from the Faculty of Geodesy at the University of Zagreb.<sup>16</sup>

SMART's generic methodology and its theoretical background are presented in several references.<sup>7,15,14</sup> Therefore only AI DSS advancements that go beyond the SMART system are described in the following sections.

**Generating the statement of needs.** The intelligence applied in AI DSS serves to reconstruct the spatial, temporal and situational state at the scene during and after the mine-laying process. It starts with a data overview—information existing in the MAC's Mine Information System. If military maps and/or other military documents are available (e.g., orders, commands and reports), they are used to define the situation at the MSA. Also, operational division experts in the MAC derive the statement of operational needs as the set of requirements related to the missing, incomplete or low-quality data, and methods and technologies that can be used for their collection or for improving their quality. Not every MAC uses this process; it was developed and defined only for the needs of the earlier research and development projects, SMART and Airborne

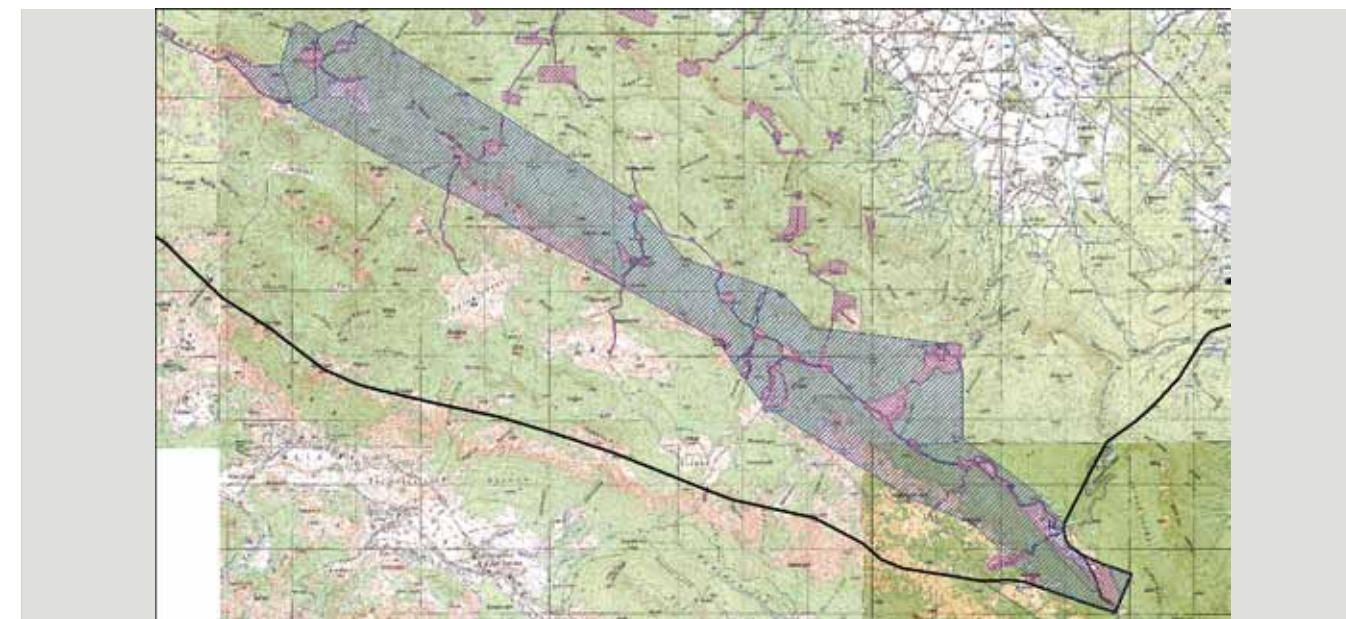


Figure 3: Changes of MSA at the ridge of the Velebit Mountain after the AI DSS project. (Legend: Crossed pink for undergoing clearance, blue if excluded from MSA.)

Minefield Area Reduction (ARC) project,<sup>6,7,13</sup> and was successfully applied in the first operational project.<sup>8</sup> The statement of operational needs will contain:

- The MSA's analytical description and assessment
- Map reconstruction of the minefield polygons based on the available minefield records and other data in the Mine Information System of the MAC

**Derivation of general and particular requirements.** Once the statement of operational needs is derived, the next step is developing two requirement types: the general and the particular requirements for collecting new data to replace missing or unreliable data or for improving information quality. The general requirements include analyzing data on mine barriers, exploring mine incidents, analyzing military and U.N. demining records and maps, and examining land conditions where military operations occurred. The particular requirements are a set of hypotheses based on available data sources in the MAC, and they present desired results of the AI DSS application. In Croatia, due to environmental changes at the scene that happened after the minefields were laid, along with a lack of available data, only a percentage of the particular requirements and hypotheses derived in CROMAC were achievable.

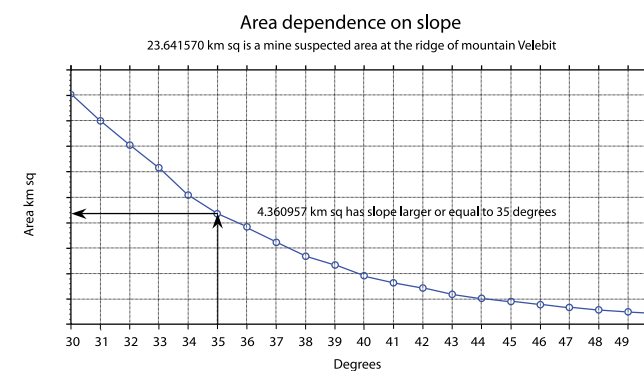


Figure 4: This diagram displays the correlation between the degree of slope and the area of MSA at the ridge of Velebit Mountain. The total area of MSA on Velebit's ridge is 23.64 sq km, with 4.36 sq km of that land having a slope of greater than or equal to 35 degrees.

Nevertheless, the airborne and spaceborne imagery processing and interpretation can still provide valuable evidence about the indicators of mine presence and indicators of mine absence at the mined scene.

When the system is implemented and results are collected and delivered to the MAC, the next phase starts: application of the project results in the MAC. The project results in this phase need to pass the SOPs for result verification for General Survey within the MAC.<sup>10</sup> Project results in Croatia show that this verification process increases benefits produced by the project.<sup>8</sup>

**Assessing the terrain's impact.** Observing terrain characteristics as a means for identifying indicators of mine absence has proved valuable. In the SMART project report from 2005,<sup>7</sup> only several kinds of indicators of mine absence were considered, so the addition of terrain features as indicators of mine absence marked one AI DSS advancement.<sup>8</sup> In the community of Gospić, one of the three communities in Croatia where the project was implemented, the Velebit Mountain ridge was in the MSA (see Figure 1.1 and 1.2 on page 69) with sparse evidence of the minefields and military positions. The terrain's slopes are the main features for the accessibility evaluation and were analyzed for Velebit (see Figure 3) in Gospić and are shown in Figure 4. The AI DSS application results provided evidence that enabled CROMAC to exclude an MSA at the Velebit Mountain ridge, except on several small areas (see Figure 3).

**Evaluating quality of data/information.** The quantitative evaluation of the data quality, information and knowledge (from here on referred to just as *data*) is one of AI DSS's important functions. It should cover:

- Data provided by the Mine Information System of the MAC
- Data collected and derived in AI DSS by airborne multisensor acquisition, by use of satellite multispectral imagery, derived contextual information and experts' knowledge

Evaluation of AI DSS sourced data will be considered later. The evaluation of the Mine Information System sourced data should assess the probability of the data's accuracy, confidence and completeness as the main features of data quality; these are considered in the following sections.

**Minefield records.** Minefield records, if available, are usually the most valuable sources of minefield data. In Croatia and in BiH, the minefield records have similar structures and usually have 39 variables (e.g., cartographical data, minefield characteristics, number of





Figure 5.1 (left): Digital orthophoto map scale 1:2000; aerial images acquired in 2006. Figure 5.2 (right): Satellite image of the same area, acquired in 2006. Trenches (long zigzag line) are clearly visible.

landmines, etc.)<sup>8,17</sup> while in other countries—Azerbaijan, for example—the records are not available. The records sometimes have sketches of the minefield.

It is widely known that minefield records are seldom complete and that their accuracy and confidence are not high enough. At the MAC, experts reconstruct polygons of the minefields on the map and consider all data available in the minefield records, military maps and documents. The 39 variables of the minefield records differ: 21 of them are more important than the others (e.g., position of the minefield, its shape, orientation and the reference point of the coordinates) for the spatial, structural and temporal assessment of the minefields.

When CROMAC examined 122 MSA minefield records in Gospić,<sup>8</sup> completeness and positioning accuracy was compared for 39 variables/21 variables/positioning accuracy, as estimated by experts, and was shown to vary among the three. In previous R&D projects<sup>7,6</sup> the quality of the minefield records was not considered. The importance of minefield-record quality is now recognized in the current operational project.<sup>17</sup> Further research of the variables' behavior (completeness and positioning accuracy, relationship between variables, factor analysis, etc.) is underway and new statistical models are expected.

**Aerial digital orthophoto maps as sources of indicators of mine presence.** Aerial digital orthophoto maps, if they exist, are very important for AI DSS application. They serve as the cartographic reference that optimizes spatial accuracy of AI DSS products. In the preparation phase for AI DSS application they can be an auxiliary data source for strong indicators of mine presence, e.g., trenches, bunkers, shelters, unused paths, bridges, etc. However the digital orthophoto maps alone are not sufficient indicators of mine presence.

In the considered projects<sup>8,17</sup> two types of digital orthophoto maps were available: panchromatic at the scale 1:5000 and color at the scale 1:2000. If the digital orthophoto maps are acquired in different years, as was the case in the 2008 International Trust Fund for Demining and Mine Victims Assistance project,<sup>8</sup> they can serve as valuable tools for detecting changes over time. The quality of the digital orthophoto maps in ITF's project was limited due to the following constraints:

- The acquisition time was wrongly selected when vegetation (forests, agricultural fields) was high and leaves obscured the ground's surface. This problem is a consequence of the false assumption that detecting fields in use by their owners will lead to the most MSA reductions (see Figures 5.1 and 5.2).

- The MSA borders delineated the digital orthophoto area at the fine scale (1:2000). Due to this mistake the digital orthophoto maps did not cover areas outside the official MSA. Note that in Gospić, 6 sq km was added to the previously determined MSA, and the digital orthophoto map did not cover this area.
- The radiometric compression decreased the digital orthophoto map utility for remnants-of-war detection.

The quality of the aerial digital orthophoto map that has a ground resolving distance of 0.20 m is weaker for the detection of the remnants of war than the satellite image that has a ground resolving distance of 1 m.



Figure 6: Example of the fortification objects, remnants of war marked with arrows, triangles or circles visible on the aerial image that was acquired in April 2009 at the MSA community of Gospić.<sup>8</sup>

**Military maps.** Military maps, if they exist and are available, can provide information about the war history on the considered terrain and improve understanding about the spatial and temporal distribution of the units and the minefields. The most usable—although rarely available—are the maps of the engineers' activities; they contain details of the spatial and temporal placement of minefields. The maps of higher ranked military personnel contain less data about the minefields but can provide contextual information about the scene. Separation lines, distribution of subunits and engineers' preparation support the scene reconstruction and can provide the spatial frame for the detected indicators of mine presence or mine absence.

In the operational project in Croatia,<sup>8</sup> military maps became available at the middle of the project, and their contribution was not used for the whole area or at every point during the project. In the operational project in BiH,<sup>17</sup> the military maps were not available at all, but deminers who participated in the war reconstructed the battle-situation maps.

Besides the military maps, auxiliary map sources can include memoirs of former military commanders. Although edited for publishing, these memoirs can add missing spatial, temporal and situational contextual information. In the operational project in Croatia,<sup>8</sup> the memoirs were used in the analytic assessment of the MSA status and helped to better understand the MSA site's behavior.



Figures 7.1 (above) and 7.2 (left): Pod with sensors installed on the fuselage of the helicopters Mi-8 and Bell 206. The moving map supports navigation and acquired images are stored on the external hard disks. Two or three operators control the aerial acquisition. The standard operating procedures that include pre-flight and post-flight operational calibration are developed for general aerial multisensor imagery acquisition. The particular SOPs are developed for mine-action survey and surveillance of the sea oil spills are under continuous advancement.

**Derivation of requirements for acquiring data by aerial multisensor survey.** The general and particular requirements derived by data analysis available in the Mine Information System of the MAC are tested regarding vegetation and snow cover, as well as the expected indicators of mine presence and indicators of mine absence, types, dimensions and shapes. The output of this process is a list of the objects the aerial multisensor system is expected to detect. The airborne sensors' operational parameters will provide necessary spatial, spectral and radiometric resolution in imagery, as well as the surveyed area's spatial coverage.

Indicators of Mine Presence (IMP)	Importance
Minefield records	1
Mine accidents	2
Table marking of the minefield	3
Fortifications	4
Trenches	5
Bunkers	6
Natural objects modified to serve for fire action	7
Dry wall (in a battle area)	8
Shelters for artillery, vehicles, infantry	9
Bridges, passes of water ways	10
Dominant hill	11
Edges of forest	12
Fords	13
Helicopter landing area	14
Roads not in use (in a battle area)	15
Abandoned overgrown areas	16
Demolished houses (in a first front line)	17
Observation posts (usually for hunting)	18
Indicators of Mine Absence (IMA)	Importance
Houses in use	1
Areas in use	1
Roads in use	1
Step terrain, slope greater than 30 degrees	1

Table 1: A list of the indicators of mine presence, indicators of mine absence and importance rank given by an expert for the MSA in the community of Gospić.<sup>8</sup>

**Multisensor aerial imagery acquisition.** The multisensor aerial system used in mine action's first operational remote-sensing project<sup>8</sup> and in current use,<sup>17</sup> was developed and realized in the project funded by the Ministry of Science, Education and Sports of the Republic of Croatia<sup>13</sup> (Figures 7.1 and 7.2). The installation on the aerial platform (helicopters Mi-8 and Bell 206, airplane Cessna 172R) takes less than two hours. The system enables imagery acquisition in the strip mode and in a sequence of the frames. Width of the strip is 30% of the flight altitude above the terrain. The cruising speed is from 90 to 130 km/h; endurance is up to 4h 15min (platform Mi-8). This is an electro-optical acquisition system that covers wavelengths from 400 to 900 nm and from 8 to 14 μm, with several sensors. The hyperspectral scanner in imaging mode provides a strip mode image in 95 channels, in wavelengths 430 to 900 nm, using a multispectral camera in visible and near infrared bands. The inertial navigational unit is integrated into the pod's sensor system and enables parametric geocoding of the hyperspectral scanner's data.

**Extraction of data and formalization of experts' knowledge.** The preparation phase finishes after terrain analysis, after the multisensor aerial imagery acquisition and after obtaining the satellite multispectral imagery. The next phase is data extraction from these sources and information-quality assessment. This phase also includes a formalization of the experts' knowledge, which provides contextual information correlated with the particular terrain. The objects that should be detected are defined as the indicators of mine presence and the indicators of mine absence; this is a valuable contribution from the previous R&D projects<sup>2,5,6,7,16</sup> (see example in Table 1).

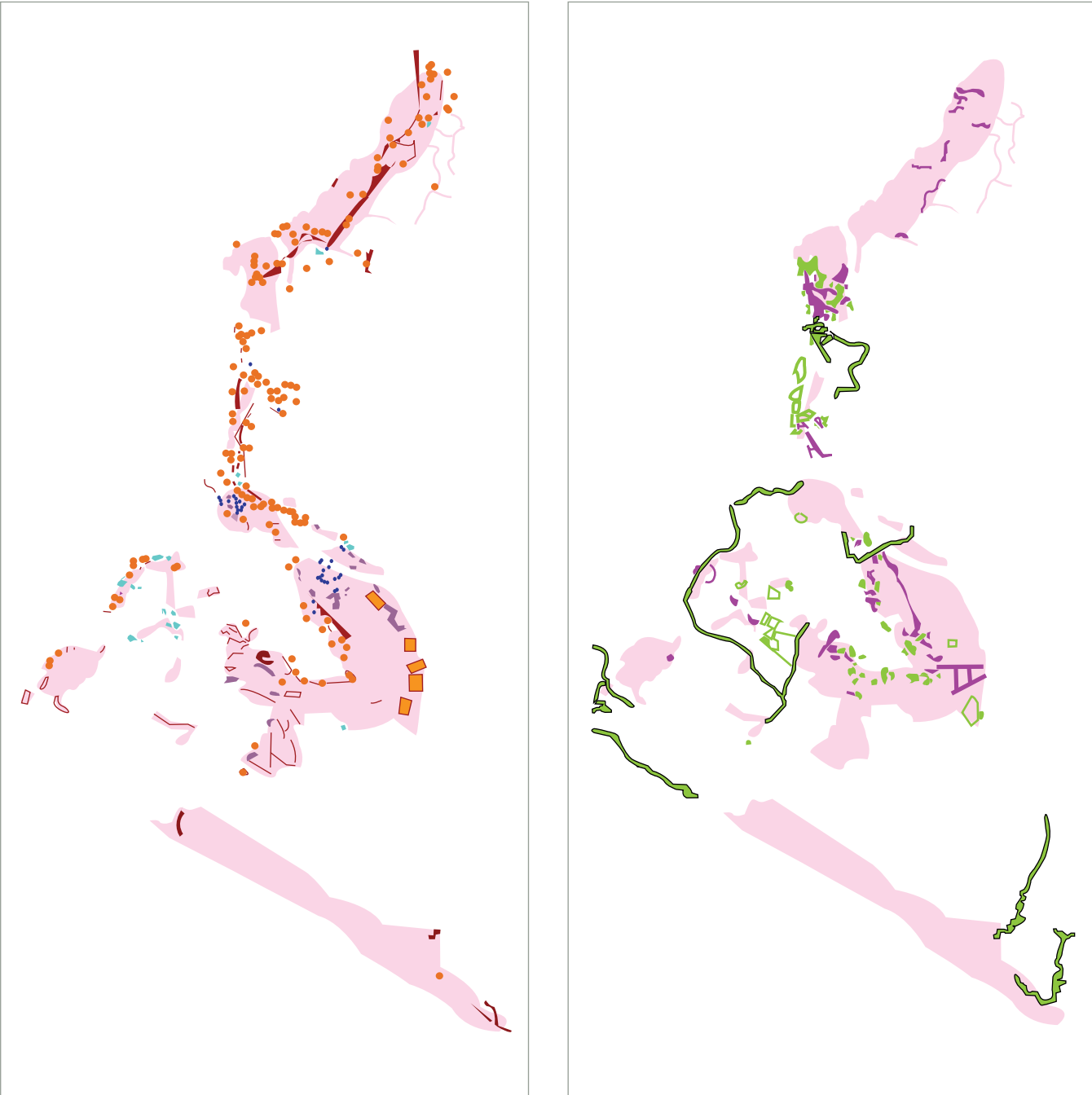
The data extraction is used by different remote-sensing interpretation methods and by subjective interpretation supported by different techniques (imagery enhancement, feature mapping, principal component analysis, etc). Experience from the operational projects<sup>8,17</sup> shows



that the subjective computer-assisted indicators of mine presence extraction was the most efficient solution for the extraction of the remnants of war and similar objects (see Figure 7 on page 72). There are more efficient classification methods for indicators of mine absence extraction that usually cover larger areas. The goal of the considered activity is extract indicators of mine presence and indicators of mine absence with high probability and at the same time provide very high confidence. For this purpose, we use images from one, two or more imagery sources until the accuracy of the detection and/or classification of the indicators of mine presence, indicators of mine absence and their

respective confidences reach high thresholds.

**Multi-level fusion, fuzzy classification and hazardous-risk maps.** The next step in processing data is rather complex; it includes multi-level fusion, data fuzzification, fuzzy classification, multi-criteria and multi-objective decision support processes. Also, danger maps and the maps of the confidence and stability must be produced. The original source for these terms is SMART<sup>7</sup> and will not be discussed here. For CROMAC, the most pertinent information was the map of proposals for the MSA exclusion and inclusion.<sup>16,8</sup> See Figures 8.1 and 8.2 for the map of the indicators of mine presence and indicators of mine absence.



Mine Action Centre	Advanced Intelligence Decision Support System
MIS (mine field records, incidents, accidents, survey, QA).	MIS (Mine field records, incidents, accidents, survey, QA).
Scanned maps scale 1:5000, 1:2000, aerial digital ortho photo maps scale 1:5000, 1:2000 only for MSA.	Scanned maps scale 1:5000, 1:2000, aerial digital ortho photo maps scale 1:5000, 1:2000 <b>Satellite maps at the scale 1:5000 for areas of MSA and outside of MSA.</b>
Aerial digital elevation model (DEM) for 3D vizualisation of the terrain.	Aerial digital elevation model (DEM) for 3D visualization of the terrian. Aerial and satellite DEM for quantitative spatial analyses of the terrain and for 3D visualization.
Scanned military maps.	Scanned military maps.
War history data, data about explosive barriers.	War history data, data about explosive barriers.
	<b>Analytic assessment of the mine suspected area (MSA).</b>
	<b>Statistical evaluation and quality assessment of all data used in AI DSS: completeness, probability, confidence, sensitivity.</b>
	<b>Detection and extraction of the indicators of mine presence (IMP) and mine absence (IMA) in the satellite images, airborne multisensor images, digital ortho-photo map (DOF) (if usable). Assessment of quality, confidence.</b>
	<b>Collecting and processing of the contextual data and information.</b>
	<b>Formalization of experts' knowledge: membership function, relative importance of IMP.</b>
	<b>Quantitative spatial analyses of the terrain. Detection and extraction of the indicators of mine absence (IMA)</b>
	<b>Processing of the multisensor aerial and satellite imagery. Detection and extraction of the strong indicators of mine presence IMP. Classification and extraction of indicators of mine presence IMP and absence IMA. Assessment of detection probability and confidence.</b>
	<b>Delivery of the AI DSS results: danger map, confidence map, proposal for reduction, for re-categorisation, for inclusion areas into MSA, maps of conflicts between MIS and AI DSS results.</b>
Application of the results delivered by AI DSS. Exclusion from the MSA, inclusion in MSA, recategorization.	<b>Feedback to AI DSS, assessment of the cost-benefit ratio. Evaluation of the collected new experience, inclusion into the methodology of the AI DSS.</b>

Table 2: This table shows the difference in functions between the MAC and the AI DSS. New content is shown in red.

**Functionalities of the AI DSS and CROMAC.** Between the processes of the General Survey in CROMAC<sup>10</sup> and the Advanced Intelligence Decision Support System<sup>8,17</sup> commonalities exist in their functions and data. However AI DSS also introduces new functionalities, as seen in Table 2.

**Implementation Results in Croatia**

The three Croatian communities where AI DSS was implemented had 104.97 sq km of MSA and nearly 46 sq km outside of the MSA prior to the project. The proposals for reducing MSAs with the highest level of accuracy and reliability resulted in a suggested MSA reduction of 7.67 sq km to 23.34 sq km, and certain areas were proposed for MSA inclusion.<sup>8</sup> The project results were delivered in September 2009 to CROMAC so it could make decisions about MSA additions and reductions in accordance with its standard operating procedures.<sup>10</sup> In July 2010 the AI DSS process results as applied to the community of Gospić, Croatia, were available.<sup>19</sup> See Figures 1.1, 1.2, 3, 8.1 and 8.2 for the map of Gospić. The results of its successful application in Gospić were:<sup>8</sup>

- Exclusion of 28 sq km from 56 sq km of MSA (i.e., MSA reduction)
  - Inclusion of 6 sq km in MSA, new areas that were not registered before in the Mine Information System as hazardous risk areas
  - Re-categorization of areas inside MSA (e.g., from “minefield” to “for survey”)
- Similar activity started in June 2010 for the community of Bilje; the results should be available in late autumn 2010.

**Conclusions**

The Advanced Intelligence Decision Support System has met an important mine-action community need: finding a cost-effective way to improve land cancellation and release. The AI DSS cost-benefit ratio compared to that of other systems aiming to exclude areas from MSA proved more than 140:1. AI DSS is the first system to combine airborne and spaceborne remote sensing with advanced intelligence for MSA assessment in an operationally effective way. The system also enables a more efficient resource allocation (minimizing costly Technical Surveys and demining in nonhazardous areas). Because of this success, Croatia,



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along with other countries choosing to implement the system (such as BiH), is moving closer to fulfilling the Ottawa Convention's Article 5 goals.♦

see endnotes page 82

*Thanks to the Ministry of Science, Education and Sports of the Republic of Croatia, AI DSS was developed and realized in 2007–08 as an operational system under one of its technology projects.<sup>13</sup> Financial support was provided by the Office of Weapons Removal and Abatement in the U.S. Department of State's Bureau of Political-Military Affairs with assistance from ITF, which supported operationalization and advancement of the AI DSS in Croatia in 2008–09 and has a project underway in Bosnia and Herzegovina. CROMAC provided data, information and expertise in mine action as crucial operational support for the project. The AI DSS is the result of continuous efforts of many researchers, mine-action experts, Croatian Air Force and Defense pilots, research institutions, academia and fruitful cooperation between Croatian and European scientists. It was our privilege and pleasure to work with all of them.*



# ITEP Evaluation of Metal Detectors and Dual-sensor Detectors

Since its development in the early 1970s, scientists from an array of disciplines have found reason to utilize ground-penetrating radar to create radar images of the subsurface. The following article examines how GPR use in combination with standard metal detectors could aid workers in the field of demining.

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An ITEP dual-sensor detector test, led by the *Bundesamt für Weh-  
artechnik und Beschaffung* (BWB), Germany’s Federal Office of De-  
fense Technology and Procurement, took place September–October  
2009 in Germany.<sup>1,2</sup> Analysis of the test results clearly confirmed that  
the tested dual-sensor detectors reduce false alarms and that their met-  
al-detector parts are not deteriorated, in comparison to the base model  
of a stand-alone metal detector used along with the GPR part of a dual-  
sensor detector.

In this article, a dual-sensor detector refers to a combination of a  
metal detector and GPR. The combination allows the detection and  
identification of metal-containing objects; this combination is expect-  
ed to contribute to the reduction of false alarms and, consequently, im-  
prove clearance-operation efficiency. This article provides an analysis  
and overview of the test results. The test’s detailed descriptions, as well  
as the results, can be found in the test report which will be available on-  
line soon.<sup>3</sup>

### Test Conditions

A test site was constructed at a BWB facility in Oberjettenberg, Ba-  
varia, Germany. Three types of soil were prepared: laterite, magnetite  
and humus. Laterite is a reddish clay loam with low stone (basalt) con-  
tent. The soil has a very high magnetic susceptibility and is frequen-  
cy dependent. Thus, it often causes metal detectors to give false alarms.  
Magnetite, the second soil type, is coarse sand mixed with engineered  
magnetite. The soil has a very high magnetic susceptibility but no fre-  
quency dependence. The third soil type is a loamy soil with a relatively  
high humus content—about 10%. Test-soil properties are described in  
detail in an accompanying report.<sup>4</sup> Three types of mine-like targets, in-  
cluding rendered-safe mines, were planted in the soils: ERA calibration  
target, Gyata-64 and PPM-2. In addition, various sizes of metal pieces,  
such as bullets and cartridges, were buried as metal clutter. The burial  
depths ranged from 2 to 15 centimeters (0.78 to 5.90 inches).

An advanced landmine-imaging system developed by Tohoku Uni-  
versity, Japan<sup>5,6</sup> participated in the test. Cambodian deminers, who were  
trained by Tohoku University and attended previously conducted tests,  
operated the dual-sensor detector.<sup>7</sup> For the comparison, various mod-  
els of commercial metal detectors, including the base metal detector of  
ALIS (CEIA MIL-D1), as well as a commercial stand-alone GPR, were

also tested. Operated by two scientists in the test, the stand-alone GPR  
system is not specially designed for demining but for general non-de-  
structive testing purposes. Since the stand-alone GPR is not integrated  
with a metal detector, the system followed various models of stand-alone  
metal detectors and performed only discrimination. Therefore, the de-  
tection performance of the stand-alone GPR cannot be discussed, and  
only the discrimination performance is demonstrated.

The test was a blind test: The detector operators did not know the lo-  
cations or the object types.<sup>8</sup> Dual-sensor operators first used the met-  
al-detector part of the device for detecting mine-suspected objects and  
switched over to the GPR for discriminating mines from metals. Two  
colors of markers were used to indicate the location and object type  
(mine or metal) found in the search with a dual-sensor detector. Opera-  
tors of stand-alone metal detectors simply used one color of markers.  
After each test run, marker positions were measured with total stations.

### Data Analysis

Data collected in the test was analyzed in the same way as analyzed  
in “Data Analysis and Performance Evaluation of Japanese Dual-Sensor  
Systems tested in Croatia” from *The Journal of ERW and Mine Action*,  
Issue 13.3.<sup>9</sup> Detection capability is evaluated by calculating probabili-  
ty of detection and false-alarm rate, and discrimination performance  
is evaluated by false-alarm rate reduction and probability-of-detection  
loss. The measures are defined as follows:

$$FAR = \frac{\text{Number of false alarms}}{\text{Area searched}}$$

$$FAR\ reduction = \frac{\text{Number of rejected false alarms by GPR}}{\text{Number of false alarms by metal detector}}$$

$$POD = \frac{\text{Number of detected targets}}{\text{Number of buried targets}}$$

$$POD\ loss = \frac{\text{Number of rejected targets by GPR}}{\text{Number of detected targets by metal detector}}$$

Probability-of-detection ranging from 0% to 100% indicate how of-  
ten targets are found, and a higher value indicates a better performance.  
False-alarm rate shows how many false positive indications (false  
alarms, alarms from other than target) are obtained in one square meter,  
and a lower value indicates better performance. False-alarm rate reduc-  
tion indicates how many false alarms the GPR use decreases the number  
of false alarms found with the metal-detector alone. False-alarm rate  
reduction of 100% means that GPR use successfully discriminates and  
rejects all false alarms, and 0% means that no false alarms are rejected.  
This measure directly relates to efficiency improvements.

Probability-of-detection loss indicates how many mines detected by  
the metal-detector part are falsely identified as metals and rejected by  
the GPR. A 0% probability-of-detection loss means all mines are cor-  
rectly recognized as mines, and a 100% probability-of-detection loss  
means all mines are falsely rejected. This measure is directly related to  
the safety of deminers.

Probability-of-detection and false-alarm rate can be calculated at  
two stages of the dual-sensor detector’s operation: after using only the  
metal-detector feature and after using both sensors. On the other hand,  
false-alarm rate reduction and probability-of-detection loss can only be  
calculated after using both sensors. This means that both can be con-  
sidered to be performance measures of the dual-sensor detectors’ GPR  
sensor.

Note that in this data analysis, unlike previously-conducted stand-  
alone metal-detector trials, metal pieces are considered a source of false  
alarms, not true positives. In this data analysis, only mine-like objects  
are considered the source of true positives (see Table 1 below from our  
earlier article).<sup>9</sup> This is because dual-sensor detectors are supposed to  
discriminate mines from metals. In this article, this categorization is  
applied to stand-alone metal detectors as well so that their results can be  
directly compared to those of the dual-sensor detectors.

### Results

To demonstrate an overview of the detectors’ performance, results  
shown in this article are averaged overall soil types. These results, as well  
as detailed interpretations, will be in the test report.<sup>3</sup>

Figure 1 shows probability-of-detection versus false-alarm rate of  
ALIS and stand-alone metal detectors. The metal-detector part of ALIS  
(blue dot) achieved a result similar to its base metal detector (CEIA  
MIL-D1, light blue cross). This result indicates that the metal-detector  
performance integrated in ALIS is not deteriorated by the combined  
GPR, and it is still as good as the base metal detector. The metal detector  
part of ALIS declared approximately 2.5 false alarms per square meter,  
and using the GPR sensor reduces it to about 1.4 false alarms, denoting  
a 45% reduction. Consequently, the false-alarm rate obtained by ALIS  
is lower than any other stand-alone metal detector tested in the campaign.  
Since the metal detector is the primary sensor in ALIS, the detection  
performance depends entirely on the base metal detector. In the soils  
used in this test, the base metal detector achieved the lowest probabili-  
ty-of-detection among all tested detectors. Therefore, the probability-of-  
detection obtained by ALIS is also low, but this is due to the base metal  
detector’s performance.

False-alarm rate reduction and probability-of-detection loss are  
plotted in Figure 2. The stand-alone GPR (red cross) achieved a remark-  
ably high false-alarm rate reduction, indicating that approximately 90%  
of the false alarms are correctly identified. Furthermore, the false-alarm  
rate reduction by ALIS is much lower, meaning more metal pieces were  
misidentified and left as mines by ALIS as compared to the stand-alone  
GPR. On the other hand, the stand-alone GPR missed more mines than  
ALIS. It is difficult to grade the devices because the results can change  
with each operator. If an operator is afraid of missing mines and re-  
ports mines for all metal-containing objects the metal detector signals,



Objects used in the test. From left to right: metal clutter (ammuni-  
tion belts, cartridges, bullets) and mine-like targets (Gyata-64, PPM-  
2, ERA calibration target).  
PHOTO COURTESY OF BWB

no mine will be missed, but also no false alarms will be rejected, mean-  
ing both probability-of-detection loss and false-alarm rate reduction are  
very low. This is due to the fact that the device only provides informa-  
tion on the objects, and this information must be interpreted by the op-  
erator. Thus, the decision is entirely up to the operator. Nevertheless, the  
figure clearly shows that GPR itself is potentially capable of discriminat-  
ing landmines from metal pieces. However, from the operational point  
of view, probability-of-detection loss must be kept as low as possible.

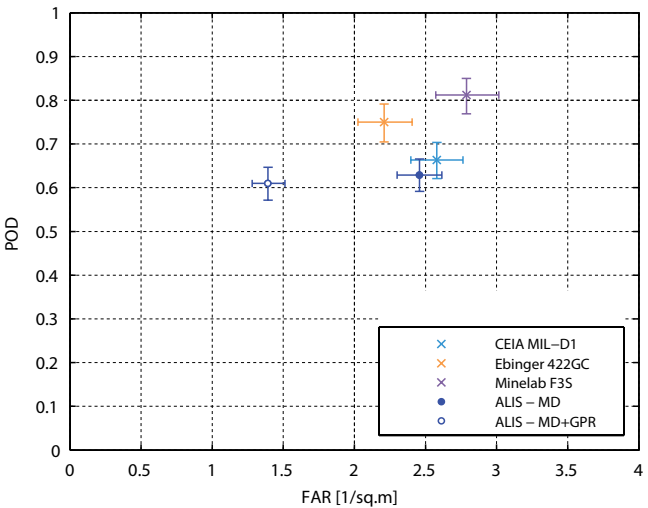


Figure 1: Probability-of-detection versus false-alarm rate of ALIS and  
stand-alone metal detectors, in all soil types averaged. The error bars  
show 95% confidence bounds. For ALIS, the dot and circle indicate  
before and after discrimination respectively.

Figures 3a and 3b (on page 78) shows false-alarm rate reduction and  
probability-of-detection loss as a function of depth. As a tendency, ALIS  
and the stand-alone GPR achieved lower false-alarm rate reductions and  
higher probability-of-detection losses at shallow depths, which confirms  
the results in a former test.<sup>10</sup> The depth dependency looks weaker for  
ALIS, especially at the shallowest depth range of 0–3 centimeters in both  
false-alarm rate reduction and probability-of-detection loss. This vari-  
ance might be due to the difference in signal processing employed in the  
systems and the GPR data’s representation to the operators. The stand-



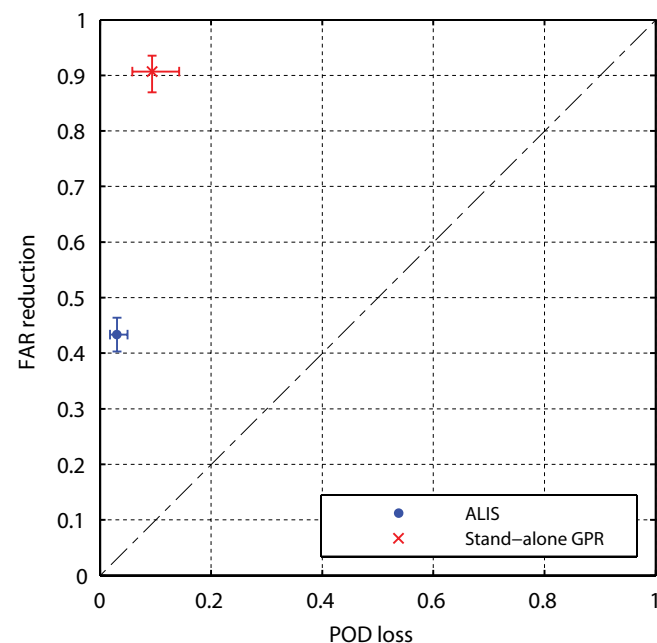
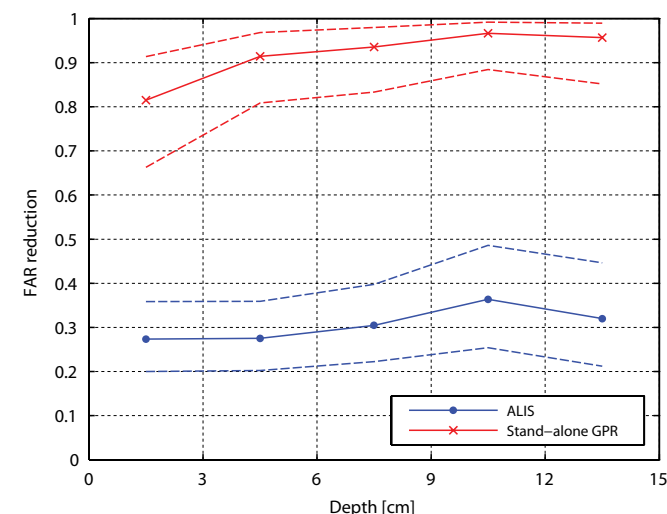


Figure 2: False-alarm rate reduction versus probability-of-detection loss found in the discrimination process in all tested soil types averaged. The error bar shows 95% confidence bounds.

alone GPR displays almost raw data<sup>11</sup> as a vertical slice of the subsurface, whereas ALIS constructs horizontal slices by applying a number of signal processing operations. As a result, ALIS may be able to obtain more robust information on targets than the stand-alone GPR through the sophisticated processing.

Figure 4 shows the averaged search speeds of ALIS and stand-alone metal detectors operated by newly trained vs. experienced personnel. ALIS required nearly double the metal detector's time. In other words, ALIS was twice as slow as the stand-alone metal detectors. In this test, only detection and discrimination were performed. Excavation and confirmation of detected objects, which corresponds to the steps 4 and 5 in the Boshoff and Cresci *Journal of ERW and Mine Action* article, "The HALO Trust and HSTAMIDS," were not included.<sup>12</sup> Therefore, assessing the efficiency improvements of the entire clearance operation with a dual-sensor detector in detail is impossible based on the obtained results. However, a rough estimate can be made as follows: Let  $T_0$ , the total time necessary for the entire clearance operation with a metal detector,



be equal to the search time plus the time for excavation (and other processes). The search time can be expressed as the time for searching one metal-containing object ( $t_s$ ) multiplied by the number of objects found,  $x$ . In a similar manner, the time for excavation can be expressed as the time for excavating one object ( $t_e$ ) multiplied by the number of objects,  $x$ .

Assuming ALIS needs twice the search time of a stand-alone metal detector for detection and identification of one object, but reduces false

$$T_0 = t_s x + t_e x$$

alarms by half, the total work time using ALIS ( $T_1$ ) can be expressed as: If  $T_0 > T_1$ , we obtain  $t_e > 2t_s$ , which means that the clearance operation is expected to be accelerated if the excavation process for one object re-

$$T_1 = 2t_s x + \frac{1}{2} t_e x$$

quires more than twice the time necessary for finding one object, under the assumption that rejected false alarms will not be excavated. For the sake of humanitarian demining, rejected false alarms may also need checking, but it can be done quickly if the detected objects are identified as non-explosive items like Boshoff and Cresci showed with the Hand-held Standoff Mine Detection System.<sup>12</sup> Even taking into account rapid excavation to accelerate the process, the situation may be realistic, especially in heavily mine-contaminated areas.

A study shows that the most common activity at the time of an incident is excavation.<sup>13</sup> Using a dual-sensor detector to reject metals cannot reduce the potential risk of the excavation process because detected landmines must be taken out anyway. However, the amount of this stressful work can be reduced, and it may help deminers concentrate on their tasks.

#### Discussion and Conclusions

The test results confirm that dual-sensor detectors can reduce false alarms as compared to stand-alone metal detectors, which indicates potential efficiency improvements in clearance operations. However, a few issues in need of consideration came up during the test and data analysis, such as probability-of-detection loss, search speed and training. From observation, dual-sensor detectors can correctly reject false alarms, but they also sometimes falsely reject mines. This seems to happen especially at shallow depths (see Figure 3b), but it also appears related to the soil type.<sup>14</sup>

Investigating soil properties and screening out unfavorable soil types can help to minimize the false rejection of mines (probability-of-

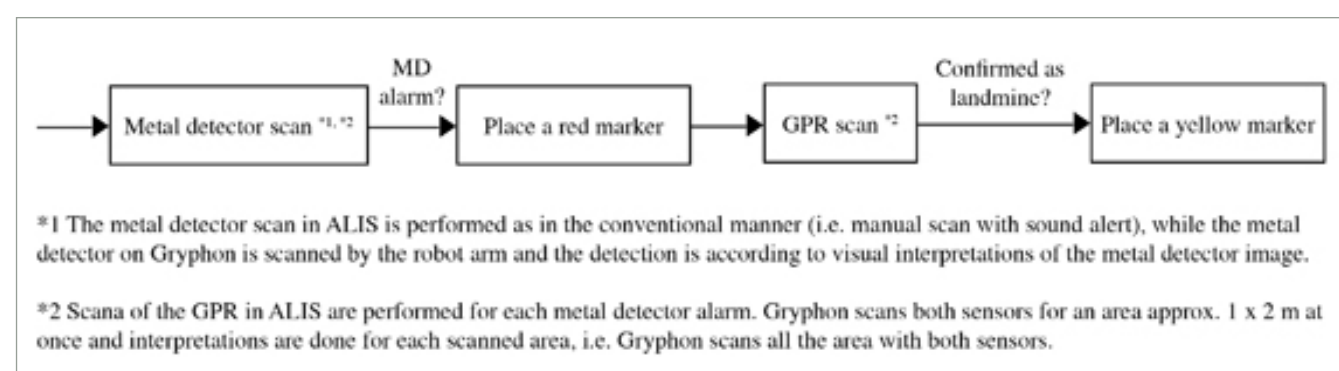
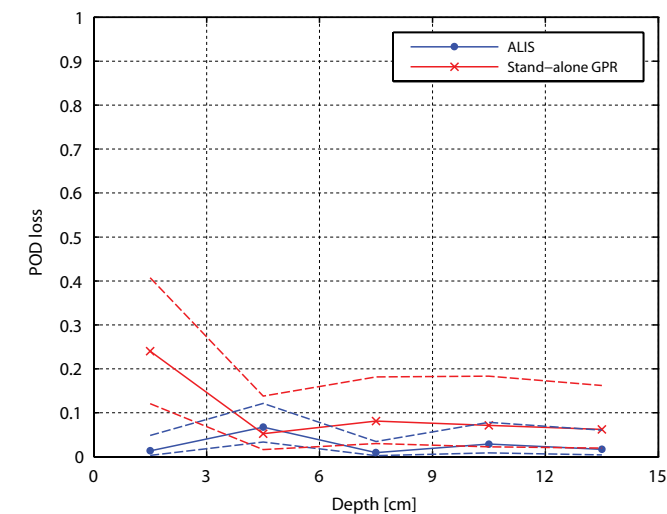


Table 1: Differences in categorization of sources of alarms for stand-alone metal detectors and dual sensors.

detection loss) for dual-sensor detectors. If an area is assessed as difficult for dual-sensor by the investigation, a dual-sensor should not be used and other methods should be employed. The search speed is directly related to the efficiency improvements, and the higher the search speed, the more improvements can be achieved. The test results indicate that dual-sensor detectors are twice as slow as stand-alone metal detectors. Even so, the clearance operation can be accelerated if a certain number of false alarms are reduced. Furthermore, an additional attempt in this test indicated that operators of dual-sensor detectors who have more experience and knowledge working with the device can work as fast as operators using stand-alone metal detectors. However, this fact also indicates that more training and/or practice is necessary for dual-sensor detector use when compared to standard metal detectors. The advantages of experienced per-

sonnel who have trained for a short period of time appear significant in search speed and performance.

The dual-sensor test allowed us to evaluate detection and discrimination performance in a blind test. Although a very rough estimate of the efficiency improvements has been made, other factors need consideration for the detailed assessment such as excavation time, detector costs, and training and practice costs. Only a long-term field trial can evaluate these factors.

In the test campaign, stand-alone metal detectors that possess the capability of discriminating objects were also tested. The evaluation is not discussed in this article, but readers interested in these devices can find the results in the test report.<sup>3,4</sup>

see endnotes page 83

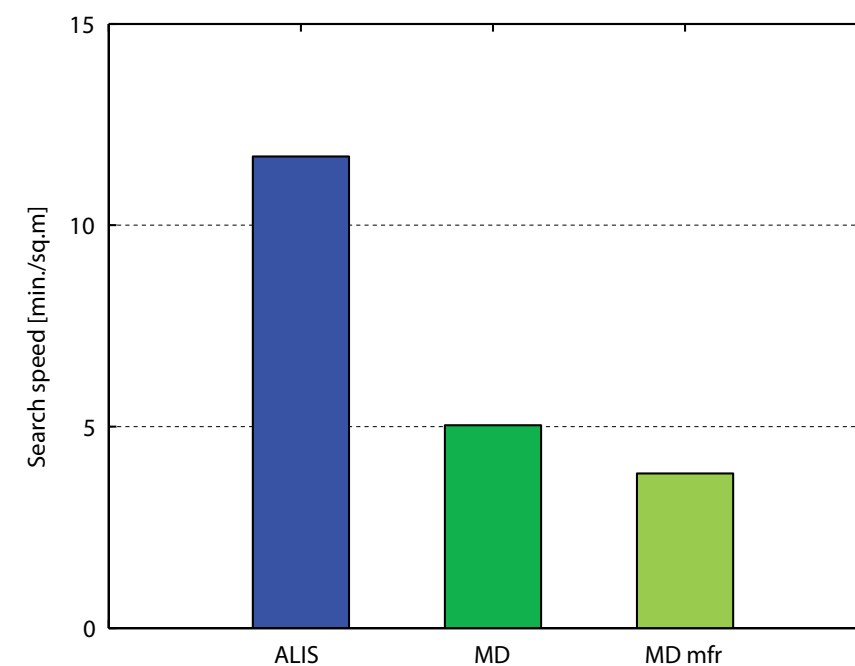


Figure 4: Average search speed of ALIS and stand-alone metal detectors in minutes per square meter. The labels "MD" and "MD mfr" indicate metal detectors operated by trained operators and the manufacturers, respectively.



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The Bridge from Hold to Build, Escalante [ from page 12 ]

1. *To Walk the Earth in Safety*. 2010. Office of Weapons Removal and Abatement in the U.S. Department of State’s Bureau of Political-Military Affairs (PM/WRA). <http://tiny.cc/jyblf>. Accessed 20 September 2010

Destruction of Cluster Munitions in Moldova, King [ from page 15 ]

1. *Berlin Conference on the Destruction of Cluster Munitions*. German Federal Foreign Office and Geneva International Centre for Humanitarian Demining. 25 - 26 June 2009. <http://bit.ly/d7CKuw>. Accessed 1 September 2010.

2. An electrical squib is a small electrical explosive device which through detonation can be used to ignite other explosives. Black powder is an explosive combination of sulfur, charcoal and potassium nitrate, also known as saltpeter.

Albania Makes Progress in Demilitarization, Goodyear [ from page 19 ]

1. “AMAE Response to Gërdec Tragedy.” *Albanian Mine Action Executive*. March 2008. <http://tinyurl.com/394qpj8>. Assessed 27 September 2010.

2. Demilitarization is the full range of operations from demolition to industrial dismantling.

3. In open detonation, additional explosive charges are added to explosives and munitions to detonate and destroy them.

4. “Albania.” *To Walk The Earth In Safety*, 8th Edition, U.S. Department of State, Bureau of Political-Military Affairs, June 2009 (Page 27). <http://tinyurl.com/39l9zt8>. Accessed 27 September 2010.

5. The Office of Weapons Removal and Abatement in the Department of State’s Bureau of Political-Military Affairs (PM/WRA) provides funding to the International Trust Fund for Demining and Mine Victims Assistance, which is managing the Gërdec site clearance. The Dutch government supported the Albanian Army EOD with equipment and demolition firing systems. DanChurchAid and the United Nations Development Programme also assisted immediately following the accident with mine clearance through Albanian Mine Action Executive. <http://bit.ly/boOmcj>. Accessed 4 October 2010.

The Terter Regional Vocational Training Center, Nwolisa [from page 23 ]

1. Professional Development Framework for Vocational Skills of VET Practitioners. 1st Edition 2009. Government of Western Australia Department of Education and Training. <http://bit.ly/djor5l>. Accessed 17 June 2010.

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1. “Landmines: Major Public-Private Partnerships.” U.S. Department of State Bureau of Political-Military Affairs. <http://bit.ly/cpV4Bq>. Accessed 17 June 2010.

2. Nwolisa, Nick. “Azerbaijan Mine Victim Association: The Story So Far.” *Journal of Mine Action*, Issue 12.1 (Summer 2008). <http://bit.ly/auYUKp>. Accessed 17 June 2010.

3. *UN Marked Mine Awareness Day in Azerbaijan Jointly With Villagers and Local Partners in Borsunlu Village Situated Near Cease-fire Lines*. 2 April 2010. <http://bit.ly/cQdP6B>. Accessed 17 June 2010.

4. Jalalov, Musa and Sadigov, Vagif. “Mine Risk Education: The Effective Way to Save Lives.” *Journal of Mine Action*, Issue 7.3 (December 2003). <http://bit.ly/aBD8HQ>. Accessed 17 June 2010.

5. “Azerbaijan.” *Landmine Monitor Report 2009*. <http://bit.ly/d9RX2e>. Accessed 17 June 2010.

6. Azerbaijan Mine Action Programme Mine Victim Assistance, one of the Pillars of the Humanitarian Mine Action.

7. *Azerbaijan Mine Action Strategy 2009–2013*. ANAMA. <http://bit.ly/a4vP29>. Accessed 17 June 2010.

8. Kerimoglu, Rey. “Tartar Regional Vocational Training Centre Was Opened.” *International Eurasia Press Fund*. 3 April 2010. <http://bit.ly/b3xz38>. Accessed 17 June 2010.

9. “Deborah Netland of the US Department of State Visits IEPF Office in Tertar Region.” Side-Talks Azerbaijan. 29 October 2009. <http://bit.ly/3XYOS0>. Accessed 17 June 2010.

10. Perry, Debra. *The Basics of Vocational Assessment: A Tool for Finding the Right Match Between People with Disabilities and Occupations*. ILO, Bangkok. <http://bit.ly/a1156Q>. Accessed 17 June 2010.

11. *Professional Development Framework for Vocational Skills of VET Practitioners*. 1st Edition 2009. Government of Western Australia Department of Education and Training. <http://bit.ly/djor5l>. Accessed 17 June 2010.

12. Tartar Regional Vocational Training Center. <http://bit.ly/bH-8p0I>. Accessed 17 June 2010.

Mine Action Development Funding in Bosnia and Herzegovina, Carrier and Powell [ from page 28 ]

1. “Guidelines for grant applicants: Support to Mine Action in BIH.” The Delegation of the European Union to Bosnia and Herzegovina, 12 July 2009. p. 4. Call for Proposals Number: EC/BIH/CFP/09/001. <http://bit.ly/a23mfY> Accessed 5 October 2010.

2. The authors thank the project team and partners for supporting this pilot intervention and constantly searching for positive solutions to recurring issues related to the integrated mine action development approach.

3. “Landmine Contamination: A Development Imperative,” Social development notes, World Bank, October 2004. p. 3. <http://bit.ly/cXRuCJ>. Accessed 5 October 2010.

4. From a mine-action institutional perspective, a key area of concern revolves around the need for the national mine-action center to differentiate formal mine action (that must be supervised) from “uncontrolled” development intervention in mine-affected areas. For example, when a development organization implements a standard priority needs assessment in a mine-contaminated area, mine-action institutions may interpret it as a mine-action activity conducted without accreditation and/or without respecting the existing standard operating procedures. A solution is possible: The organization conducting development activities in mine-contaminated areas should be aware of mine-action procedures while mine-action institutions should focus their supervisory role on the five official mine-action pillars and related national procedures, namely advocacy to universalize the Anti-personnel Mine Ban Convention, assistance to landmine survivors/victims, clearance of mined areas, mine-risk education, and stockpile destruction.

5. Gasser, Russell (Dr.) and Music, Almedina. “Evaluation of the UNICEF Mine Risk Education Programme in Bosnia Herzegovina 2007.” Geneva International Centre for Humanitarian Demining. October 2007. p. 11. <http://bit.ly/98tPDL>. Accessed 6 October 2010.

Mine-action Funding: GICHD Survey of Donor Countries, Devlin and Naidoo [ from page 32 ]

1. *Landmine Monitor Report 2009: Toward a Mine-Free World Annual Report*. International Campaign to Ban Landmines. The 2009 *Landmine Monitor* refers to total external funding amounting to US\$517.8 million in 2008. <http://bit.ly/c2uKtd>. Accessed 11 October 2010.

2. Australia, Austria, Belgium, Denmark, the European Commission (EC), Finland, Germany, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Sweden, Switzerland, the United Kingdom and the United States. Canada stated it was unable to respond at this time as it is undergoing a review, and China, the Czech Republic, France, South Africa, Spain and the

UAE did not respond to the initial message.

3. *Paris Declaration on Aid Effectiveness and the Accra Agenda for Action*. Organization For Economic Co-operation And Development. <http://bit.ly/AvgX>. Accessed 11 October 2010.

4. The GICHD study did not explore new funding avenues for development activities in mine-affected communities, for which there may be significant opportunities.

UN Portfolio of Mine Action Projects, McCoull [ from page 35 ]

1. Country Portfolio Directors initially were solely U.N. officials, but some NGOs and national authorities have become more involved. Due to greater involvement in such mine action projects, these NGOs and countries have had leaders and experts of their agencies named as Country Portfolio Directors.

2. “Overview.” Geneva International Centre for Humanitarian Demining. <http://tinyurl.com/6lah3h>. Accessed 7 October 2010.

3. Millennium Development Goals. For more information: <http://un.org/millennium>. Accessed 1 October 2010.

4. United Nations Development Assistance Framework (UNDAF). United Nations Development Group. For more information: <http://undg.org/?p=232>. Accessed 11 October 2010.

5. E-mail from Gustavo Laurie, United Nations Mine Action Service, 9 August 2010, sent on behalf of the HQ Portfolio Team (UNMAS, UNDP and UNICEF).

6. “Aid Policy: Money for mine action is hard to come by.” Integrated Regional Information Networks. <http://tinyurl.com/2bmhroj>. Accessed 11 October 2010.

7. *Landmine & Cluster Munition Monitor*. <http://lm.icbl.org>. Accessed 11 October 2010.

8. In addition, the overall problem is diminishing because of effective mine-action efforts having been undertaken and an international normative framework being in place. However, this does not mean that funding flows should cease but that the focus can now be on finishing the job in more and more cases, with national authorities taking the lead, according to UNDP.

9. *The Comprehensive Peace Agreement Between the Government of The Republic of The Sudan and The Sudan People’s Liberation Movement/Sudan People’s Liberation Army*. The Comprehensive Peace Agreement, or Naivasha Agreement, ended the Second Sudanese Civil War between the Sudan People's Liberation Movement and the Government of Sudan. <http://tinyurl.com/y5y5ut8>. Accessed 11 October 2010.

The Mine Action Programme of Afghanistan, Reza [ from page 39 ]

1. Bolton, Matthew. *Foreign Aid and Landmine Clearance: Governance, Politics and Security in Afghanistan, Bosnia and Sudan*. London: I.B. Tauris & Co Ltd, February 2010.

2. *Portfolio of Mine Action Projects*. (2007, Tenth Edition.) United Nations Mine Action Service. <http://bit.ly/aDYQga>. Accessed 30 June 2010.

3. In Afghanistan, marking is only carried out when minefields are under active management for survey or clearance. On other sites, it is not considered a helpful long-term protection measure due to the risk of materials being removed or moved.

4. “Afghanistan.” *Landmine Monitor Report 2001*. New York: International Campaign to Ban Landmines. <http://bit.ly/bfc36Z>. Accessed 30 June 2010.

5. “Afghanistan.” *Landmine Monitor Report 2003*. New York: International Campaign to Ban Landmines. <http://tinyurl.com/2d5xxxe>. Accessed 30 June 2010.

6. The Integrated Operational Framework is published annually and is available on the MACCA website at [www.macca.org.af](http://www.macca.org.af). The current Afghan calendar year 1389 runs 1 April 2010–31 March 2011.

7. “Mine Action Programme of Afghanistan Newsletter.” *Mine Ac-*

*tion Programme of Afghanistan*. May 2010. <http://bit.ly/aICdH7>. Accessed 30 June 2010.

Bosnia and Herzegovina Demining 15 Years Later, Grujić [ from page 43 ]

1. U.N. peacekeeping force UNPROFOR had originally arrived in 1992, and Security Council Resolution 1031 discussed the transfer of authority.

2. North Atlantic Treaty Organization (NATO) operation that began 12 April 1993

3. The Implementation Force (IFOR) was a NATO-led multinational force in Bosnia and Herzegovina under a one-year mandate from 20 December 1995 to 20 December 1996.

Mine Action in Northern Sudan, Hamed [ from page 46]

1. “The background to Sudan’s Comprehensive Peace Agreement.” UNMIS. <http://bit.ly/aoeQFW>. Accessed 05 October 2010.

2. “Sudan.” E-mine Electronic Mine Information Network. <http://bit.ly/cgjD9r>. Accessed 24 August 2010.

Mine-action Program in South Sudan, Mathiang [ from page 49 ]

1. “The Background to Sudan’s Comprehensive Peace Agreement.” UNMIS. <http://tinyurl.com/246yw4d>. Accessed 08 September 2010.

2. “Government of Sudan Presidential Decree No. 25/2006.” Government of Southern Sudan, Office of the President. Internal document. 27 June 2006.

3. The United Nations Mine Action Office. Internal document.

4. Conversion as of 27 October 2010.

Falkland Islands Demining Pilot Project: Completion of Phase 1, Swanson [ from page 54]

1. Although a territory of the United Kingdom, Argentina says it has a right to the islands, which it calls the Malvinas, because it inherited them from the Spanish crown in the early 1800s. It has also based its claim on the islands’ proximity to the South American mainland. It has stressed that its claim to the territory is nowadays entirely peaceful. For more information: <http://tiny.cc/azd1b>. Accessed 4 October 2010.

2. Kuklick, Cory. “Falkland-Malvinas Islands Update” *The Journal of ERW and Mine Action*, Issue 14.1. (Spring 2010: 65-66). <http://bit.ly/9HdNC7>. Accessed 8 August 2010.

3. The Feasibility Study can be found in PDF version under Item 10 “General Exchange of Views” at the 8th Member States Party (MSP) meeting in Jordan on 18 November 2007 under Argentina or U.K. <http://bit.ly/bT2S7O>. Accessed 8 August 2010.

4. This information was in the form of documents turned over to the U.K. government by the Argentine military following its surrender; and when they were found to be credible, they allowed the technical surveys and subsequent clearance to be properly targeted and conducted

5. BACTEC employed Roger Gagen and Kev Bryant as Project and Ops Manager respectively plus 37 Zimbabwean and 15 Lebanese demining personnel.

6. A mixed mine panel is one which contains both anti-personnel mines and anti-vehicle mines.

7. Centimeter accurate survey similar to, but better than, Differential GPS.

8. This was a separate BAC task designed to check the area south of the Sapper Hill minefield which was a cluster-munitions strike during the conflict.

9. This was a technical survey BAC task designed to check the complete area of a cluster-munitions strike during the conflict. It only represents 10 percent of the headland area released as cleared.

10. The U.K. also laid a small number of minefields some time after the conflict ended but these were subsequently cleared by U.K.



military personnel in the mid-1980s.

11. The DPO was provided by C King Associates Ltd.

Strengthening the Demining Sector Response to HIV/AIDS in Sub-Saharan Africa, Chitsama [ from page 57 ]

1. “The origin of AIDS and HIV and the first cases of AIDS.” Avert. <http://tiny.cc/xnr6p>. Accessed 2 November 2010.

2. *Landmine Monitor Report 2007 and 2009*. <http://the-monitor.org>. Accessed 19 October 2010.

3. “Sub-Saharan Africa.” *Aids Epidemic Update 2009* (November 2009). <http://tiny.cc/lyiln>. Accessed 19 October 2010.

4. “Post exposure prophylaxis and pre-exposure prophylaxis.” Avert. <http://tiny.cc/pz0a4>. Accessed 2 November 2010.

5. “Landmine Removal: Restoring Land, Restoring Lives.” United Methodist Committee on Relief. <http://bit.ly/cUyc02>. Accessed 29 October 2010.

6. “Barrick Gold’s Tanzanian Corporate Health Responsibility: The Lake Zone Health Initiative.” Republic of Mining. Home to nine million residents, Tanzania’s Lake Zone wraps around Lake Victoria and spans seven regions, including the Kahama and Mara districts. <http://tiny.cc/qifak>. Accessed 2 November 2010.

7. “Circumcision Gains Ground as Anti-AIDS Measure.” AolNews. <http://tiny.cc/zro0q>. Accessed 24 September 2010.

8. “Male Circumcision for HIV Prevention.” World Health Organization. : <http://tiny.cc/tu449>. Accessed 2 November 2010.

9. IMAS 10.40. *Safety & occupational health - Medical support to demining operations*, First Edition. UNMAS (1 October 2001). <http://bit.ly/9MYogm>. Accessed 2 November 2010.

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1. Mine Action Centers Angola, Mozambique, DRC, Sudan, Chad

2. Interagency Coalition on AIDS and Development

3. UNAIDS HIV/AIDS Report 2009

The Growing Threat to Humanitarian Operations, King [from page 61.]

1. Al Somood. The Struggle, Nov 2009. Islamic Emirates of Afghanistan. Extract of an interview with a Taliban regional commander (translation by HMS Ltd).

2. “The Geneva Conventions of 1949: The Geneva Conventions and their Additional Protocols are international treaties that contain the most important rules limiting the barbarity of war. They protect people who do not take part in the fighting (civilians, medics, aid workers) and those who can no longer fight (wounded, sick, shipwrecked troops, prisoners of war).” ICRC. <http://tiny.cc/h0op1>. Accessed 2 November 2010.

The Effect of Reinforcement Rate Variations, Sargisson and McLean [ from page 68 ]

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The Advanced Intelligence Decision Support System for the Assessment of Mine-suspected areas, Bajić [ from page 75 ]

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**Deadline: February 15, 2011**

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Landmine survivor and Peer Support Worker Mohamed Alisić helped Kavara Mehmed, a mine survivor from Bosnia-Herzegovina, recover from depression and resume his occupation as a farmer. Photo by Paul Jeffrey/kairosphotos.com

## FOCUS

### Victim Assistance

Issue 15.2 of *The Journal of ERW and Mine Action* will focus on the topic of Victim and Survivor Assistance. Articles related to services available to landmine survivors, their families and the communities where they live are requested. We are especially interested in articles regarding methodologies to help survivors deal with psychosocial problems as well as physical injuries, including peer-to-peer support programs, and programs that help victims, survivors and communities regain socioeconomic independence. Individual victims' stories of triumph, as well as submissions describing the efforts of organizations working with these survivors, are encouraged. Also of interest are articles about changes in the definition and perception of who a survivor or victim is and how best to assist them, as well as how disability-advocacy efforts have helped survivors on their roads to recovery.

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Our Feature section will tell the stories of deminers working in unusually dangerous situations, including places where non-state actors or local tensions are still causing pockets of conflict, or areas in which acts of terrorism, kidnapping and violence are common. What hazardous conditions are deminers overcoming every day to complete their work? What dangerous encounters have deminers experienced? How has the landscape of humanitarian mine action changed with respect to security concerns in recent years? When have areas been deemed too hazardous for demining to continue? Are the experiences different in countries where mine action is carried out by militaries?

## SPECIAL REPORT

### Information Management and GIS/Mapping

This issue will also include a Special Report section on information-management issues as well as updates in the field of Geographic Information Systems and mapping. What information-management issues does the mine-action community struggle with today? How has information management for mine-action data changed over the years? What are the current best practices and what changes are still necessary? How are GIS and mapping techniques being used to inform data collection? How could they be used better?

## RESEARCH, TECHNOLOGY AND DEVELOPMENT IN MINE ACTION

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