# THE JOURNAL OF ERW AND MINE A

Issue 16.2 | Summer 2012

## Focus: How SA/LW Affect Security

## Special Report: Urban Land Release in Libya

## Plus: Notes from the Field and Research & Development

THE JOURNAL OF ERW AND MINE ACTION

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*The Journal of ERW and Mine Action*
Center for International Stabilization and Recovery
at James Madison University
Issue 16.2 Summer 2012 | ISSN: 2154-1469
Print Date: July 2012

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### Cover Photo

Children are particularly vulnerable to the excess of small arms and light weapons in Libya.
*Photo courtesy of Paul Jeffrey.*



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## DIRECTOR'S MESSAGE

Dear Readers,

The mine-action community has always set standards for global humanitarian intervention by tapping into our strengths—we get directly involved in the success of communities, and we use these experiences to tailor future interventions.

Working with explosive-ordnance-disposal expert Colin King and JMU faculty, and with support from the Office of Weapons Removal and Abatement in the U.S. Department of State's Bureau of Political-Military Affairs (PM/WRA), in 2010 CISR completed a two-year study on the effects of aging on landmines. Since its publication on the CISR website (http://cisr.jmu.edu/research/aging/aging_intro.html), dozens of practitioners have commented on the Landmine Aging Study's wide application in real-world settings. With this in mind, we ask demining practitioners to help us move forward as a community and continue this important research.

The premise is simple: Collect information on the condition of the munitions and explosives you encounter in the field. By following standard clearance procedures, organizations can provide valuable information without dismantling landmines. External conditions give a good indication of internal conditions. Even with *in situ* demolition, trained experts can assess and record the conditions of landmines as they render positive visual identification.

Basic information on the condition of landmines plays a critical role in understanding munitions life cycles. The Landmine Aging Study team recommended engaging with field projects to collect additional data. Involving the largest possible number of operational organizations working within normal procedures and practices will have a significant impact on this research and our community. To facilitate this process, we have created a form for practitioners to track the conditions of munitions found. You can download the form from the Aging Study website: http://bit.ly/JVNIBJ. Please send completed forms to cisr@jmu.edu, and we will maintain a database of the information collected in order to inform future aging research.

As we have seen with the first iteration of the Landmine Aging Study, collecting and analyzing information readily available to practitioners can improve clearance operations, prioritization and mine-risk education. Once again, we can come together as a community and set a standard for good practice and research.

Sincerely,

Ken Rutherford

*Photo courtesy of Missouri State University Photo Services.*

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# Unplanned Explosions at Munitions Sites: Concerns and Consequences

Over the past 25 years there have been reports of more than 400 unplanned explosions at munitions sites in almost half the world's countries. The UEMS rate is quickly increasing. Whereas the Small Arms Survey's UEMS Database shows 70 such incidents for the 10-year period between 1987 and 1996, more than this number was registered in the past two years alone. These events occur in large part because states store their munitions improperly. This article reviews the direct and indirect consequences of these explosions on peace and security. It also notes steps states are taking—or should take—to improve practice in stockpile management.

by Eric G. Berman and Pilar Reina [ Small Arms Survey ]

The Small Arms Survey defines unplanned explosions at munitions sites as accidents resulting in the explosions of abandoned, damaged, improperly stored or properly stored stockpiles of munitions and explosives. Munitions sites comprise storage areas such as those temporarily maintained during demilitarization or explosive-ordnance disposal. Processing sites, whether temporary or permanent, are also considered munitions sites. Ammunition-manufacturing facilities (ordnance factories) are not included in this definition, but accidents during ammunition-processing operations within munitions sites were included where known.[1]

The SAS has recorded unplanned explosions in 94 countries since 1987 (see Figure 1 on page 6). Explosions have reportedly occurred on every continent except Antarctica and Australia. The UEMS Database reveals more than a twofold increase in the number of incidents from 1997–2006 compared to the previous 10-year period. Furthermore, the average number of incidents from 2007–2011 is almost 50 percent greater than that of the preceding five years. An average of seven incidents were recorded per year during 1987–1996. Yet in 2011, more than seven incidents occurred every two months.

Several factors contribute to the explanation of the increase. Multilateral political and legal processes at the global and regional levels may have compelled governments to submit more comprehensive reports on UEMS. Perhaps states have become more willing to acknowledge the occurrence of such explosions to garner financial resources and technical expertise that previously was unavailable. (Since 2000, for example, the NATO Maintenance and Supply Agency has funded projects to destroy surplus ordnance and improve physical security and stockpile management practices.)[2] Another reason may be that increased public access to information via social media could simply make it more difficult to keep UEMS secret.[3]

In assisting countries with their PSSM needs, ammunition-storage specialists focus on technical causes for UEMS. Such experts note that the propellants, fuzes, primers and explosive components comprising ammunition become unstable over time. Poor storage conditions, inadequate surveillance and insufficient testing can exacerbate an inherently hazardous situation. Although the causes for many reported UEMS remain unknown and official explanations may be erroneous or misleading, a dearth of local expertise on ammunition and explosives safety is clearly a contributing factor.

The direct effects of unplanned explosions are numerous. A single incident can result in significant casualties. In January 2002, one particularly deadly explosion in Lagos, Nigeria reportedly claimed the lives of more than 1,000 people and injured 5,000 more.[4] Another direct consequence of UEMS is the dispersion of fragmented ordnance. Unexploded ordnance can be propelled over long distances, thus representing immediate and long-term dangers to neighboring civilians as well as military personnel assigned to clean up the affected area. For example, in June 2011, in the Udmurtian village of Pugachevo in the Russian Federation, a fire expanded across 18 storage facilities, triggering a blast that was felt across a 10-kilometer radius (6.2 miles) and that spread explosive fragments over the surrounding 16 hectares (39.5 acres).[5]

A government depot in the Democratic Republic of the Congo.
*Photo courtesy of Gwenn Dubourthoumieu/MAG.*

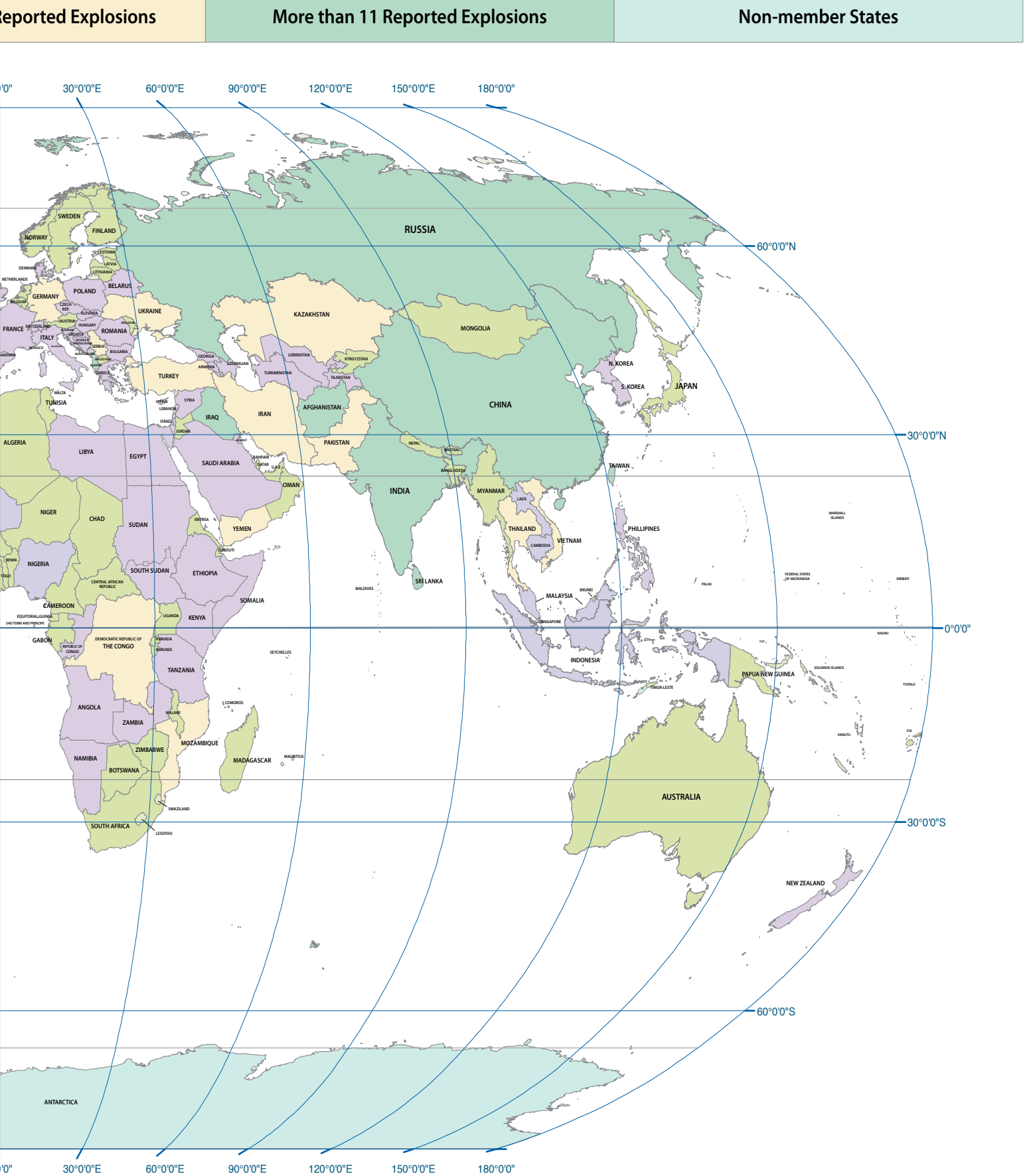
A single event can also result in the displacement of thousands of people. In Uzbekistan, 60,000 Kagan residents were displaced in 2008 after more than 150 million rounds of ammunition exploded.[6] Later that year an explosion in eastern Ukraine's Karhkiv Oblast resulted in a 14,000-person evacuation from the city of Lozovaya because of the ensuing fire and blast effects.[7] In 2011, a Venezuelan army depot exploded in Maracay, forcing the evacuation of 10,000 people.[8] Later in the same year, after an explosion in Dar es Salaam, Tanzania, some 4,000 people fled their homes near the army base for shelter in a stadium.[9]

In addition to such widespread and long-lasting effects, UEMS can cause extensive damage to infrastructure. In mid-2011, an explosion in Cyprus crippled the island's primary power plant. Daily power cuts across the island ensued, adversely affecting the economy and exacerbating an escalating political crisis.[10] Accounts of unplanned explosions tend to focus on the value of the material destroyed and the costs of the subsequent clean-up, especially when an external donor is engaged. More attention should focus on the longer-term economic impacts and consequences for affected communities.[11]

Another indirect effect of poorly managed stockpiles is the diversion of state-owned weapons and ammunition to unintended recipients. The absence of accurate record-keeping inhibits accountability and facilitates corruption, e.g., security forces renting or selling their weapons and ammunition. Poor storage practices can enable such misconduct, making it difficult to keep track of inventories, as is the case when recovered items—such as weapons, ammunition or explosives used in training or confiscated from the public—are haphazardly tossed onto piles or into open or loose crates.

Preventing UEMS sometimes calls for expensive strategies to implement and may require external assistance. The international community is addressing this challenge. Some sites may need to be closed and have their ordnance moved to other locations at significant cost. New sites, incorporating


Figure 1. Unplanned explosion locations as recorded by SAS.
*Graphic courtesy of CISR*




*See footnotes page 8.*

6,000 Kilometers

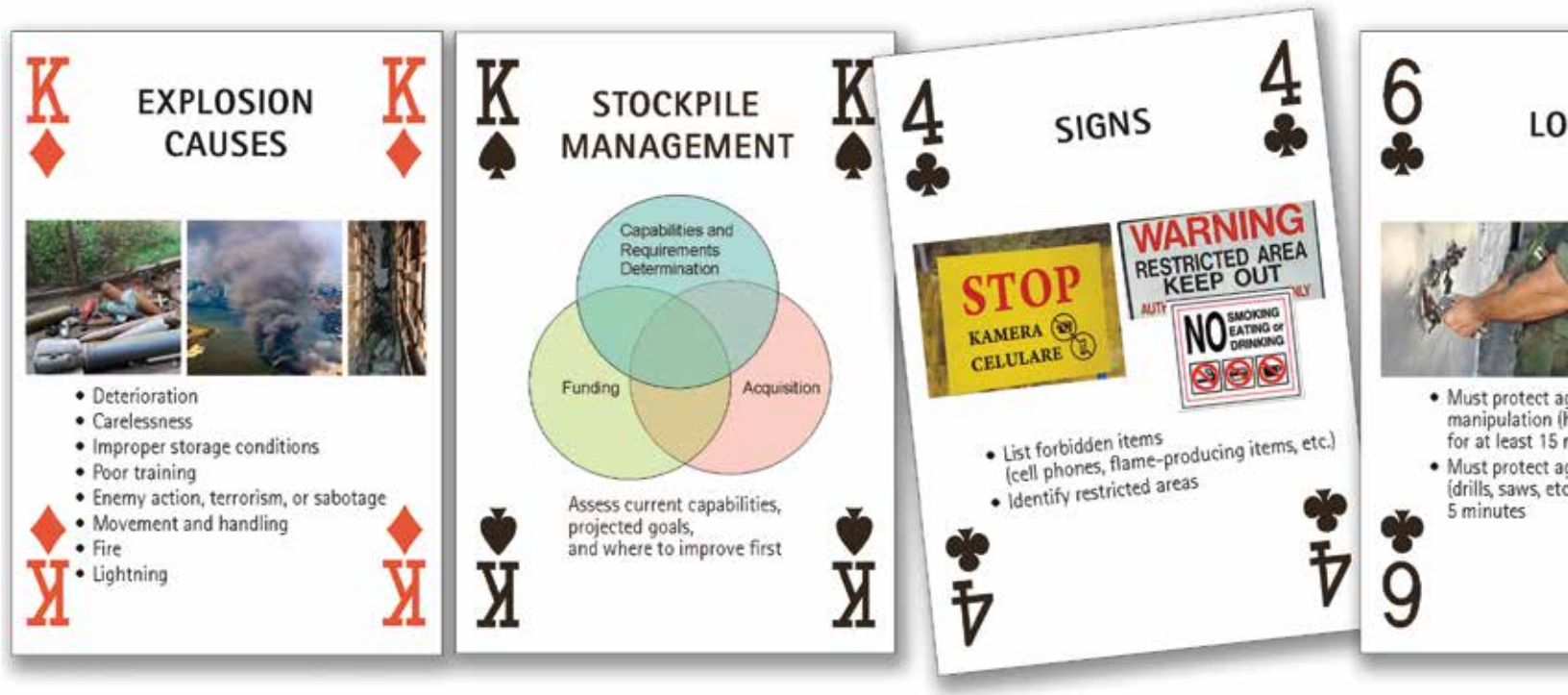



Figure 2. The Physical Security and Stockpile Management Best Practice Cards, produced by the Small Arms Survey for the Regional Approach to Stockpile Reduction Initiative, provide guidance on best practice for stockpile management.

MAP FOOTNOTES:

ALBANIA: In 1997 more than a dozen explosions at ammunition depots were reported during social unrest in several towns throughout Albania.

ARMENIA: The explosion in Armenia occurred in a depot owned by Russia's 7th Army.

AZERBAIJAN: One of the explosions occurred in Azerbaijan in 1991 (no date reported) when the country was probably still a republic of the Soviet Union. Azerbaijan regained its independence *de facto* in 25 December 1991, when the dissolution of the Union Soviet occurred.

CHINA: This includes 10 incidents recorded in Taiwan, a province of China.

CZECH REPUBLIC: The two reported incidents took place before 31 December 1992, when Czechoslovakia ceased to exist as a single state, but in the region that became the Czech Republic.

ISRAEL: The two incidents took place in the Palestinian Territories.

SOUTH SUDAN: The two incidents were recorded in Juba (2005 and 2007) after Sudan signed the Comprehensive Peace Agreement (9 January 2005) and before South Sudan became independent (14 July 2011) from Sudan.

LUXEMBOURG: The depot where the incident took place has been the Belgian Army's main munitions store since 1993.

RUSSIA: Three explosions in the Russian Federation happened while it was still the USSR.

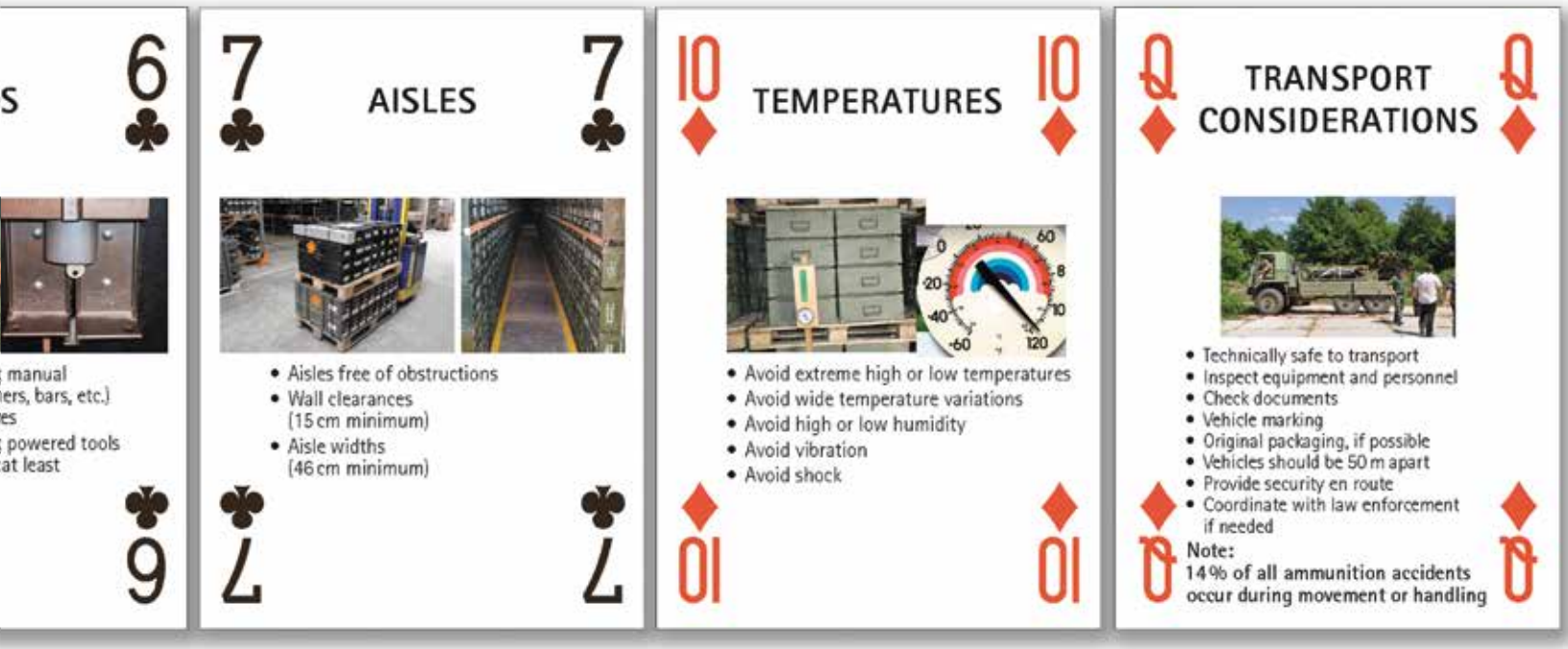
*Sources: Wilkinson (2011); Zahacewsky 2011); Small Arms Survey (forthcoming).*

quantity-distance[12] principles and security features, may need construction from scratch. These concerns are addressed by groups such as the Regional Approach to Stockpile Reduction Initiative, an *ad hoc* coalition of nine countries from Southeast Europe that agreed to share information on their surplus stockpiles and demilitarization capacities to achieve economies of scale and to generate international support.[13]

Many measures, however, can be undertaken unilaterally and with modest investment. As depicted in the RASR PSSM Best Practice cards,[14] states can achieve positive results without major infrastructure projects. They can do so by installing proper doors and locks, using adequate fences and barriers, posting signs to warn and inform, and organizing the stockpile into stacks and aisles free of obstruction. Given the high human and economic costs of unplanned explosions, policymakers should appreciate the value of such modest investments.

Numerous challenges remain. The U.N. and several regional organizations have developed PSSM best practice and technical guidelines. However, such guidance does not necessarily cover all obstacles encountered in practice.[15] Solutions themselves can generate new challenges. For example, a number of explosions at demilitarization plants raise questions about the efficacy of existing national controls, oversight and coordination with commercial contractors.[16] The upcoming Second Review Conference of the U.N. Programme of Action on Small Arms (August/September 2012) will provide the international community with an important opportunity to track progress and consider improvements to practices in the field.[17]

*See endnotes page 81*

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# How DTRA/SCC-WMD is Minimizing the Risk of Catastrophic Accidents Across the Globe

The U.S. Defense Threat Reduction Agency and the U.S. Strategic Command Center for Combating Weapons of Mass Destruction are taking measures to reduce the number of accidents caused by conventional weapons. More accidents are occurring with the proliferation of small arms and light weapons; DTRA wants to significantly reduce those accidents and the risks of their occurrence. In doing so, DTRA's SA/LW Program organizes and conducts seminars on the practices for physical security and stockpile management throughout the world. Its goal is to educate countries through seminars on proper management of stockpiles and to ultimately assuage the risk of those weapons becoming available to insurgents.

by Anne Marek [ DTRA/SCC-WMD ]

On 6 April 1994, two man-portable air-defense missiles, or MANPADS, struck an aircraft in mid-air carrying the presidents of Rwanda and Burundi, causing the plane to erupt into flames and crash into the gardens of the Rwandan presidential palace. The crash killed both presidents and propelled one of the bloodiest conflicts of the late 20th century, including a Rwandan genocide that killed more than 800,000 people.[1] Responsibility for the attack remains disputed, but the method—MANPADS, commonly referred to as shoulder-fired anti-aircraft missiles—demonstrates the tragic and destabilizing consequences that can occur when conventional weapons and munitions fall into dangerous hands.

During the Cold War (1945–1991), millions of small arms and light weapons—pistols, machine guns, shoulder-launched anti-aircraft missiles and rocket-propelled grenades—were manufactured and shipped around the world. Since then, many of these weapons have fueled local and international armed conflicts and supplied low-level terrorists and non-state actors with the ability to cause widespread casualties and economic disaster.

The United Nations estimates that conventional firearms kill more than 500,000 people worldwide every year,[2] with the bulk of these deaths occurring in conflict zones of developing regions. MANPADS have hit at least 40 civilian aircraft since the 1970s, and these weapons continue to pose a threat to commercial aviation.

*"Nobody has been killed by a nuclear weapon or dirty bomb in 50 years, but people get killed by small arms and light weapons on a daily basis. These weapons are much easier to acquire, conceal and transport. They are the everyday tool of a terrorist."*

~ Brett Wise, SA/LW Internal Relations Specialist and SOUTHCOM/PACOM Desk Office

## DTRA's SA/LW Program

The Defense Threat Reduction Agency's SA/LW Program plays a critical role in reducing SA/LW across the globe. The branch assists foreign governments with improving security, safety and management of state-controlled stockpiles of SA/LW, MANPADS and conventional ammunition. SA/LW experts provide foreign governments with assessments, technical advice and orientation seminars on the best international practices for physical security and stockpile management. By securing and managing these stockpiles, the DTRA's SA/LW Program limits the availability of weapons and ammunition to terrorists and insurgents. DTRA helps reduce regional exposure to destabilizing cross-border weapons transfers and minimizes the risk around the world of catastrophic accidents caused by improperly storing weapons.

"The whole world is affected by the proliferation of small arms and light weapons. If it's not a concern for tracking and tracing, it's a concern for import and export control, or it's a concern for illegal trafficking," says SA/LW Branch Chief

Senior Technical Officer, Bill Johnson, assesses an ammunition storage area in Southeast Asia, Fall 2010. *All graphics courtesy of Defense Threat Reduction Agency/ USSTRATCOM Center for Combating Weapons of Mass Destruction [DTRA/SCC-WMD].*

Larry Schultz. "The channels used to smuggle drugs and other illegal substances are the same channels used to smuggle weapons and ammunition."[3]

DTRA's on-site Inspection Directorate first became involved in PSSM, following a deadly ammunition explosion in Guyana in 2000. Prior to this accident, the agency's focus centered primarily on arms-control treaties and activities in the former Soviet Union. However, after the Guyana event, DTRA, with its experience in conducting military missions in sensitive environments, was asked to provide technical expertise to the U.S. Department of State to help foreign nations safely secure and store stockpiles of arms, ammunitions and explosives.

Over the next few years, DTRA developed and conducted orientation seminars to assist nations with securing national SA/LW and ammunition stores. In 2006, DTRA was designated the executive agent for supporting SA/LW destruction initiatives, providing assistance to countries wishing to improve the security of their stockpiles of small arms and ammunition. Since then, the agency's SA/LW expertise has continued to grow significantly as the types and number of missions have developed and evolved.

### DTRA's SA/LW Outreach

Currently, program requests come from a number of sources: U.S. Embassies, U.S. regional combatant commands (European Command, Central Command, Northern Command, Africa Command, Southern Command and Pacific Command), the U.S. Department of State, host nations and multilateral organizations. For each request, DTRA conducts a thorough, routine coordination process that seeks concurrence from the Office of the Secretary of Defense, Joint Staff, appropriate staff offices and the partner country's U.S. Embassy. Through additional coordination with the United Nations, NATO, the Multinational Small Arms and Ammunition Group, the Organization for Security and Cooperation in Europe and other nations' arms-control and

### Steps in a Small Arms and Light Weapons Request

1. SA/LW experts meet with host government.
2. Host government requests assistance.
3. SA/LW team performs assessment of host government's munitions, weapons, storage and safety.
4. Assessment results are reported to the local U.S. Embassy.
5. The local U.S. Embassy reports assessment findings to the host government.
6. SA/LW team reports results to U.S. Department of State for funding consideration.
7. SA/LW team shares best practices with host government to correct problems.
8. Host government may implement best practices with or without funding or U.S. assistance.

| SA/LW by the Numbers | | |
|---|---|---|
| | **Total Assessed (Since 2001)** | **Total Destroyed (Since 2001)** |
| Total MANPADS | 26,607 | 32,000 |
| Total SA/LW | 1,657,500 | 1,500,000 |
| Total Ammunition (Tons) | 2,686,296 | 90,000 |

Table 1. Destruction activities funded and administered by the U.S. Department of State.

verification agencies, the program has mediated many U.S. bilateral and multilateral commitments.

In less than a decade, DTRA has conducted PSSM assessment missions and seminars in 60 countries worldwide. DTRA-recommended solutions, ranging from the destruction of conventional weapons to the building of more secure SA/LW storage facilities, may receive funding from the Office of Weapons Removal and Abatement in the U.S. Department of State's Bureau of Political-Military Affairs (PM/WRA).

"We've done assessments everywhere you can imagine," says SA/LW Internal Relations Specialist and Southern Command/Pacific Command Desk Officer Brett Wise. "Sometimes we have to remind people that just because a place is nice to visit doesn't mean it doesn't have problems."[4] For instance, in 2010, fisherman in the Galapagos Islands retrieved nine severely corroded World War II-era bombs left over from an abandoned military airbase in 1947. A Navy-led investigation revealed that local fishermen have occasionally pulled up and released aircraft bombs from territorial waters, and a large number of these bombs remain on the seafloor. In addition, a small quantity of aging ammunition was found near the abandoned U.S. military base. Concerned about the potential threat to its tourist industry, the Ecuadorian Government requested U.S. assistance to address the problem. DTRA conducted a subsequent threat assessment, identified all the risks and made recommendations on how Ecuador could best consolidate and destroy the aging munitions.

"That base was built at a time when those islands were considered by some, to be a worthless wasteland," says SA/LW Program Manager Billy Johnson. "It wasn't until years later, when Ecuador realized the ecological importance of the area, that they began protecting it. Those islands are now a major source of tourism for Ecuador. So an accident there could have seriously affected their income stream."[5]

The SA/LW Program may seem like an unusual fit for an agency focused on countering weapons of mass destruction—chemical, radiological, biological, nuclear and high-yield explosives—but its mission is shared. High-yield explosives, technically classified as SA/LW, are one of the most easily acquired forms of CBRNE materials and, depending on the amount and location of the explosives, can prove as deadly as their chemical, biological or nuclear counterparts.

Additionally, the cooperative relationships that DTRA built through the SA/LW Program demonstrate that the agency can help partner countries control and reduce weapons within their own borders while providing assistance and training as it relates to weapons of mass destruction.

SA/LW Technical Advisor Ben Cacioppo assesses an ammunition storage site in Central America, summer 2010.

African weapons storage facility, summer 2010.

In November 2010, DTRA U.S. Strategic Command Center for Combating Weapons of Mass Destruction Director Kenneth Myers joined U.S. Senator Richard (Dick) Lugar (R-Indiana), Assistant Secretary of Defense for Nuclear, Chemical and Biological Defense Programs Andrew C. Weber, and Principal Deputy Assistant Secretary for Global Strategic Affairs Ken Handelman, in leading a mission to Burundi where experts from the Departments of State and Defense are working closely with the Burundi Government to destroy weapons and ammunition stockpiles through the Lugar-Obama SA/LW Destruction Program. The program is a by-product of the Nunn-Lugar Global Cooperative Threat Reduction effort that has succeeded in securing, storing and eliminating weapons of mass destruction for more than two decades. "Whether we're dealing with conventional weapons or dirty bombs, physical security and stockpile management is a large part of what this agency does," says SA/LW Deputy Branch Chief and European Command/Central Command Desk Officer John Schmitt. "Stockpile management of explosives can help prevent catastrophic events like Khobar Towers and the Oklahoma City bombing…"[6,7]

The program's success is not without its challenges. Three of the program's desk officers break down the six geographic combatant commands. Together, with a staff of 11, they must brief every defense attaché and every security officer that enters host countries. Program desk officers must prepare personnel for what to expect when they arrive and educate them on how the SA/LW Program can assist their country with physical security and stockpile management. They must gain the trust and respect of the host country to allow them to enter the country and assess the host's weapons and munitions.

"We can't just come in and say, 'We want to look at all your stockpiles and possibly destroy some of them,' because they don't always understand why," says Wise.[4] "So we go into their country in a cooperative manner and tell them that we know they are the true experts of what they need for their own defense purposes. We explain that we just want to make sure that whatever they have is being secured properly, but that's not always easy to do."

In 2008, DTRA approached Tanzania through the U.S. Embassy to offer an assessment of the facility in the Mbagala district of Tanzania, which had long been identified as a concern. However, Tanzania did not take advantage of the opportunity. The following year, an ammunition explosion at the facility killed 26 people, injured hundreds more and destroyed more than 7,000 homes. DTRA offered to help the country secure its facilities, but Tanzania again declined. Two years later, an army munitions bunker housing aging ammunition exploded in Mbagala near the international airport. The explosion killed at least 20 people and wounded more than 100.[8]

*"The [U.S.] State Department was given the mandate to finance destruction of these weapons for the U.S., but they did not have the necessary technical expertise to do it. DTRA became the technical set of eyes to help the State Department carry out that mission."*

~ Larry Schultz, SA/LW Branch Chief

"Unfortunately, this happens," says SA/LW Africa Command Desk Officer Chanda Brown. "We offer our assistance to countries, and they don't take it. They have so many other factors

SA/LW Technical Advisor Ben Cacioppo escorts U.S. Senator Richard Lugar and U.S. officials at a storage facility in Burundi, Fall 2010.

for instability—coups, changes in leadership and natural disasters—that they don't always see us as a priority. But when they do agree to schedule a meeting with us, and they don't cancel… when they listen to what we can do for them and seem to want to make a difference… when they actually work to make tangible improvements themselves or follow up with the State Department for assistance… that's what I view as a success."[9]

In March 2011, a SA/LW team deployed to the Democratic Republic of the Congo was preparing to conduct a seminar at a base attached to the DRC presidential palace when 60 armed

rebels stormed the compound in a violent attempt to assassinate President Joseph Kabila of the DRC. In a hail of gunfire, numerous soldiers and rebels were killed; the compound was closed for investigation, and the SA/LW team was forced to relocate the seminar. "We were teaching our seminar to the participants from the base that was attacked," says SA/LW Africa Command Technical Advisor Ben Cacioppo. "With everything that had just happened, it was difficult to get their mindset back onto some of the things we were talking about … but we talked about the tragedy and what could have prevented it to refocus them on why we were there."[10]

Although the global effort to secure SA/LW has increased, the threat posed by these weapons persists. Large ammunition stockpiles accumulated during the Cold War continue deteriorating around the world, and many countries, especially those without strong diplomatic ties to the United States, do not request assistance until an accident occurs. "One of the most difficult things about this program is that we can't do an assessment until they invite us in," says Brown. "When they do invite us in, we prefer to do our assessments first, but when that is not possible, we can use our seminars as a lead into the assessments. That way, we are informing countries that aren't familiar with us, and don't know why we're there or what we're really after, before we do the assessment. Basically, we're trying to earn their trust and build relationships where we can."[9]

In coordination with multilateral organizations and the arms control and verification agencies of like-minded nations, the SA/LW Program assists nations with stockpile management and building lasting relations with the countries where it conduct missions. "It's an education process worldwide," says Schmitt. "It is free for these countries for us to come in (and that's what we try to sell them on), listen to what we have to say and if there's a problem, we tell them how to fix it. For the most part, the solutions we offer don't break the bank, but if you think about how much human suffering and economic turmoil that an accident in one of these places may create, our program is a real value."[6]

***"We help prevent humanitarian disasters, and we do it on a relatively small budget. We would prefer to spend a couple thousand taxpayer dollars upfront over millions of dollars worth of humanitarian aid following a disaster."***

~ Ben Cacioppo, SA/LW Technical Advisor

*See endnotes page 81*

~ *Reprinted with permission from* The Shield, *Volume 1, Issue 3, Fall 2011*

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# Small Arms/Light Weapons and Physical Security in Misrata, Libya

During November 2011 DanChurchAid performed a small arms/light weapons field assessment in Misrata, Libya. In this article, DCA outlines this assessment and explains why SA/LW risk education is a valuable and appropriate response to this situation.

by Adam Forbes [ DanChurchAid ]

Children are at risk from small arms and light weapons. They are naturally curious and do not know they should not touch weapons.
*All photos of courtesy of Paul Jeffrey.*

The proliferation of small arms and light weapons is a common civil-war legacy, often thought to exacerbate post-conflict insecurity and instability within a country and beyond its borders.[1] SA/LW proliferation is a potentially sensitive and dynamic issue for international nongovernmental organizations to address; this issue becomes more difficult in the immediate aftermath of war and major uprisings.

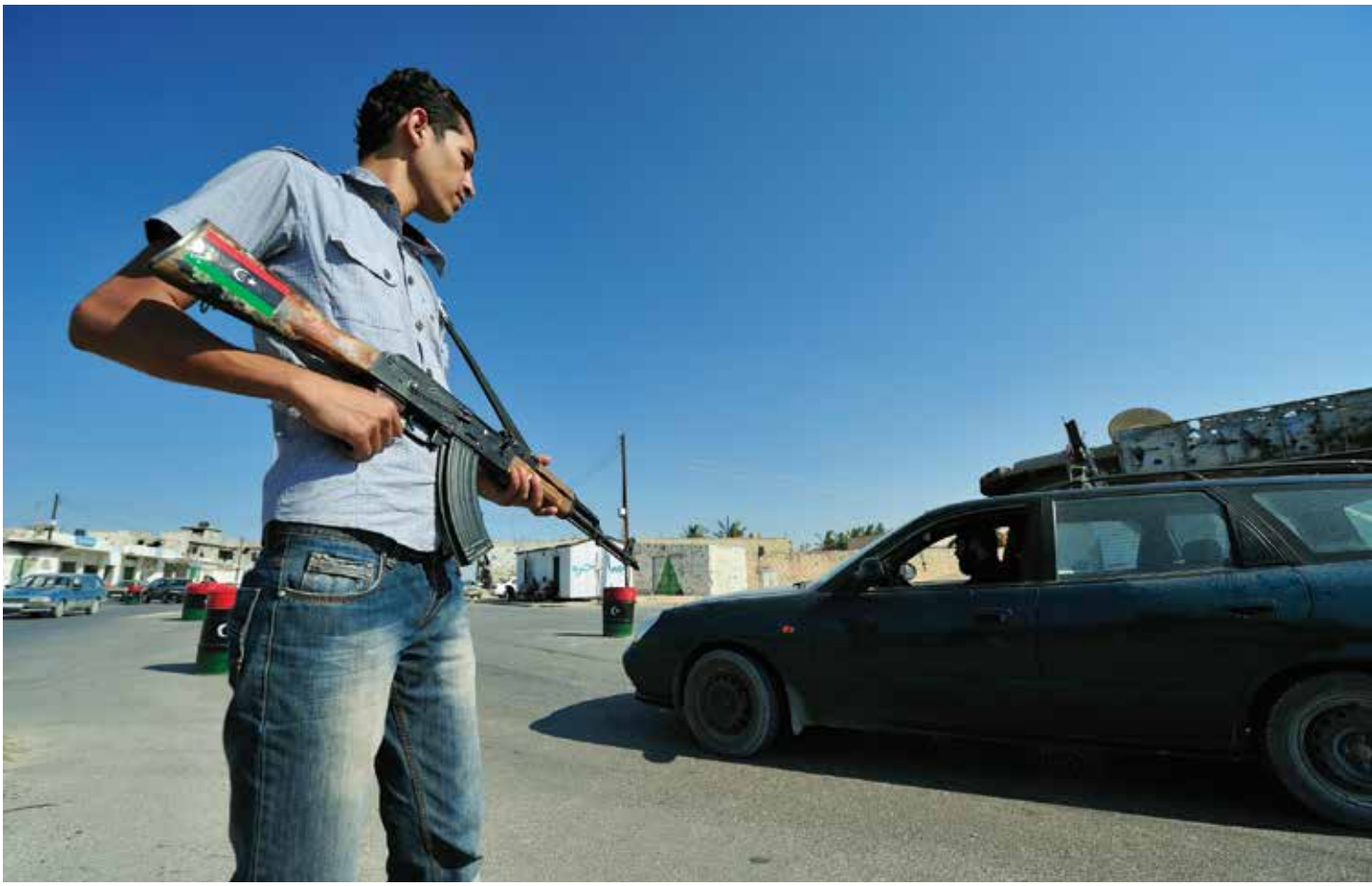
The 2011 uprising in Libya and the accompanying influx of SA/LW into civilian communities prompted DanChurchAid to evaluate the SA/LW situation in Libya.[2] A recent field assessment undertaken by DCA in Misrata determined that, within the areas visited and at the time of the assessment, SA/LW were not contributing to insecurity in the political or criminal sense. However, DCA found that SA/LW did represent an immediate threat to personal security and should be the legitimate focus of humanitarian efforts to reduce the risks to civilians.

## SA/LW in Misrata

Misrata saw some of the heaviest fighting in the 2011 Libyan uprising. Under the Moammar Gadhafi regime, few people were authorized to own small arms apart from some hunters and farmers. However, the events of 2011 caused the civilian population to acquire a large and unknown number of SA/LW via combat, stockpile seizure or the black market.

At a macro-level, Misrata was secured in late 2011. Interviews with authorities and community leaders suggest that crime rates are negligible, and the inevitable maneuvering of local political factions is peaceful and nonviolent. DCA found that a considerable amount of social control exists to regulate individual behavior around SA/LW and mitigate some of the potential negatives of weapons ownership. A number of sources pointed to heavy regulation. The brigades, known as *khatiba*, reportedly have a large number of SA/LW. One hundred eighty-six brigades of approximately 50 members each are registered with the Misrata Military Council. During the uprising, prospective weapons owners were required to enroll with a brigade and register their firearm. This data for most, if not all, SA/LW would greatly benefit any future attempt to collect and control these weapons. Brigades exert some control as they only allow their members to carry their weapons "on duty" (e.g., staffing a checkpoint) and they plan to centralize members' SA/LW into stockpiles.

Religious leaders are another source of control. Speaking on radio broadcasts and during Friday prayer, the Imams condemned the practice of celebratory gunfire. It is largely due to their influence that the practice has become less common; this influence was evident by the virtually gunshot-free, public



People are holding onto SA/LW for multiple reasons: for protection, as trophies and to mitigate uncertainty over the future.

celebrations following the death of Mutassim Gadhafi (son of Moammar Gadhafi) in October 2011. Lastly, communities self-regulate, and if someone fires a weapon in or around a home, vocal and forceful criticism ensues, which carries great weight in a tight-knit society.

### SA/LW Risk Education

During the assessment DCA found that SA/LW-related incidents threaten physical security in Libya. The results led the DCA team to conclude that SA/LW risk education is the most appropriate and effective method for organizations to assist the transitional authorities and civil society. Future interventions involving physical security and stockpile management in Libya need assessment as the context evolves.

SA/LW risk education is based on observing risk-taking behavior and forming the appropriate messages to encourage behavioral change. These messages are then turned into materials (e.g., training curricula, posters or plays, and programs delivered via radio) and transmitted through a relevant medium (e.g., peer-to-peer education, radio broadcast or community leaders).

Through interviews with civil society, transitional authorities and international NGOs (notably Handicap International), DCA found the following examples of risk-taking behavior. Statistics are not available, however, because no one, foreign or domestic, systematically collects data on SA/LW-related injuries in Misrata.

### Risk-taking Behavior

**Celebratory gunfire**. Numerous reports cite people being wounded and killed during bouts of celebratory gunfire. Growing recognition of this danger and the strong advocacy of Imams and transitional authorities against the practice significantly decreased its frequency.

**Mishandling ammunition**. In addition to hearing numerous reports, DCA witnessed children playing with ammunition, fuzes and grenades. Teachers report that children bring ammunition to school and try to remove the gunpowder. Ammunition is often thrown into fires for its explosive effect. Only a few days prior to this assessment, a young girl was seriously injured because her brother was playing in this way.

Children are particularly vulnerable to the excess of SA/LW in Libya.

**Alcohol-induced misuse**. Judiciary authorities stated that of 10 incidents of post-conflict shootings currently under legal investigation, seven involve alcohol. On 25 October 2011, a drunk man killed a *khatiba* member at a checkpoint in the Kasar Ahmed district. In another case, neighbors entered into a violent dispute with a hero of the uprising who repeatedly shot into the air when intoxicated. Neighbors killed the man because he was dangerous.

**Children playing with small arms**. Firearms, unless securely stored, represent a particular threat to curious children. Grenades and other explosive devices pose a threat to the entire household regardless of how they are stored. While many men insisted they knew of and practiced safe-storage techniques, the majority of women interviewed believed their husbands and older sons were still unfamiliar with firearms and said the men frequently left weapons unattended and loaded. Notably, some households lack appropriate storage containers. Reports of accidents are rare but occur nonetheless. Although parents undoubtedly tell their children not to touch SA/LW, a discrepancy exists between safety messages and a wider culture in which weapons are celebrated as a means of defense and of defeating the regime. This is evidenced in television, public events and public discourse in general.

## Local Outreach

As described previously, individuals, civil society and transitional authorities in Libya are already active in controlling SA/LW misuse. DCA will continue to assist local authorities, governments and NGOs as they work to mitigate risk-taking behavior among civilians through a variety of capacities, including:

**Imams**. Imams in Misrata are organized through the Council of Mosques (*Al awkaf*). The current leader, Sheikh Ahmed Dowa, met with DCA and has the authority to guide the content of the sermon at Friday prayers across all Mosques in the city. Thousands of male adults and children hear these prayers. Based on the successful work of imams to discourage celebratory shooting, the Council of Mosques is keen to work with DCA to deliver a wider range of risk-education messages.

**Teachers**. State schoolteachers and Koranic schoolteachers are excellent influencers of children's behavior and subsequently, their parents' behavior. DCA is working with schoolteachers to help provide psychosocial support to conflict-affected children and will build upon this initiative and network.

**Radio stations**. Radio broadcasts are highly influential and respected. Regular programs and drama sketches address the problem of celebratory shooting. The main station, Radio Misrata, operated throughout the conflict, and Gadhafi forces regularly attacked it due to its credibility with the local population. Interviews with women suggested that radio is perhaps the best medium for reaching mothers and wives who spend much of their time at home and are considered to be responsible for the home. Therefore, women have a key role to play in ensuring that weapons are stored safely.

***Khatiba* members**. Misrata society honors as heroes the predominantly young, volunteer fighters from the uprising. They have a profound effect on teen and child behavior and are very aware of this fact. One member told DCA that "if children see us smoking, then they will smoke too." Many *khatiba* members have a negative view of SA/LW after seeing many friends killed or injured, which differs to some extent from older men who may have acquired a firearm for protection but did not witness such fighting. DCA will seek to mobilize a number of *khatiba* members to deliver SA/LW risk-education messages in schools, at parent-teacher evenings and elsewhere. *Khatiba* members display a strong sense of responsibility for the new Libya and expressed interest in this activity.

| Group | Level of risk awareness | Category | Sample messages |
|---|---|---|---|
| **1** | Unaware | Children | Similar to Mine Risk Education – don't touch etc |
| **2** | Aware of risk, unaware of appropriate safe behavior | • Older children<br>• Teenagers<br>• Adults unfamiliar with weapons<br>• Some weapons-owning males | • Never point a weapon at anyone<br>• Always assume that a weapon is loaded and dangerous<br>• Never touch the trigger unless you have thought exactly about what you are shooting and why you are doing it<br>• Make sure your weapon is locked away and inaccessible to children<br>• Separate ammunition from weapon |
| **3** | Aware of risk and safe behavior but choose to ignore | • Teenagers<br>• Weapons-owning males | • There is no point keeping a weapon in your house to protect your family if that weapon only makes them more afraid<br>• People fought and died to build a new Libya. Wouldn't you rather protect yourself from weapons in order to enjoy this new future? |

Table 1. At-risk groups for excess SA/LW and samples of mine-risk education messages.

**Military Council and Security Council**. At the time of the assessment, the Military Council and Security Council were the most tangible forms of authority followed by the National Transitional Council. DCA met with leaders of both councils who DCA found to be ready and willing to speak on radio programs and through other media to deliver SA/LW risk-education messages.

**Local NGOs**. Prior to the conflict, only two NGOs existed in Misrata: the Boy Scouts and the Red Crescent. They are now joined by a burgeoning number of NGOs and associations with varying levels of capacity, activity and organization. The Boy Scouts organization is active in mine-risk education and will soon begin work with Handicap International on SA/LW risk education. The Red Crescent works with the International Committee of the Red Cross on, *inter alia*, MRE. The newer NGOs often respond to the effects of the conflict on vulnerable people, particularly children. Local NGOs are a good source for delivering messages to women as well. By training local NGOs in SA/LW risk-education methods, DCA will complement existing community outreach programs to empower women with safety advice.

## Conclusion

Contrary to the experience of many post-conflict settings, SA/LW did not present a threat to security in terms of crime or political stability in Misrata, Libya at the time of this assessment. However, SA/LW constituted a considerable threat to personal security, which Libyan civil society, authorities and media have recognized. While the scope of this assessment did not include other areas of the country, anecdotal evidence suggests that the situation is similar in Benghazi and, to a lesser extent, Tripoli. The immediate role of DCA and other international actors is to help Libya and its elected authorities mitigate the risk of SA/LW in this transitional period and beyond, whether SA/LW are subject to disarmament, regulated ownership or a combination of both. This is a humanitarian endeavor in every sense and follows the mine-action mission to remove the explosive remnants of war, so that survivors may enjoy peace. As one Libyan journalist noted, "What good is freedom if one is not safe to enjoy it?"

*See endnotes page 81*

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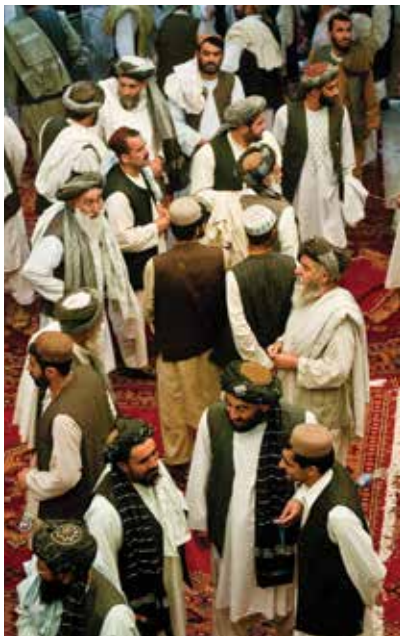
# Afghan Experience Calls for Innovative Approach to DDR

Criminal activities, illegal arms trading and violence against civilians continue threatening Afghanistan's stability and security, and hinder the work of humanitarian nongovernmental organizations. As a result, potential investors are discouraged from making heavy capital investments, and NGOs cannot implement projects that could dramatically improve the socioeconomic condition of civilians. Disarmament, demobilization and reintegration appear to be crucial steps for the success of post-conflict recovery in Afghanistan. Conducting DDR in the complex and turbulent Afghan environment has proven difficult, and this article explores past attempts at DDR in Afghanistan to draw lessons for future efforts.

The Bonn Agreement was a power-sharing arrangement between Northern Alliance factions and militias that assisted in U.S.-backed efforts against the Taliban.[1] Over time, these groups have become largely self-sufficient. Many of these groups were founded in direct opposition to the central government in Kabul, some along ideological lines. According to a 2009 report on disarmament, demobilization and reintegration in Afghanistan published by the Small Arms Survey, Afghanistan's various interest groups include "multiple *Mujahedeen* parties, tribal militias, warlords, paramilitary organizations, a trained state officer corps, armed intelligence services, and both mono-ethnic and multi-ethnic armed groups and alliances."[1] Established under the Bonn Agreement, the government was comprised of many autonomous groups whose allegiance to the state and one another was questionable.[2]

The disarmament process reflected these divisions, and as a tentative agreement between volatile allies, the process was slow. Strict disarmament efforts were viewed as a risk to the new state's authority and solidarity, as many of the leaders who drafted the Bonn Agreement were involved with armed groups. The Bonn Agreement called for the *Mujahedeen* militias of the Northern Alliance and the other armed groups outside the government to be dissolved, reorganized as the Afghan Military Forces and brought under the auspices of the Afghan Ministry of Defense. However, the agreement did little to determine the actual disarmament process.[1]



Tribal and religious leaders gather following a *shura* held by Afghan President Hamid Karzai in Kandahar, Afghanistan.
*Photo courtesy of U.S. Navy Petty Officer 1st Class Mark O'Donald.*

In 2002, the government established the Afghan National Army and dismantled the Afghan Military Forces.[3] With limited effort in January 2003, the government established the National Disarmament Commission, an oversight body tasked with implementing the internationally led disarmament effort—the Afghan New Beginnings Programme. President Hamid Karzai and his administration moved quickly to bolster the National Disarmament Commission, expanding its initial mandate to include the collection, stockpiling and eventual transfer of one million weapons to the Afghan Ministry of Defense depot in Kabul. Viewed by many as an effort to preempt any international disarmament effort, the program displayed a lack of transparency, and a host of questionable dealings led many observers to doubt its legitimacy. The government has yet to release the program's final figures.[1]

International pressure mounted against the expansion of the National Disarmament Commission. In March 2003, the international community pushed the Afghan government to establish the Afghan New Beginnings Programme, led by the United Nations Development Programme. The National

Disarmament Commission and its tasks were integrated into the new program, which then began its own DDR program. Initially, the organization's goal was collecting weapons from 100,000 Afghan Military Forces combatants, but the number was not calculated on the basis of a thorough needs assessment. Spontaneous demobilization and fluctuating membership is characteristic of Afghan militias, and after one year of operation, estimates were lowered to 60,000 participants.[4] In fact, the Small Arms Survey notes that virtually no standard preparatory and investigatory measures were taken to determine needs, capacities or best practices before the launch of the Afghan New Beginnings Programme.[1]

AMF groups submitted a list of fighters to the Ministry of Defense in Kabul. Ministry of Defense staff verified these lists, and trusted community leaders received them for approval. If the fighters met eligibility criteria—essentially, if they had at least eight months of prior service and the ability to submit a serviceable weapon upon disarmament—then they surrendered their weapons and started the process of reintegration. The reintegration process began with a meeting between a combatant and a case worker, in which the case worker recommended possible avenues of reintegration—i.e., future education, vocational training, etc. Afterward, militiamen were discharged under the condition that they swear off violence. In the program's first phases, militiamen were given cash payments, but this ended after authorities discovered that former commanders seized these funds.[1]

Though the program began successfully, issues of fraud and pilfering surrounded it. In some cases, commanders were suspected of providing their least loyal and most poorly trained fighters for disarmament, which happened in previous National Disarmament Commission programs.[4] Moreover, cash incentives led many to register under falsified identification. Old lines of patronage and loyalty still existed, threatening government legitimacy, authority and the rule of law. To address these problems, the Afghan New Beginnings Programme began the Commander Incentive Programme in 2004 and offered a generous package to commanders willing to comply with DDR efforts. A new law prohibiting political ties to militia groups, which effectively banned politically ambitious commanders from upcoming elections, and according to *Small Arms Survey*, a shift in U.S. policy toward promoting DDR efforts created a climate for success.[1] By mid-2006, 460 commanders of the 550 identified had participated in the program.[1]

In 2006, the DDR mandates expired, and the final participants gave up their weapons in a ceremony with Afghan President Hamid Karzai.[5] The removal of Afghan Military Forces from the Ministry of Defense budget, the disbandment of militia checkpoints and the restriction of commander privileges positively affected Afghan civilians, former combatants and security forces within Afghanistan. By significantly reducing militia arsenals and optimistically reintegrating former soldiers, the program has fostered a more stable environment in the country. However, the situation remains tenuous, and observers worry that, if tensions escalate, the decommissioned units could quickly remobilize.[1] Furthermore, Afghan New Beginnings Programme's efforts only addressed AMF personnel and did not disband armed groups outside of the Northern Alliance.

Members of a combined Afghan and coalition security force collected a cache of weapons after clearing a known Haqqani network foreign fighter encampment site in Paktitka province, Afghanistan. The insurgents had stockpiled weapons, including rocket-propelled grenade launchers, heavy machine guns and AK-47 assault rifles.
*Photo courtesy of International Security Assistance Force.*

### Disbandment of Illegal Armed Groups

During the formal DDR of Afghan Military Forces members, President Karzai issued a decree making all non-AMF militias in Afghanistan illegal. In 2005, the Canadian government offered a grant to establish the Disbandment of Illegal Armed Groups program, charged with fostering, promoting and conducting disarmament and disbandment of armed groups outside of the government. At first, officials estimated that more than 1,800 illegal militias with over 100,000 members existed in Afghanistan. Not only do these militias pose a threat to the government's authority and legitimacy, but they engage in the illegal arms and drug trade, further promoting black-market activities and supporting violent criminal factions within Afghanistan.[1,6] According to the *Programme of Action Implementation Support System*, the United Nations' informational resource for countering the illegal sale of small arms and light weapons, the new Disbandment of Illegal

Armed Groups program focused on two main initiatives:[1,7]

1. To improve security through the disarmament and disbandment of illegal armed groups
2. To provide basic development support to communities freed from the threats of illegal armed groups

These two interrelated initiatives were intended to provide an impetus for communities to disarm and reduce the need for illegal activities as a means of socioeconomic empowerment. However, benefits encouraging disarmament were provided at the community level, not at the individual level. Unlike the initial DDR programs, which were based largely on these individual incentives to promote disarmament, the Disbandment of Illegal Armed Groups program activities primarily took a law-enforcement perspective.[1] Problems similar to those faced in earlier DDR efforts encircled the project: Commanders submitted their least serviceable weapons and would often "disarm" militias that had already been through the DDR process.[1] Thus, Disbandment of Illegal Armed Groups' efforts did not adequately reduce the militia arsenals, failed to provide support to ex-combatants seeking reintegration and could not create a viable security situation for disarmed communities. Because of these shortcomings, many regions deemed in compliance to the Disbandment of Illegal Armed Groups program's demands slipped back into violence. In 2010 alone, six compliant districts relapsed into insurgency, while only 12 were brought into compliance.[8] However, in spite of its logistical issues and brief mandate, the Disbandment of Illegal Armed Groups program curbed the influence of illegal armed groups and militia leaders on the government.[1]

### Current Situation and Future Obstacles

Afghanistan remains a country in conflict, and insurgent activities fuel the robust industry of its illegal black market. Militia leaders derive their authority from the pervasion of weapons and traditional patronage networks, which keeps Afghanistan in tumult and prevents many international actors from investing in capital-intensive projects. Security is an overwhelming concern for civilians and government and hinders the progress of development projects, economic enterprises and the rule of law.[1,6,9,10] Arms and conflict proliferation also prevents NGOs in the country from effectively providing assistance.

As of 2006, Afghanistan was considered the "most dangerous country in the world for aid agencies."[10] NGOs in Afghanistan became targets for insurgent groups that view internationally coordinated aid agencies and government-supported Afghan NGOs as forms of external interference, even though staff are predominantly Afghan nationals. The security situation is too volatile for many organizations to extend their efforts outside of the capital in Kabul. For fear of attacks by insurgent groups, NGOs are often forced to settle for less ambitious projects and half-measures.[10]

Though small-arms proliferation escalates the violence, hindering NGO work, the disarmament of Afghan militias and civilians proved immensely difficult under a weapons-centric approach, as it addresses only the symptoms of underlying problems—i.e., the deep-rooted patronage culture and the appeal of illegal-commodity markets for poor civilians without viable alternatives.[1,9,11] One solution may be to focus on incentivizing disarmament with development assistance, an approach that was previously pursued in limited ways. By providing development assistance to distressed communities, international and domestic actors can provide alternatives to the violent cycle of crime and insurgency.[1,11]

At a forward operating base in Kandahar, Afghanistan, explosive ordnance disposal personnel prepare charges to blow up stockpiled bombs left behind by fleeing al-Qaeda troops. *Photo courtesy of U.S. Navy, Chief Photographer's Mate Johnny Bivera.*

On the other hand, coupling DDR with development assistance can lead insurgent groups to improperly connect humanitarian NGOs that deliver development assistance without political or military ties with Coalition forces, and this puts the NGOs in peril. One of the primary avenues for development assistance and local capacity-building is the NGO community, and various Afghan NGOs often deliver the development assistance. Yet, the more these NGOs associate with the Afghan Government, foreign security forces and their disarmament mission, the more insurgents view them as foreign occupiers and targets for insurgent violence. U.S. and Coalition forces further distorted this association between NGOs and foreign military forces when they established Provincial Reconstruction Teams. These Provincial Reconstruction Teams operate like humanitarian NGOs

but are extensions of the foreign military forces and thus have strategic and political ends.[10]

## Conclusion

The struggle to disband armed groups is one of Afghanistan's most prevalent problems, threatening civilians, NGOs, commercial actors and the government. Despite numerous efforts, developing effective programs for confronting illegal armed groups and the black market activities supporting them have yet to occur. However, some important lessons from the past can guide and focus future efforts:

1. Reintegration and economic development are essential components to discourage illegal armed groups, and demobilized militia members must be provided with alternative opportunities.
2. Weapons collection cannot serve as the focal point for Afghanistan's DDR. It neither addresses the underlying causes for armed insurgency nor weakens the arsenals of these militias, and commanders generally hand over their weakest weapons and least trained fighters.
3. Disarmament practitioners must provide illegal armed groups with disbandment incentives but must be careful to maintain the distinction between humanitarian NGOs and foreign military actors. Also, development assistance designed to encourage DDR must be publicly distinguished from nonpartisan, unaffiliated humanitarian work that other NGOs provide.

These three lessons are not easily applied, but if properly implemented, they could lead to a more stable and secure Afghanistan. By using development and not weapons collection as the driving force behind DDR in Afghanistan, practitioners can provide alternatives to illegal activities. Furthermore, practitioners can provide an impetus to disarm without alienating Afghan civilians who may see gun ownership as a necessity in a volatile security situation. By rejecting the weapons-centric mentality, actors involved with DDR can focus on more tangible measures of success, such as the extent to which DDR activities reduce Afghanistan's overall level of violence and illegal activity. Work focused primarily on removing the motivation to participate in illegal armed groups more easily accommodates the complex Afghan cultural identity and adapts to the long history of violent conflict in the country.

*~ Jeremiah Smith, CISR staff*

*See endnotes page 81*

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# News Brief

## Agnès Marcaillou Appointed UNMAS Director

In March 2012, the United Nations Mine Action Service appointed Agnès Marcaillou as Director.[1] Marcaillou replaced Justin Brady, who served as Acting Director from 11 April 2011 to 19 March 2012. Brady became Head of Office for the Office for the Coordination of Humanitarian Affairs for Somalia.

Previously Chief of the Regional Disarmament Branch in the United Nations Office for Disarmament Affairs, Marcaillou worked for Kofi Annan, Secretary-General of the United Nations, as the U.N. Deputy Spokesperson. She also worked for the American Division of the Department of Political Affairs as a Special Representative of the Secretary-General Akashi and at the United Nations Institute for Disarmament Research.[2] Notably, Marcaillou served as Chief of Staff for the first Executive Secretary of the Organization for Prohibition of Chemical Weapons in the Hague.[2]

A long-time women's-rights advocate, Marcaillou is a former President of the Group on Equal Rights for Women at the United Nations.[2] Similarly, she pioneered the first Gender Action Plan of the U.N. Secretariat.[1] Marcaillou is a laureate of the NATO and U.N. Programme of Fellowship on Disarmament and a Fellow of the French *Institut de Hautes Etudes de Défense Nationale* (Institute of Higher National Defense Studies).[2]

UNMAS is responsible for U.N. mine clearance around the world. As Director, Marcaillou will bring her extensive experience in political affairs, conflict prevention and post-conflict interventions, disarmament and non-proliferation.[2]

*~ Blake Williamson, CISR staff*

*see endnotes page 81*

*Photo courtesy of UNMAS.*

# Comprehensive Rehabilitation Center of Colombia

*El Centro Integral de Rehabilitación de Colombia* (CIREC) is a nonprofit organization based in Bogotá, Colombia that focuses on the rehabilitation of disabled individuals by strengthening physical and social capacities in order to improve independence and quality of life. It was established in September 1976 by Dr. Jeannette Perry de Saravia and Father Joaquin Castro in hopes of addressing the needs of the disabled in Colombia.[1] Many of these disabled individuals are victims of anti-personnel mines; they face physical, economic and social obstacles as a result of their disabilities and are in need of rehabilitative treatment, prosthetics, orthotics or mobility aids. As the majority of AP mine survivors cannot pay for these services, CIREC is dependent on the support of partners and donations to fund their activities. Their primary funders include *Colnodo* (the Colombian Association of Nongovernmental Organizations for Communication), *Fundación Panamericana de Desarrollo* (the Pan American Development Foundation), *El Instituto Colombiano de Bienestar Familiar* (the Colombian Family Welfare Institute), *La Organización de Los Estados Americanos* (the Organization of American States), the Norwegian Government, the Star of Hope Mission, the United States Agency for International Development, and the Office of Weapon's Removal and Abatement in the U.S. Department of State's Bureau of Political-Military Affairs (PM/WRA).

Since its inception, CIREC has become a respected organization in Colombia and is especially well-regarded for its work in prosthetics and its psychosocial rehabilitation programs involving sports, culture, art, leisure, education and other activities.[2] In addition to assisting persons with disabilities, CIREC focuses on other underrepresented groups in Colombia including women and those living in poverty. CIREC also strives peaceably for economic development, human rights and social justice in areas of the country where violence is common. In addition, in February 2012 CIREC received the Quality Management Certification ISO 9001:2008.[3]

## Seeds of Hope

The *Semillas de Esperanza* (Seeds of Hope) program is one of CIREC's most influential projects. Operating in regions affected by intense violence, Seeds of Hope sends medical brigades to remote rural districts to provide therapy to PWDs. The Seeds of Hope program also helps conduct community message campaigns and develop small businesses, so that PWDs are able to gain economic and psychological independence. As a result, PWDs are reintegrated as self-sufficient, productive members within their families, workplaces and communities. The program also supports the rights of PWDs through community leadership, social awareness and inclusion activities. Finally, Seeds of Hope is the vehicle for CIREC's mine-risk education program. In the same communities where the Seeds of Hope program is being carried out, MRE tools are distributed to community leaders—many of whom are landmine survivors themselves—for use in educating others on the appearance, location and dangers of landmines and unexploded ordnance. Seeds of Hope is active in 50 townships in 10 departments (Antioquia, Bolívar, Cauca Cundinamarca, Meta, Nariño, Norte de Santander, Santander, Sucre and Tolima) and boasts a support network of more than 3,577 members.[4]

Other CIREC projects include:

- *Trabajando con Calidad* (Working with Quality), an 18-month project funded by *La Fundación Panamericana para el Desarrollo* for CIREC to design and implement a comprehensive program aimed at improving the quality of CIREC management practices and operations.
- *Un Regreso a la Capacidad Creativa* (A Return to Creative Capacity), a 12-month project funded by the U.S. Department of State in which CIREC will run four rehabilitation brigades serving 199 PWDs and work toward minimizing the risk of landmine accidents in the municipality of San Francisco, Antioquia.

- *Entrando en la onda TIC* (Entering the ITC Wave), a 12-month project in which CIREC will train PWDs to use computers and Internet tools. This project is funded by *El Ministerio de Tecnologías de la Información y las Comunicaciones* (the Ministry of Information Technology and Communication), and *Colnodo*, an organization based in Bogotá and focused on development through electronic communications.
- A four-month cooperation agreement with *El Instituto Colombiano de Bienestar Familiar* (the Colombian Family Welfare Institute) that promotes familial well-being and the rights of disabled children and adolescents through workshops and family-strengthening intervention strategies.
- *Mejorando la calidad de vida de sobrevivientes de mina antipersonal y munición sin explotar* (Improving the Quality of Life of Anti-personnel Mine and UXO Survivors), a 12-month project funded by the Norwegian Government involving specialized care, training and support for young survivors of landmines and unexploded ordnance in Valencia, Cordoba.
- *Puentes para Paz y Pan* (Bridges for Peace and Bread), a 12-month project funded by *Premio Estrella de Esperanza* (Star of Hope Award). In this project, CIREC focuses on empowering the community of Mirandita, Antioquia to self-sustainability by providing educational materials and constructing an organic garden for the school of Mirandita to improve the diet and nutrition of the children and community.

Since 1993, CIREC has presented the Star of Hope Award to disabled individuals who have returned to productive roles in their families and communities. Aimee Mullins, an American athlete and model who had her legs amputated below the knees at age one, was invited to tell her story at CIREC's 2011 Star of Hope Award Ceremony.[5] More than 400 people attended the ceremony, which was held at *Club El Nogal* on 19 September 2011 and covered by a number of major Colombian news stations.

In addition to presenting awards, CIREC has also received numerous awards for its service to the people of Colombia. Most recently, CIREC was recognized when the U.S. Department of State honored Dr. Jeanette Perry de Saravia for 35 years of dedicated service to victims of landmines and PWDs.

*~ Dan Baker, CISR Staff*

*See endnotes page 81*

A display of prosthetics at a CIREC clinic.
*Photo couresty of Survivor Corps/CISR.*

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JAMES MADISON UNIVERSITY®

CISR

Center for International Stabilization and Recovery

The Center for International Stabilization and Recovery at James Madison University in Harrisonburg, Virginia helps communities affected by violence and trauma through education, programs and transformative services. CISR offers on-the-ground management and mine-awareness training and victim-assistance programs and services; facilitates innovative post-conflict recovery workshops and conferences; researches a variety of post-conflict issues; and offers resource materials through its information-exchange services including online and print media and content-rich websites, all focusing on post-conflict topics related to mine action and victim assistance.

CISR collaborates with many international partner organizations, including the U.S. Departments of State and Defense, the United Nations and the Geneva International Centre for Humanitarian Demining, among others. In 2011, U.S. Secretary of State Hillary Clinton recognized CISR as a leader in post-conflict issues, and in 2008 the U.S. Senate Appropriations Subcommittee on Foreign Operations recognized JMU as one of 10 U.S. universities uniquely qualified to support State Department and United States Agency for International Development tasks.

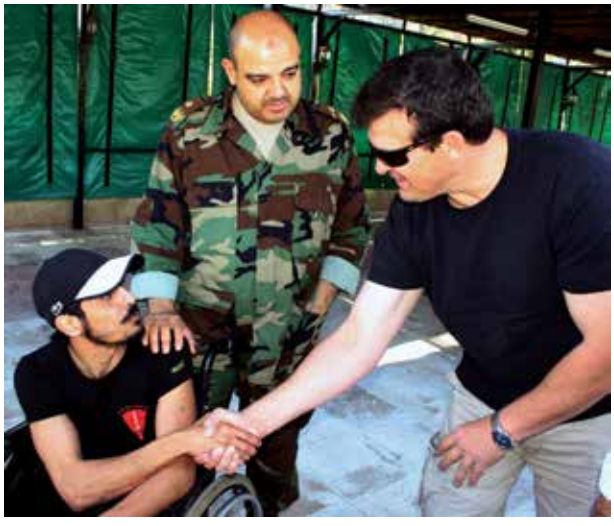
### Information Exchange

CISR functions as an information clearinghouse, gathering, managing and distributing information about global mine action through an interactive website, publications and related research. CISR's website includes the CISR Sphere Blog, mine-action forums, an international job announcement board, publications and the Global Mine Action Registry—connecting people and organizations with resources throughout the world. CISR's staff regularly updates the website with new developments in the field and is available to assist in researching questions related to clearance and recovery efforts.

Published three times a year, the CISR publication, *The Journal of ERW and Mine Action*, is sponsored by the Office of Weapon's Removal and Abatement in the U.S. Department of State's Bureau of Political Military Affairs (PM/WRA). *The Journal* was first published in 1997 and is the longest continuous source of explosive-remnants-of-war and mine-action information in the world. It reaches more than 1,800 readers in print and 170,000 online readers in 180 countries. Each themed issue contains editorials; articles on current clearance and recovery projects; reports on topics such as victim assistance, mine-risk education and field studies; book reviews; organization and/or country profiles; mine-related news; and the latest in research and development in the industry. The R&D section, supported by the U.S. Department of Defense's Humanitarian Demining Research and Development Program, contains peer-reviewed articles describing new technology for clearance efforts and study results of equipment and technology tests.

CISR also publishes *To Walk the Earth in Safety*, the U.S. Department of State's annual report on its global work in landmine removal and conventional weapons destruction. In addition, CISR publishes other useful resources, including, for example, the *Landmine Action Smart Book*, detailing background information and the key components of the mine-action pillars; the *Adaptive Technology Catalog*, providing in-depth listings of practical products to meet the needs of resource-limited persons with disabilities; and *Landmine Casualty Data: Best Practice Guidelines*, a reference for documenting and using mine/ERW victim information.

CISR conducts mine-action and victim-assistance research and publishes reports about the findings. In May 2011, CISR concluded a two-year study of the effects of aging on landmines for the U.S. Department of State. The results and findings of the study are available on CISR's website. In



CISR Director, Ken Rutherford (right), greets a participant of the Pathways to Resilience Workshop in Lebanon. The workshop was held in May 2011.

partnership with GICHD, CISR is currently conducting a four-country analysis and study of the use of landmine victim-assistance information as part of comprehensive mine-action national programing.

### International Training

CISR continues to serve as the global leader for senior management training programs. Since 2004, CISR annually conducts a five-week ERW and Mine Action Senior Managers' Course, providing high-level management training for officials and experts conducting clearance, demilitarization and conventional weapons destruction efforts throughout the world. Sponsored by the United Nations Development Programme from 2005 through 2009 and by PM/WRA since 2010, the course combines the expertise of CISR staff members and JMU College of Business faculty with that of demining and post-conflict recovery experts. The courses are hosted by CISR at JMU, and the most recent course was held 16 May–13 June 2012 for 17 participants from 14 countries.

From 2009 to 2011, CISR and the JMU College of Business faculty facilitated a sister course to the SMC in Amman, Jordan, working with Jordan's National Committee for Demining and Rehabilitation to deliver the ERW Senior Managers Training Course.

Between the SMC courses at JMU and the ERWTC in Jordan, more than 200 managers from 47 countries have been trained to date.

Recognizing the need to address the emotional as well as the physical trauma faced by landmine and other conflict survivors, CISR held its first Pathways to Resilience seminar in Hammana, Lebanon in May 2011. The program provided psychosocial assistance to 29 landmine/ERW survivors from Iraq, Jordan, Lebanon and Yemen through resilience activities empowering participants to manage emotions, gain self-confidence and find social support. Participants were also trained to establish and manage peer-to-peer support programs, in which a trained survivor provides encouragement and assistance for other survivors. This pilot program is a model that CISR will deliver globally.

In 2010, the international nonprofit Survivor Corps dissolved, and with the support of the Survivor Corps board, CISR absorbed its wealth of information and files, and hired its peer-to-peer support specialist, Cameron Macauley. Since then, CISR has provided train-the-trainer projects, enabling survivors to help other survivors of war-related trauma in communities in Burundi, Colombia, Lebanon and Rwanda. In January 2012, in cooperation with the African Centre for Treatment and Rehabilitation of Torture Victims, CISR held a four-day workshop on peer support for survivors of torture for 21 mental health professionals in Entebbe, Uganda. In March 2012, CISR worked with its local implementing partner the Association for the Empowerment of Persons with Disabilities to develop and lead a three-day peer-support training program for 35 persons with disabilities in Dong Hoi, Vietnam.

### Other Services

Supported by PM/WRA and working with Jordan's NCDR, CISR and a Jordanian NGO, Life Line Consultancy and Rehabilitation, jointly developed the "We Love Life" play, a psycho-educational drama and creative arts performance. This play, in Arabic, provides MRE to children and young adults, teaching mine-warning signs, safe behaviors and social sensitivity to survivors. The play was performed by disabled actors for more than 25,000 people in Jordan in 2008 and 2009. It has also been performed in Lebanon, and the team plans to use this MRE program in other neighboring countries.

Additionally, CISR administers the annual Frasure-Kruzel-Drew Humanitarian Mine Action Fellowship with PM/WRA, funding one JMU graduate to work at PM/WRA in Washington, D.C. for a year. The fellowship is named after three former U.S. officials who lost their lives in an automobile accident in Bosnia and Herzegovina in 1995, while working to help end the concurrent conflict.

Each April CISR hosts a Post-Conflict Recovery Week at JMU that includes a range of humanitarian UXO and mine-clearance activities. Past activities include demonstrations using mock minefields, lectures with keynote speakers, including landmine survivors and international clearance experts, movies and a variety of other activities that highlight the continuing global humanitarian impact of landmines and ERW. Post-Conflict Recovery Week 2012 was held 2-5 April at James Madison University.

"As a landmine survivor myself, I understand how challenging recovery is," says CISR Director Dr. Ken Rutherford. "Whether it's through our victim-assistance workshops, training programs for trauma counselors in low-resource environments, or our studies and publications, CISR is committed to standing with communities until peace is achieved."

*~ Rachael Weber and*
*Eric Wuestewald, CISR Staff*

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# DANISH DEMINING GROUP

Danish Demining Group was founded in 1997 and is the Humanitarian Mine Action Unit in the Danish Refugee Council. Based in Copenhagen, Denmark, DDG works in 10 countries. DDG's mission is to foster a safe environment and enable economic and social development in areas that have suffered trauma and conflict due to landmines, unexploded ordnance, and small arms and light weapons.

DDG works diligently to "make a positive difference in people's lives" and strives to fulfill its strategic objectives:[1]

- Enhance human security by clearing landmines, UXO and other remnants of war; reducing risks from SA/LW; and providing SA/LW and mine-risk education
- Provide efficient, effective and innovative solutions with partners and stakeholders in conflict-affected areas
- Enable social and economic development by supporting "local structures and institutions in finding sustainable solutions to residual problems."[1]

DDG's main donors are the governments of Denmark, Germany, Holland, Japan, Sweden and the United States, the United Nations Development Programme, the United Nations Refugee Agency and the United Nations Mine Action Service. DDG is a member of the International Committee to Ban Landmines and the Cluster Munition Coalition, the Survey Action Center, the IMAS Review Board as well as the Geneva International Center for Humanitarian Demining Advisory Board. In addition, DDG is part of the Expert Reference Group to the International Small Arms Control Standards and is a certified partner of the Humanitarian Accountability Partnership.[1]

## Mine Action

DDG works in Afghanistan, Colombia, Iraq, Liberia, Libya, Somalia (including Somaliland), South Sudan, Sri Lanka, Uganda and Yemen. DDG's mine-action operations are based on the five pillars of mine action as set out in the *Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction* (also known at the Anti-personnel Mine Ban Convention, or APMBC):

1. Mine and UXO clearance
2. MRE
3. Victim assistance
4. Advocacy
5. Stockpile destruction

In addition, DDG educates the public and advises officials on issues related to SA/LW security and destruction.

**Mine/UXO clearance:** Although DDG has expanded its mission to include risk education and reducing SA/LW threats, the organization still supports and conducts significant mine- and UXO-clearance activities in Afghanistan, Iraq, Somaliland, Puntland and South/Central Somalia, South Sudan and Sri Lanka. In Afghanistan, one of the world's most mine-affected countries, DDG's mine-action program has conducted survey, clearance and MRE since 1998. These operations cleared 1.3 million UXO items and 33,800 landmines, releasing 5,133,000 square meters (1,268 acres) of contaminated land and 21,445,000 sq m (5,299 acres) of battle area. DDG has also covered 3,500 towns in village-by-village explosive-ordnance clearance, an emerging method for safer, more efficient mine clearance based on needs identified by local community leaders.

**MRE:** DDG conducts MRE programs aiming to educate the population on the exact location of mined areas, addressing how to best avoid them and explaining the consequences of handling mines and UXO. Uganda, where educational training programs are conducted daily, provides an example of DDG's MRE work. These training sessions often target children, as they are at risk of encountering UXO and land-

The Danish Demining Group working in Afghanistan.
*Photo courtesy of Charlotte Østervang/DDG.*

mines when collecting water and firewood. The program stresses community involvement and gives children T-shirts that read "report to your parents," encouraging them to inform their teachers and other community members if they come into contact with UXO.[2]

### Armed Violence Reduction

In November 2010, DDG partnered with UNDP to cohost a conference on armed-violence reduction and development in Nairobi, Kenya. Attendees were civil-society members and representatives from various governments and U.N. agencies. The conference focused on armed violence as an obstacle to human development and discussed how to better address the developmental needs of communities suffering as a consequence. DDG recognizes armed violence as a major obstacle for human development and feels that community-based solutions aimed at targeting the source of conflict are the best means for enhancing safety.[3]

DDG emphasizes local community involvement, implementing community-based impact programs, such as the Community Safety program in Somaliland and the Community Safety and Livelihoods programs in Uganda. The Community Safety programs educate community members in conflict management, provide firearm-safety education, and conduct ERW-disposal operations and MRE. The programs also foster cooperation between local police and communities to improve safety. Both programs strive for cultural sensitivity when uniting communities, and enhancing safety and security in violence-threatened regions.[4]

The Armed Violence Reduction and Community Safety initiatives specifically address SA/LW and ERW problems while also fostering a sense of communal responsibility: emphasizing the role of local communities in identifying and addressing their own safety needs.[1] These DDG strategies also help reduce the risk of violence to its employees and the local population, as DDG often works in potentially dangerous locations in conflict-affected countries.

### Future

DDG continues to expand the scope and efficiency of its work in efforts to promote safety, security and prosperity for people in conflict-affected regions. Its dual focus on human security and local capacity-building allows for immediate but sustainable relief for people in war-torn regions, while its emphasis on efficiency and innovation ensures that all available resources are put to the best possible use.

In the future, DDG hopes to expand its operations in Colombia. DDG first came to Colombia in late 2010 when the country approved Law 1421, which allowed international nongovernmental organizations to participate in humanitarian mine-action activities within the country.[5] In April 2011 DDG became registered as a humanitarian mine-action organization in Colombia. Though the legal framework remains in discussion, DDG hopes to extend operations to all areas of mine action in Colombia in 2012.

*~ Ivy Hensley, CISR Staff*

*See endnotes page 81*

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Golden West Humanitarian Foundation is a public charity established in 1997 to address operational limitations in mine and unexploded-ordnance-clearance efforts, and to protect the lives and livelihoods of individuals affected by landmines and UXO.[1] Since 1997, Golden West has grown and built upon its work, starting new programs with governments, the United Nations and nongovernmental organizations, while expanding operations to Belize, Cambodia, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Moldova, Nicaragua, the Solomon Islands and Vietnam.[2]

Based in California (U.S.), with offices in Cambodia, Hawaii (U.S.), South Africa and Vietnam, Golden West consists of nine full-time American employees and 13 local staff in Cambodia and Vietnam, as well as a number of part-time employees who are engaged as needed. Combining experience with explosive-ordnance disposal, engineering, chemistry and more, Golden West works to create innovative technology for the mine-action community making operations safer, faster and/or cheaper.[3]

## Activities

As part of its mission to help those affected by landmines and other explosive remnants of war, Golden West undertakes numerous activities, including:

- **Consultancy**: Golden West offers specialized methods and/or technologies to groups that dispose of mines or ERW In the past, Golden West has consulted on developing national mine-action standards, mine/UXO/ERW-detection technology, cluster-bomb/small-arms stockpile destruction, white phosphorus munitions destruction, battle-area clearance and related subjects.[4]
- **Munitions-risk education**: Golden West operates several programs aimed at providing MRE. One of these programs, the Mine Indicator Program, offers participants country-specific materials with visual indicators that signal the presence of landmines or UXO. The program encourages individuals to mark the location of a perceived threat and submit a report to authorities.
- **Children's education division**: Golden West offers educational materials designed for and distributed to children to teach them how to respond to mines and UXO. One teaching tool is a graphic novel demonstrating landmine threats exclusively through illustrations to ensure accessibility. Other efforts include an educational video game offering visual cues of contamination that mirror reality for the One Laptop Per Child program and an illustrated storybook explaining how to alert authorities in the event of a discovered threat.
- **Detection technology**: Golden West conducts extensive research and designs improvements for land and shallow-water UXO detection instruments; increasing their capacities into multifunctional turnkey systems with digital global positioning systems interface for digital recording and accurate mapping.
- **Cluster-munitions stockpile destruction**: Golden West has developed safe and effective techniques for the disposal of low-density cluster-munitions stockpiles and uses that expertise to advise and assist other countries and organizations in disposal activities. Golden West has already provided disposal education in Cambodia, Moldova and Vietnam, and will offer these services to other countries as the need arises.
- **Harvesting explosives**: Golden West's Explosive Harvesting System safely extracts the explosives from excess ammunition, bombs and anti-tank mines; it then converts these explosives into small, highly effective disposal charges to assist with landmine and UXO clearance. This process allows countries and mine-action programs with small budgets to save money instead of spending it on commercial explosives and shipping costs.
- **Small-arms/munitions destruction**: Golden West has also developed sustainable and cost-effective small-arms burners for the destruction of small arms, light weapons and certain ammunition types. In Cambodia and Central America, these burners were fabricated using readily available local materials by fully qualified welders. In Central America alone; a single munitions/small arms burner unit processed more than 100 metric tons (220,462 pounds) of

small-arms ammunition in a five-month period, fully destroying the propellant but containing all metallic/lead components.

- **Munitions cutting**: Expanding on the techniques used with the Explosive Harvesting System, Golden West has manufactured mobile and stationary units intended to safely cut explosive ordnance up to 2,000 pounds (909 kilograms). The mobile system allows EOD technicians to safely remove the initiating system from larger ordnance items that would otherwise need *in situ* destruction and transport it to a safe storage/disposal area. The stationary units allow remote cutting of safe-to-move/hard-to-destroy explosive-loaded items, reducing the time, effort and expense of normal disposal by detonation methods.
- **Training aids**: Additionally, Golden West provides inerted ordnance and fuzing systems to other nonprofit groups—often for little-to-no cost, thus providing an essential resource for organizations to teach EOD, demining and UXO disposal.

*Photo collage courtesy of Golden West Humanitarian Foundation.*

### Employee Scholarship Program

Finally, Golden West provides education support to developing nations through GWHF's Employee Scholarship Program. The ESP affords local staff—and often their families—with the money needed to continue their education while employed with Golden West. Since the program's origination in 2008, 90 percent of the local staff acquired a secondary education, with the program covering the costs.

### Funding

Golden West's funding comes from a combination of grants, contracts, corporate donors and private donors. A large majority of government funding comes from the United States Department of Defense's Humanitarian Demining Research and Development program, Night Vision and Electronic Sensors Directorate, and the Office of Weapons Removal and Abatement in the U.S. Department of State's Bureau of Political-Military Affairs (PM/WRA). In addition, Golden West has contracts with the Organization of American States for SA/LW destruction, stockpile reduction, training and UXO-clearance work.

### Future

In the future, Golden West plans to increase involvement in SA/LW and stockpile-reduction efforts in Latin America through the Organization of American States. It also intends to continue expanding shallow-water detection technology to assist UXO clearance in Southeast Asia's ponds, rivers and canals, improving the capacities in the South Pacific as well as increasing partnerships in Vietnam and Laos to expand technology and training. The Children's Education Division is creating a new graphic novel—a scrap metal/munitions-risk story—that relies heavily on a visual component to increase communication.

*~ Eric Wuestewald, CISR Staff*

*See endnotes page 81*

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# MAG (Mines Advisory Group)

MAG employs many female deminers. These women are working in Xieng Khouang Province, Laos.
*All photos courtesy of Sean Sutton/MAG.*

MAG (Mines Advisory Group) is a nonprofit global humanitarian organization that helps create peace and prosperity by removing deadly remnants of war. For more than two decades, MAG has directly reduced the devastating effects of armed violence and conflict, and paved the way for reconstruction, peace and security in some of the world's poorest communities, thereby saving lives and enabling safer futures.

MAG works in areas of the world that have been affected by conflict, assisting local populations with recovery and development.. MAG teams consult with local community members, working to lessen the threat of death and injury, while releasing land that is safe and other vital resources back to the population to help communities rebuild and develop their social and economic potential. In 1997, MAG received the Nobel Peace Prize for its work with the International Campaign to Ban Landmines.

With 60 staff in the United Kingdom and more than 2,500 staff worldwide, MAG has worked in roughly 40 countries since 1989 and has operations in Angola, Burundi, Cambodia, Chad, the Democratic Republic of the Congo, Iraq, Laos, Lebanon, Libya, Republic of Congo, Sri Lanka, Somalia, South Sudan, Sudan and Vietnam. It is funded through grants from 14 different governments, United Nations contracting agencies, the European Union, trusts and foundations, and the general public.

## MAG's Objectives

Throughout the world, where conflict results in human death or injury from remnants of war such as landmines, unexploded ordnance, weapons and ordnance stockpiles, and other residual contamination that have a highly damaging effect on populations, MAG aims to relieve instability, suffering and distress by:

- Providing training and assistance in clearance and reconstruction
- Undertaking preventive measures that improve human security including safely managing, storing, destroying or reducing the availability of stockpiles of weapons and ammunition
- Providing risk education
- Finding solutions to problems faced by those whose lives are affected by conflict

## How MAG Works

**Mine action**. Identifying landmines and other UXO as lethal barriers to development and physical safety, MAG has long pioneered land release and clearance best practices.

**Weapons disposal and security**. Finding and destroying unsecured and often unstable weapons and ammunition stockpiles is an integral part of many MAG programs worldwide. Working with national authorities MAG is making substantial progress destroying surplus weaponry that threatens, not only surrounding communities, but also regional security.

**Teaching safety.** In addition to managing and destroying landmines, UXO, and small arms and light weapons, MAG proactively educates communities at risk with tailored safety messages about the dangers of UXO and weapons proliferation.

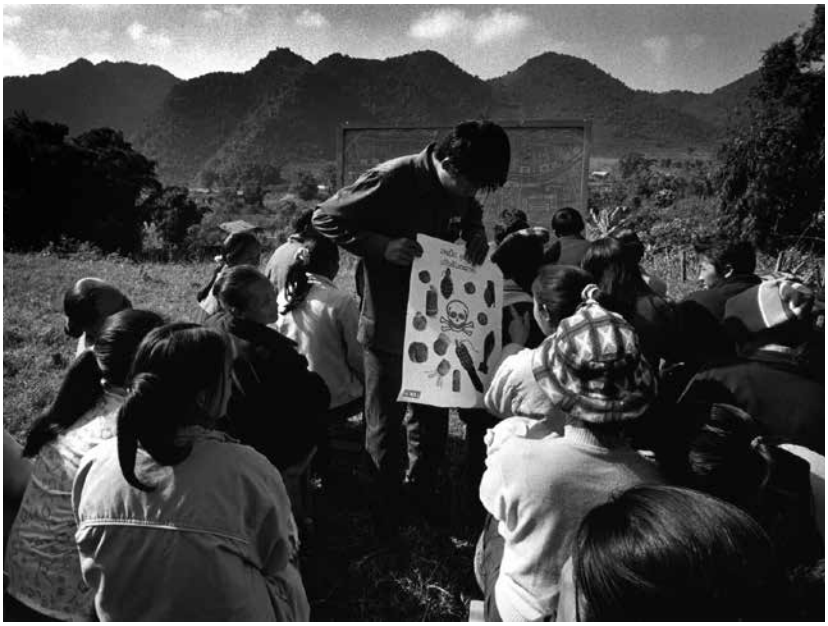
Managing stockpiles and developing capacity. MAG works with security forces in Burundi, the Democratic Republic of the Congo, Iraq, Somaliland and the state of Puntland in Somalia, and provides weapons management and storage training. In Burundi, MAG conducted a nationwide survey of all police armories and performed physical-security upgrades in many locations. MAG trains police and army officers to safely store and keep records of firearms, significantly reducing the risk they pose to civilians.

**MAG and the Millennium Development Goals**. The world's 10 poorest countries are either in or emerging from conflicts.[1] MAG's work helps release land, increase safe access to vital resources—such as water, education, trade and health services—and promotes gender equality in many of these countries. As a result, MAG's work actively contributes to the United Nations' Millennium Development Goals, which strive to "free people from extreme poverty and multiple deprivations."[2] Moreover, MAG continues to work to minimize the devastating effects of armed violence and remnants of war/conflict.

*~ MAG staff; Katy Lovin, CISR staff, assisted with this article.*

*See endnotes page 81*

MAG teams working in Laos to clear unexploded ordnance in partnership with UNESCO. This project was funded by the New Zealand Government and intended to secure World Heritage status for the site. Here Boua Van is marking the spot where her detector signaled a metal item. It could be a piece of fragmentation, a nail or a cluster bomblet.



MAG community liaison session. The team discusses the priorities for clearance determined by the community. Among other things, this involved drawing a community map, explaining MAG's methodologies, and conducting UXO awareness discussions.

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SPECIAL REPORT

# Urban Land Release in Libya: BAC and Land Release in Built-up Areas

This article's aim is to present several land-release principles for use in the battle-area clearance of Libya's built-up areas, also called Urban Land Release. Based on the practical, empirical experience of DanChurchAid, it is not intended as a one-size-fits-all solution to BAC task planning, but it may be helpful in other locations when compared with local knowledge of the situation on the ground. It does not apply to landmine clearance. BAC is the traditional means of clearing unexploded ordnance in open areas. Libya is now contaminated with UXO and explosive remnants of war as a result of the uprising that occurred in 2011. This article also examines the effectiveness of BAC as reconstruction occurs, particularly in Misrata, based on the experience of DanChurchAid deminers.

by Robert Keeley [ RK Consulting, Ltd. ]

Humanitarian mine action produces two main outputs with a socioeconomic impact. The first is land release for subsequent safe use by the local population. This is the main output of landmine clearance and UXO clearance in areas contaminated by cluster munitions where the local population is unwilling to use the contaminated areas.

The second main impact is that HMA reduces the risk of death or explosive remnants of war injury. HMA activities, such as mobile explosive ordnance disposal teams and mine-risk education, do not clear land for safe use but reduce the risk of death and ERW injury by removing hazards and modifying the behavior of the local population, thereby reducing the probability of the incidence. Notably, the local population is rarely dissuaded from using areas by the threat of ERW. Hence, any HMA activities that are based on the land's wholesale clearance are not likely to impact the livelihoods of the local population, as people would have used the land anyway.

Amount of area cleared in hectares or square meters, while a useful measure of efficiency, is not a very useful measure of impact (see definitions in Table 1). Therefore, HMA teams operating in built-up areas should focus on activities optimized for ERW's safe removal. Initially, this may appear the same as BAC, but it is important to understand that BAC is an area-clearance tool, and area-clearance tools are used for hazard reduction. Although eventually effective—teams will find ERW—it is not always efficient, especially in situations where the density of ERW contamination is comparatively low.

Examining UXO found during a BAC task. The item was hard to spot and is likely to have been missed by a previous search.
*All photos courtesy of the author.*

## Development Evaluation Criteria

A key concept referred to in this article is the development-evaluation criteria created by the Organization for Economic Cooperation and Development. Table 1 details these criteria and respective definitions.[1] The most relevant terms in this document are impact, effectiveness and efficiency.

## Land Release and Non-technical Survey

The humanitarian mine-action sector still struggles with defining the term land release. The Geneva International Centre for Humanitarian Demining has released three new International Mine Action Standards

on the subject. Although a direct reference to "land release" is constrained to a single footnote in only one IMAS, a recent meeting of the IMAS Review Board determined that considering a review of the relevant standards, IMAS 08.20–08.22, was still too soon.[2] However, the mine-action sector's general consensus is that information-gathering and analysis techniques, such as Non-technical Survey, should be used to prioritize the use of technical resources in landmine-contaminated areas and these actions should have some sort of socioeconomic impact. Definitions of the three IMAS mentioned above are as follows:

- IMAS 08.20 defines **Land Release**:
  *"Land Release is the process of applying all reasonable effort to identify or better define Confirmed Hazardous Area and remove all suspicion of mines/ERW through non-technical survey, technical survey and clearance using an evidence based and documented approach."* [3]
- IMAS 08.21 defines **Non-technical Survey**:
  *"The term 'Non-technical Survey' describes a... survey activity which involves collecting and analyzing new and/or existing information about a hazardous area. Its purpose is to confirm whether there is evidence of a hazard or not, to identify the type and extent of hazards within any hazardous area and to define, as far as is possible, the perimeter of the actual hazardous areas without physical intervention."* [4]
- IMAS 04.10 defines **Battle Area Clearance:**
  *"The systematic and controlled clearance of hazardous areas where the hazards are known not to include mines."* [5]

## Weapon Use in the Libyan Conflict

The fighting in Libya involved land-service ammunition with some air-delivered weapons and small arms and light weapons. Air strikes on existing Libyan Army ammunition-storage areas have scattered abandoned explosive ordnance and SA/LW ammunition, and caused significant contamination in the surrounding areas. The majority of the fighting was concentrated along nodal points, coast roads and around sites of particular interest, such as government buildings within town centers. Therefore, significant damage occurred in some areas, whereas other areas escaped unharmed.[6]

## BAC in Libya

In Libya, much of the early humanitarian clearance work was conducted as the fighting continued and revolved around the BAC of urban areas, particularly in Misrata. Early work by international nongovernmental organizations showed that although a number of unexploded ordnance was identified, the amount was far less than what might be expected given the intense fighting. By talking to locals, it was learned that the local forces engaged in some informal UXO removal.

Although BAC can be conducted faster than demining, especially when it involves surface-visual clearance on hard surfaces, it remains slow and expensive. Clearing a city takes considerable time; the Joint Mine Action Coordination Team was originally tasked with clearing Misrata. The operation's relative costs and benefits were brought into particular focus given that a smaller-than-expected quantity of UXO was found. Therefore, it should be considered whether the principles of the emerging

| Criterion | Definition |
|---|---|
| Relevance | The extent to which the aid activity is suited to the priorities and policies of the target group, recipient and donor |
| Impact | The positive and negative changes produced by a development intervention, directly or indirectly, intended or unintended. This involves the main impacts and effects resulting from the activity on the local social, economic, environmental and other development indicators. |
| Effectiveness | A measure of the extent to which an aid activity attains its objectives. |
| Efficiency | Efficiency measures the outputs—qualitative and quantitative—in relation to the inputs. It is an economic term which signifies that the aid uses the least costly resources possible to achieve the desired results. This generally requires comparing alternative approaches to achieving the same outputs, to see if the most efficient process has been adopted. |
| Sustainability | Sustainability is concerned with measuring whether the benefits of an activity are likely to continue after donor funding has been withdrawn. |

Table 1. OECD Development Evaluation Criteria.
*All tables courtesy of the author.*

| Ser | Datum | Uncontrolled |
|---|---|---|
| 1 | Days worked | 17 |
| 2 | Area Cleared (Ha) | 66.64 |
| 3 | Items found | 81 |
| 4 | Area cleared per day (Ha) | 3.92 |
| 5 | UXO per day | 4.76 |
| 6 | UXO per Ha | 1.22 |

Table 2. DCA BAC Data for August 2011.

land-release concepts can be employed when focusing BAC efforts into areas containing UXO contamination and where its removal will have some socioeconomic impact.

**Risk and Hazard.** The discussions below depend on a mutual understanding of the formal definitions of **risk** and **hazard**, as follows:

- IMAS 04.10 defines **risk** as the "combination of the probability of occurrence of harm and the severity of that harm."[7]
- IMAS 04.10 also defines a **hazard** as a "potential source of harm."[8]

This is usually described mathematically as: $r=P_i \times S_o$ where r = risk, $P_i$ equals the probability of the incidence and $S_o$ is the severity of the outcome. In mine-action terms, risk can also be seen as a product of hazard x activity.

This means that removing the hazard can reduce the risk, or reducing the probability of an incident by modifying people's behavior (i.e., with mine-risk education). However, the converse must also be true: Risk is not actually reduced when work is done to search areas that are subsequently found never to have had ERW contamination.

## ERW and Casualties

One problem facing the HMA sector involves how to measure the impact of EOD teams, given that they do not clear land. The more UXO that is safely removed, the safer the population. However, measuring the productive value of cleared land is not so simple. Estimating the impact of EOD teams and UXO removal is possible, and an established mathematical relationship now links the number of UXO and the number of casualties.[9] A mathematical function involves the percentage of ammunition that becomes UXO (commonly understood to be 10 percent), the percentage of UXO considered unsafe to move (and hence most likely to cause casualties) and the average number of UXO casualties per incident. In other words, the more ammunition used in a particular area, the more UXO that will remain in the area. As a result, more casualties will occur.

Any land-release technique forcing the HMA teams to concentrate on maximum-impact areas will improve **efficiency** and will have more of an **impact** on donor funds. This has already occurred in Libya. Although Misrata was one of the most heavily contaminated areas in Libya, some areas did not see combat, and identifying Misrata's contamination was the first step in this identification process. By using local knowledge and information about the conduct of the fighting (see Figure 1), teams can improve this process. Other procedures can further focus the teams' attention on the areas where the fighting was heaviest.

An example of low amounts of battle damage. No items of UXO were found around this building.

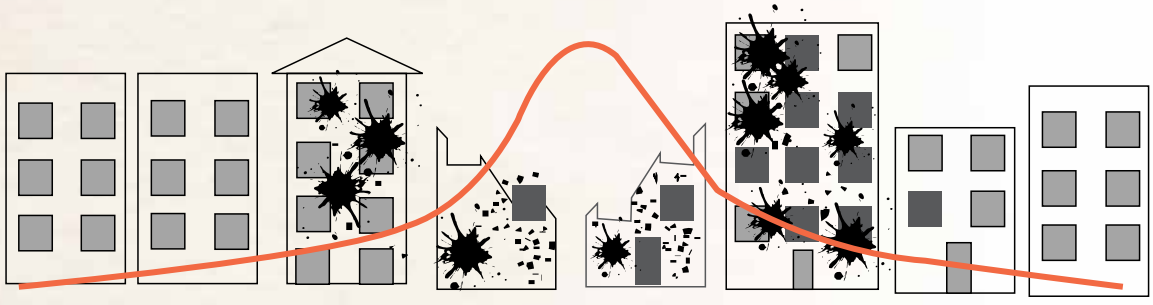


Figure 2. Distribution of battle damage around the focus of the fighting. The red line is a representation of how the density of damage is distributed across the battle area.
*Illustration courtesy of the author/CISR.*

The amount of UXO scrap found by a team of three searchers in one hour. UXO was subsequently found on the roof of a building in this same area by the team later that day.

### UXO Scrap, Damage and Fragmentation

A simple proxy indicator of the probable density of ERW contamination will be the density of UXO scrap, which can be moved and is likely to decrease over time, and weapon damage to buildings, which includes fragmentation marks. This is a simple statement of proportion: The amount of fighting is proportional to the amount of building damage. Since the amount of ERW and the amount of fragmentation damage are both proportional to the severity of the fighting, using fragmentation as an indicator of ERW presence is statistically reasonable. As a general principle, one exploding weapon causes spalling/cratering over approximately one square meter (one square yard) and significant amounts of smaller fragmentation damage over an area of 100 sq m (120 sq yd).[10]

An area showing more moderate damage. Much of the damage to this building is from fires rather than from the blast or fragmentation effects of UXO. A small number of UXO items were found in the buildings pictured.

### Experience From Misrata

Practical experience from Misrata supports a number of observations:

- **Fragmentation and battle damage is distributed around the foci of conflict.** It is possible to see a distribution of contamination around areas of most severe fighting which is similar to a statistical distribution. This appears to be a result of the nature of the fighting in Misrata. When walking a few meters away from severely damaged areas, no damage is observable in parts of the town. This distribution is represented graphically in Figure 2.
- **Items of UXO are strongly correlated with fragmentation and battle damage.** In general, the presence of UXO is very strongly correlated with the degree of observed battle damage. No items of UXO were found in areas without battle damage. The correlation with other ERW items, especially caches of abandoned ordnance, might be less strong, as ammunition stockpiles may be found away from conflict areas.
- **Far fewer ERW are being found than the amount of battle damage might suggest.** This lack of ERW is one key observation from the ground in Misrata. Looking at a building with 20-plus projectile strikes, one or two UXO items may be found in or around the building, but what was actually found on the ground was far fewer. Indeed the UXO-contamination level around the foci of fighting is estimated to be only about 10 percent of what might be found (i.e., one UXO for every five to 10 buildings searched). This is not because the ammunition used was particularly reliable; rather, information given to DCA suggests that local teams within the Libyan Transitional National Council collected ERW items before DCA (and indeed the other international NGO team working in Libya) could deploy. Seemingly, DCA teams are finding items missed by these original searchers. In conditions of such low contamination, making EOD/BAC interventions more efficient is even more important. Table 2 sets out performance data for DCA teams in Misrata for August 2011. This was effectively the first month of operations, and some days at the end of the month included a stand-down in preparation for the Eid al-Fitr holiday. These data give benchmarks by which any subsequent change in procedures can be measured.

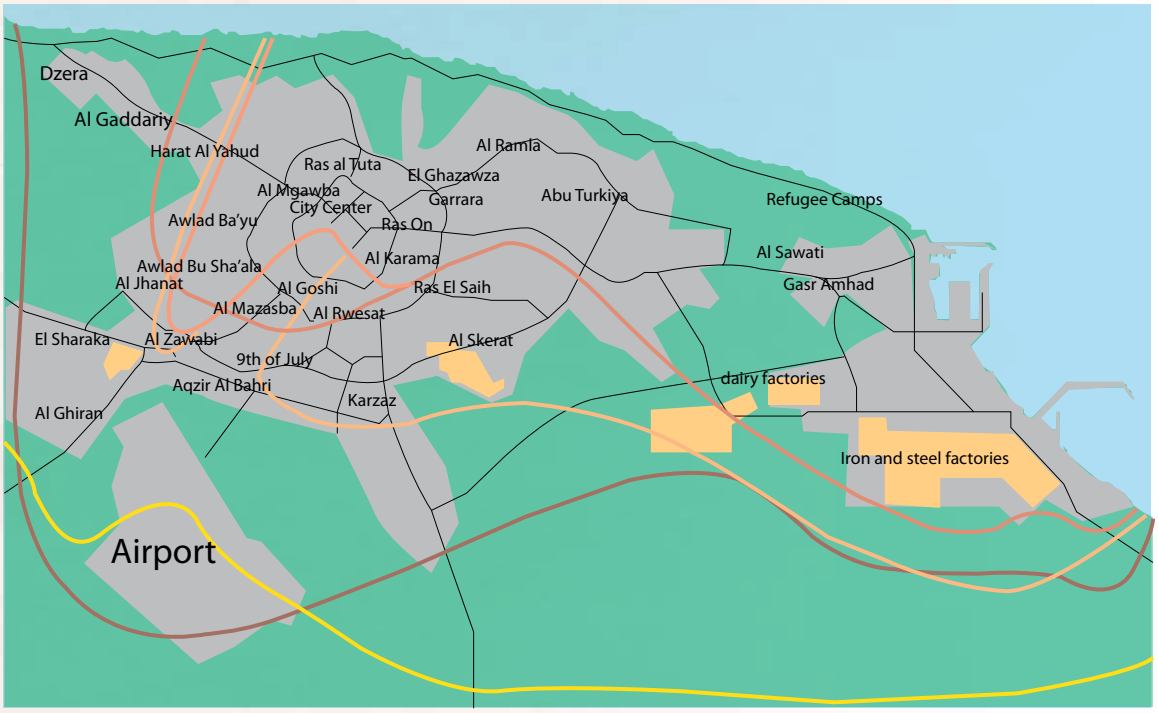



Figure 1. Wikipedia map of the battle of Misrata.
*Map courtesy of Wikipedia/CISR.*

| Damage Category | Definition | Remarks |
|---|---|---|
| Severe | Significant or total collapse reulting from repeated strikes. Significant amount of fragmentation or SA/LW strike damage | Can be harder to search than buildings with moderate damage |
| Moderate | Some strikes on buildings resulting in noticeable damage, but no general collapse. Fragmentations or SA/LW strike damage present. | |
| Light | Some fragmentation marks on buildings. No significant damage. | |
| Nil | No visible battle damage | |

Table 3. Categorization of buildings by damage and fragmentation marks.

| Damage Category | Definition | Remarks |
|---|---|---|
| Nil | Reactive call-out only to spot tasks such as abandoned explosive ordnance or caches of SA/LW ammunition. Do not carry out prophylactic BAC. | |
| Light | As per Nil. In the event that some UXO reported then 'clear to fade.' | |
| Moderate | 'Clear to fade' if UXO reported or 'clear to boundary' (of project) if area required in support of a funded development project. Clear as prophylactic BAC task when no severe areas left. | |
| Severe | Carry out BAC tasks on severe areas as priority when no EOD spot tasks reported. Clear to fade. | Consider mechanical assistance for searching rubble. |

Table 4. Resource Allocation in Urban Land Release.

### Categorizing Explosive Fragmentation Battle Damage

If the above principles are operationalized for practical use in urban land release, identifying different categories of battle damage will be useful; this information could then be used to prioritize efforts and identify different technical interventions. This should assist in improving the allocation of resources to the problem and improve efficiency.

In Misrata, four categories of battle damage were identified. These are explained in Table 3.

### Limitations

One apparent limitation of using battle-damage evidence to cancel areas for BAC is that the **outliers**, i.e., the one-off item of UXO that was the only explosive-ordnance item to fall in an area of light or nil battle damage will not be found. Nor will this method find ERW caches in areas where no immediate fighting occurred.

The technique described is purely a method for categorizing buildings and surrounding areas based on the degree of battle damage. While this method is considered a useful means of categorizing areas, other data-gathering methods exist. For example, local knowledge may also highlight one-off ERW items (since abandoned ordnance is less likely to be as closely correlated with battle damage as is UXO) or identify buildings that were occupied by fighters but were less damaged. Table 4 shows how other factors can be incorporated as part of a resource-allocation process in urban land release.

On the other hand, BAC will not find all ERW in built-up areas. It will not work in abandoned or locked buildings, and even the best BAC searchers will not be likely to spot UXO in unusual locations. We know that from World War I and World War II small numbers of UXO plague Europe long after the wars. Therefore, assuming BAC activities in built-up areas have a risk-reduction output rather than area clearance is important. ERW reports can be used to modify the default-option response, which the damage category suggests.

### Prioritization

The principles set out previously can prioritize HMA assets between EOD spot tasks and wide-ranging BAC tasks in built-up areas. Table 5 provides prioritization guidelines; these compare the type of task with likely attributes of contamination and impact. This can help determine whether multi-purpose HMA teams deploy as small, mobile EOD teams or should combine for area-clearance tasks.

### Other Techniques

**Marking.** Not all abandoned buildings are freely accessible, which may mean that not all severely damaged buildings can be cleared during urban BAC activity, and some contamination may not be found during prophylactic BAC searches. Improving BAC effectiveness in terms of contamination and impact is possible by the use (in Libya) of simple add-on stickers in Arabic and English, including a message similar to that in Figure 3.[11] These stickers should help improve the impact of HMA activity and will help the local population when they encounter ERW.

**Human information.** As implied in Table 4, collecting human information will be important. Using community-liaison teams to seek out human input on ERW is critical. MRE can help facilitate this but only when it includes information about how suspect ERW can be

| Priority | Definition | Contamination | Impact | Remarks |
|---|---|---|---|---|
| Priority One | Item of ERW reported as spot task | X | X | Strong in terms of both contamination and impact |
| Priority Two | BAC in support of funded development project | | X | Strong in terms of potential impact. Moderate and severe areas only except where clearance is specifically funded. |
| Priority Three | BAC in 'Severe' areas | X | | Most likely to be contaminated, but impact not so clearly measurable. |
| Priority Four | BAC in other areas | | | Consider relocating some teams to other regions if too many P4 tasks being undertaken. |

Table 5. Prioritization in Urban HMA.

*To the occupier:*

*A search of the area around this building has been carried out for dangerous explosive items, but access to this property was not possible. If subsequently you find any items that you suspect might be an explosive item, contact us at [telephone number] and we will check it for you as soon as possible.*

*Please DO NOT touch the item yourself and please also make sure that no one else touches it in the meantime. Do not become a casualty.*

Figure 3. Message to occupiers of a building in Misrata that could not be searched.

reported. MRE is more useful when a feedback loop is incorporated. Like the stickers on abandoned buildings, human input will help improve the impact of HMA activity as it will help the local population confront ERW.

**Clearing to Fade.** Clearing to fade is a concept whereby BAC teams search outward from ERW-contamination areas until they find no more contamination. Based on DCA's experience in Misrata, the approximate mean distance between UXO (in contaminated areas) is 25 m (27 yd). Therefore, the clearing-to-fade distance recommended here is 50 m (55 yd), or twice the average distance between UXO pieces in contaminated areas. Teams stop at least 50 m (55 yd) beyond the most recently found piece of UXO. The distance can be increased when practical, e.g., to extend the search by a few meters to allow a wall or road junction to act as a boundary.

## Independent Confirmation

Produced by the French NGO Agency for Technical Cooperation and Development (ACTED), a map served as independent confirmation of this hypothesis (see aerial photo, next page). In order to plan possible aid interventions, this map showed battle-damage areas after an ACTED survey. Based on DCA's work conducted in August, the UXO data was superimposed on this map to show a high degree of correlation between UXO finds and battle damage. The few outliers are marked; they were explained previously.

## Resource Allocation Through Response-time Analysis

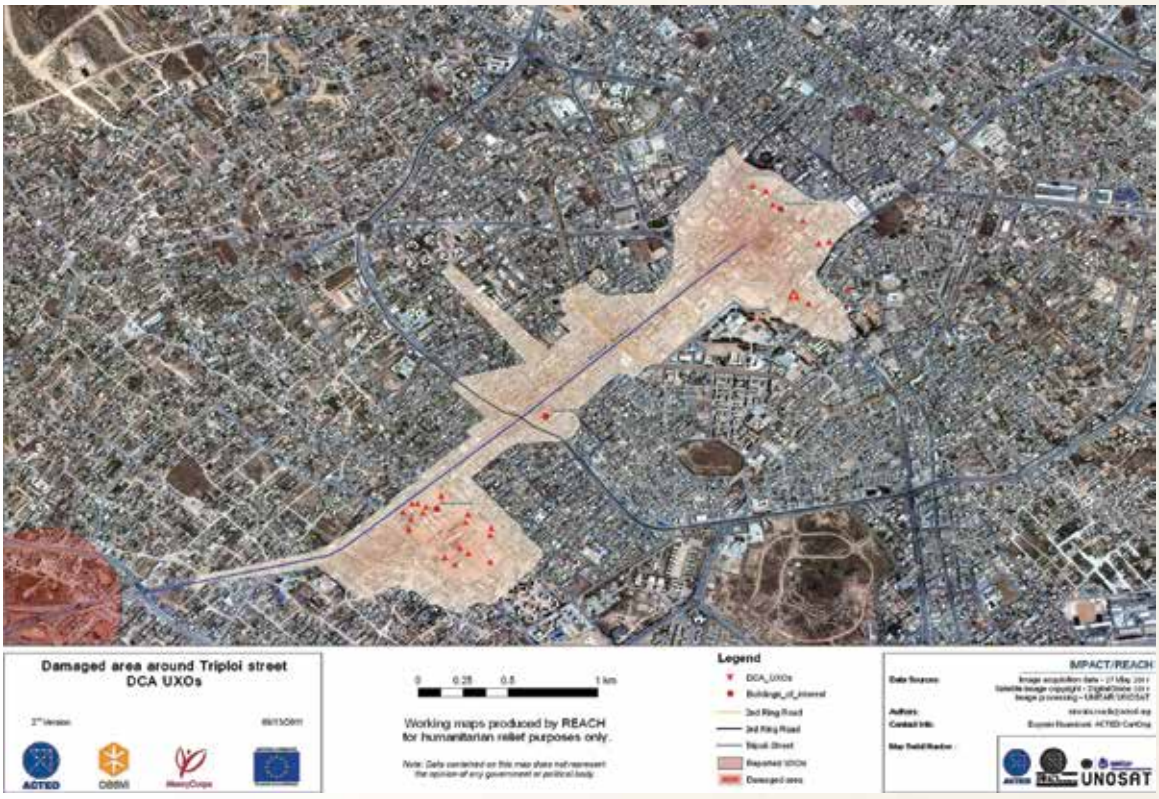
The information contained in Figure 5 is based on an approach called response-time analysis used by a number of countries, including Australia and the United Kingdom. Under such an approach, an average response time is set as a standard by the appropriating authority. This would be the expected time between an item of UXO being reported to the implementing agency and its mobile EOD team arriving to deal with the suspect item.

Given the time necessary to deal with an average find after the team arrives on site, and typical travel times between two separate locations, one could expect each team to deal with two separate UXO tasks each working day. This process allows analysis using the principles set out in Figure 5 (previous page).

This analysis can be carried out at a program level to determine whether there are sufficient EOD teams in the country, and repeated at a project level to establish whether the capacity is allocated efficiently between provinces or regions.

A DCA searcher checks severe damage to a building. The building includes a great deal of blast damage and collapse in some areas. An item of UXO was found on the roof of this building.

Can you spot the UXO? This neighborhood has no readily identifiable fragmentation or battle damage, yet apparently has UXO, as reported to DCA by a neighbor. It is unlikely to have been spotted by BAC.




The pink shaded area on the map was produced by Agency for Technical Cooperation and Development to show battle-damaged areas in Misrata. The red marks show where UXO was found by DCA in August 2011.

Top left. DCA teams working around "Severe" damaged buildings. Top right. An MRE poster provided by Handicap International. Center and bottom. This cluster munition was reported to DCA by a resident who could see it on the garage of his neighbor's house. It would have been missed by BAC teams who would not have been granted access to the house, and it would not have been spotted by the householder as there is no view over the garage from the house.

- *If EOD teams are each carrying out an average of two tasks per day and there is no backlog of tasks, then the number of teams available can be considered sufficient and their management efficient.*
- *If EOD teams are carrying out an average of two tasks per day and there is a backlog of tasks, then the number of teams available may be insufficient, even if they are being managed efficiently.*
- *If EOD teams are carrying out less than two tasks per day and there is no backlog of tasks, then there may be too many teams available (or a problem in the task reporting process).*
- *If EOD teams are carrying out less than two tasks per day and there is a backlog of tasks, then it is likely that the teams are being managed inefficiently.*

Figure 5. Principles for EOD response-time analysis.

## Conclusion

BAC is traditionally used in open areas and is conventionally considered a means to release land for subsequent safe use. DCA's experience in Libya in 2011, specifically in Misrata, suggests that BAC may not always be an efficient way of achieving a socioeconomic impact due to a number of confounding factors. These include the underestimated amount of UXO found and the large number of buildings not accessible to searchers. However, findings from initial DCA operations show a strong correlation between the degree of battle damage and the amount of UXO found. Therefore, using the degree of battle damage—supported by reports from the local population—should allow searchers to focus on reported ERW and on areas where ERW are most likely found within an urban land-release concept. Urban land release will not find all ERW, especially items of abandoned ordnance not found in the close proximity of battle areas. However, the comparatively small number of ERW found using conventional BAC reveals the importance of focusing activities in areas where ERW are most likely found. Support from enhanced MRE and community-liaison efforts will further improve the efficiency and impact of humanitarian mine-action activities in built-up areas.

*Acknowledgements: This paper could not have been developed without input from all of DanChurchAid's Humanitarian Mine Action teams working in Misrata.*

*See endnotes page 81*

**Robert Keeley**, Director of RK Consulting Ltd., is a former British Army Bomb Disposal Officer who has worked in humanitarian mine-action since 1991. He was head of the United Nations Mine Action Centre in Croatia until 1997. He has also worked for Handicap International, European Landmine Solutions and has worked as a consultant since 2002. In 2010 he acted as the Chief Technical Adviser in Libya and in 2011 helped DanChurchAid run an EOD team there. Keeley has a doctorate in applied environmental economics from Imperial College London.

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# The GICHD Tool for Management of Mechanical Demining Operations

In response to a need for an operational management tool for the mechanical demining community, the Geneva International Centre for Humanitarian Demining developed a system called the Management Tool for Mechanical Demining Operations. This system increases the efficiency of mine-clearance operations by using a database that organizes and creates data reports. GICHD is working to improve the system including the addition of a GPS tool in 2012.

by Pehr Lodhammar [ Geneva International Centre for Humanitarian Demining ] and Erik de Brun [ Ripple Design ]

Mechanical demining systems can greatly increase the effectiveness and efficiency of mine-clearance operations. In the past, only some commercial companies and very few noncommercial organizations used machines regularly, but today most make use of them in at least some capacity. Also, in recent years, the number of machine manufacturers has steadily grown, and many different types of machines and systems exist.

The Geneva International Center for Humanitarian Demining has researched and studied machine-deployment practices and the cost-effectiveness of various mechanical demining systems. GICHD found that the success of operational mechanical demining programs depends on several key elements:

- Appropriate machine-type selection
- Effective operational management
- Administration of mechanical demining operations
- Planning of mechanical demining operations
- Proper understanding of how various machines are best utilized (i.e., as stand-alone systems or jointly with other assets)

The research also revealed some unmet needs in mechanical demining:

- Operators require increased flexibility and versatility during field operations. As a result, machines are increasingly developed to support multiple working tools, such as tillers and flails. Despite the improved design of machines and their increased use, much room for improvement remains regarding how machines are deployed and how performance data is captured and processed.
- In general, mechanical demining systems in the field often are underused, which is also known as downtime. If the role of the machines in technical survey (when used alone or when combined with other methods) was more appropriately defined, overall operational efficiency would increase. Far too often, machines are not used effectively, suggesting untapped potential. This can be due to poor management and planning, a lack of logistics, or external factors such as the weather or poor security. Given the increase in mechanical demining among operators and national mine-action programs, the demand/need for assistance is likely to remain high and may increase in the coming years.
- The increased use of machines requires central coordination and support to ensure that information or experience with promising conceptual/technical innovations, as well as general global empirical experience, are shared with the community at large.

Using funds provided by the Governments of Switzerland and Sweden, GICHD worked to address these needs by developing a software tool designed to aid in the operational management of mechanical demining in 2011. The Management Tool for Mechanical Demining Operations helps minimize vehicle downtime and maximize output during mechanical demining operations. This process is done by enabling the collection and review of machine-specific operational and nonoperational data.

The GICHD Web page and GICHD training interventions made the tool accessible to the mine-action community. Based on positive operator feedback and requests from the users of the mechanical demining systems, the initial,


Figure1. Demining Management Tool: Main Menu.


Figure 2. Demining Management Tool: Admin Data Entry.

mechanical, demining-centric tool was expanded to support the management of animal detection and manual-demining operations and is known as the Management Tool for Demining Operations.

## Description

The Management Tool for Demining Operations is a simple, macro-enabled, Microsoft Excel© database. This tool tracks the performance and downtime of mechanical, manual and animal detection demining assets. It was developed primarily for field/site management and is intended to:

- Be user-friendly
- Require only a short daily or weekly time commitment
- Augment, rather than replace, existing reporting/tracking processes

The database collects operational data (i.e., performance) and nonoperational data (i.e., downtime) for each working asset every work day. The data is then compiled into a series of summary reports, which can be viewed, printed or saved as PDF documents.


Figure 3. Demining Management Tool: Mechanical Asset Entry.

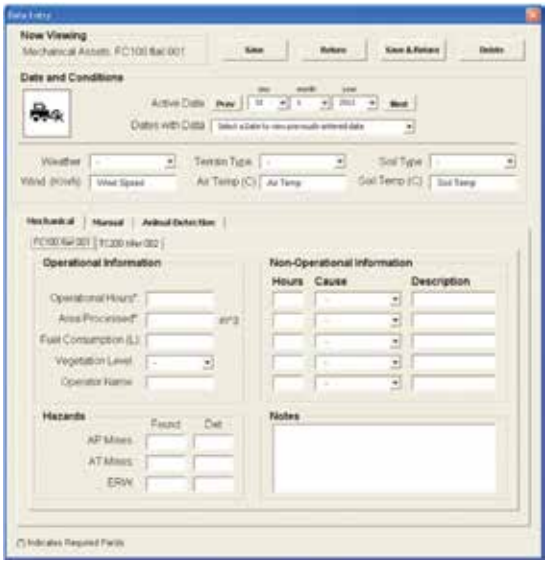


Figure 4. Demining Management Tool: Mechanical Daily Data Entry.

The user interface is designed to be intuitive for operators; it has a simple format that contains clearly-labeled data-entry fields. The main menu provides a starting point, and the tool is divided into three main sections:

- Setup
- Daily data entry
- Reporting

## Using the Tool

When the tool is first used as part of a new task, the user must enter organizational and asset-specific information in the setup areas. The user only needs to enter the information once, and it can be saved and used as a baseline for

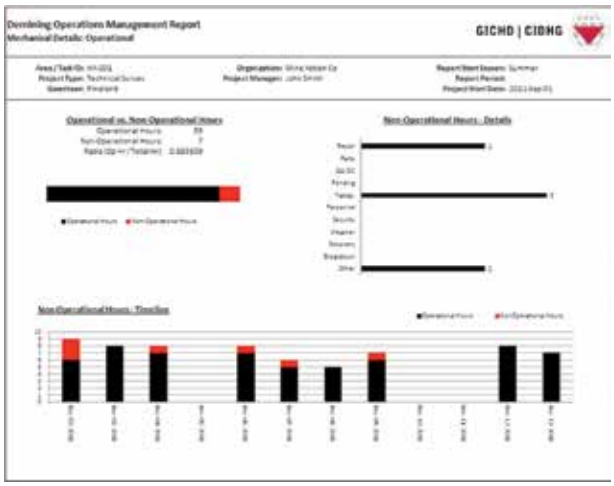

Figure 5. Demining Management Tool: Example Report, Mechanical Page 1.

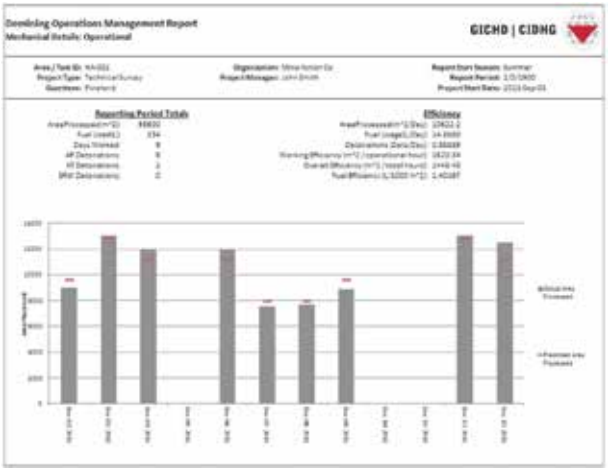

Figure 6. Demining Management Tool: Example Report, Mechanical Page 2.

Figure 7. Demining Management Tool: Example Report, Page 3.

subsequent tasks. Task and organizational information is entered first, followed by asset information. For machines, users need to input:

- Machine-identifying information
- Tool specifications
- A capacity estimate (area processed per unit of time)

For manual-demining teams, users enter the team name, supervisor and a team-capacity estimate. For each animal asset, the animal name, handler ID and a capacity estimate are required. Assets can be added, modified or deleted at any time.

Once assets are entered into the database, the daily data entry form (Figure 4, previous page) can be used to record operational and nonoperational information for each asset every working day. To begin, data about the site's environmental conditions, e.g., weather, terrain, soil information, is recorded. Under each asset type, individual assets can be selected and specific related information for that working day entered. The following information for each asset is also recorded:

- Operational data, such as hours worked, area processed or asset-specific environmental data
- Nonoperational data, such as downtime and causes
- Hazard-specific data

Once data entry is complete, operators can access the reporting forms. The demining management tool processes all recorded data and produces a set of reports for each asset group and individual reports for each specific asset. For each asset group, a two-page summary report is generated, which shows tabular and graphical data for all the active individual assets. For any specific asset, a two- to three-page report is prepared, which shows nonoperational details and operational/performance details, alongside environmental conditions (see Figures 5, 6 and 7 for an example of a mechanical asset report). Reports can be viewed within the tool, printed or exported as PDF documents.

In 2012, the tool will be improved to include a GPS tracking and visualization function, as well as other features to allow operators to view the mechanical demining unit production graphically. A small GPS tracking device will be fitted to the demining machine, and after each working session, the data collected during clearance will transfer to the management tool. To review the GPS data, the operator needs only to select appropriate dates, and the software will display a map of the area with all path data displayed as an overlay. The GPS tracking report will be viewable and printable.

## Conclusion

Based on needs identified during studies of mechanical demining operations in the field, GICHD developed the Management Tool for Mechanical Demining Operations, software enabling mechanical demining operators to collect performance and downtime data and generate useful reports. The initial tool, released in mid-2011, is already used in more than 40 field projects. Based on feedback from operators, the tool was expanded to include manual demining and animal detection, and will continue to help enhance the productivity and cost-effectiveness of demining operations.

The tools and companion user manuals can be downloaded from the GICHD Web page and are regularly distributed to operators during GICHD training outreach activities.[1] GICHD welcomes feedback from users, which should be sent to Pehr.Lodhammar@gichd.org.

*See endnotes page 82*

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# The Role of Croatian Media in Mine-risk Education

In its work, the Croatian Mine Action Centre (CROMAC) has found that various forms of media, from new Internet applications to newspapers and the radio, are uniquely situated to raise awareness among at-risk populations about the realities of landmines. To examine the media's effectiveness in mine-risk education, in 2008, CROMAC completed a study evaluating the Croatian media's coverage of landmine incidents and related news. With cooperation, CROMAC hopes better reporting about MRE programs will prevent mine accidents and create a more informed population.

by Josip Čerina [ Croatian Mine Action Centre ]

Landmine contamination in Croatia is a result of mass landmine use during World War II (1941–1945) and the Homeland War (1991–1995). Between 1991 and 2011, 1,329 mine incidents occurred in Croatia resulting in approximately 1,912 casualties. Since the establishment of the Croatian Mine Action Centre in 1998, the number of incidents has steadily decreased over the years to fewer than 10 incidents per year. From 2008 to 2010, six mine incidents each year occurred (a total of nine killed and 12 injured), and in 2011, five incidents occurred (zero killed/four injured). From 2005 to 2007, a total of 37 mine incidents resulted in eight deaths and 24 injuries, and from 2002 to 2004, 47 incidents resulted in 21 deaths and 30 injuries.[1] (See Table 1 for details.)

Various activities such as massive clearance efforts funded by the Croatian Government and by some foreign governments and private donors contributed to the reduction of mines in Croatia, including conducting mine-risk education and marking mine-suspected areas with hazard signs. The media has also contributed greatly to this reduction. During a study published in *Medijska istraživanja* in 2009, CROMAC found that the "media is a very important CROMAC partner in the implementation of different programs as well as distributing educative and preventive messages."[2]

Bearing in mind that mine action's purpose is not only demining but also reduction of mine danger, this article elaborates on the role that the media plays in the process of solving the mine problem. Taking into account recent Croatian media practices, CROMAC investigated how extensively the media covers mine action-related topics and analyzed the effects of incomplete reporting that fails to educate or teach preventive behavior. This research allowed CROMAC to begin to understand more efficient solutions for MRE delivery and other mine-related information.

Mine incidents involving civilians following the Homeland War show the need for systematic communication regarding risks. Endangered communities require safe-behavior training and warning about the risks that mines and explosive remnants of war impose. This is especially important in the Croatia's rural areas, where inhabitants live and engage in agriculture and farming near mine-suspected areas. According to the Geneva International Centre for Humanitarian Demining's *A Guide to Mine Action*, four categories of persons suffer from mine incidents:

1. Unaware: The person is not aware of mine danger.
2. Uninformed: The person is informed about mines but is not aware of safe forms of behavior.
3. Inconsiderate: The person knows about and ignores the safe forms of behavior.
4. Deliberate: The person, generally without many options available, deliberately accepts unsafe behavior.[3]

Due to Croatia's persistent landmine and ERW contamination, continuing mine-awareness activities and promoting behavior change is necessary.[4] Croatia uses radio, television and newspapers, along with signposts marking hazardous areas, to spread warnings and raise public awareness about risks and safe behaviors.

In addition, recent technological developments enable communication over the Internet. CROMAC website's MISportal, launched in February 2009, allows users to obtain comprehensive information about mine-suspected areas in Croatia by selecting a desired location.[5] MISportal also details the method of marking contaminated areas.

Although media coverage helps prevent landmine incidents, until mined areas are finally cleared, the most important form of prevention from mine incidents is the mine-warning sign. Each year, CROMAC regularly checks the conditions of

| Year | No. of accidents | Minor bodily injuries | Fatal incidents | Major bodily injuries | Total | |
|---|---|---|---|---|---|---|
| 1991 | 190 | 43 | 48 | 162 | **253** | |
| 1992 | 235 | 48 | 67 | 196 | **311** | |
| 1993 | 183 | 42 | 67 | 162 | **271** | |
| 1994 | 110 | 36 | 37 | 102 | **175** | 1603 |
| 1995 | 205 | 27 | 93 | 214 | **334** | |
| 1996 | 100 | 23 | 35 | 75 | **133** | |
| 1997 | 75 | 20 | 43 | 63 | **126** | |
| 1998 | 62 | 21 | 36 | 35 | **92** | |
| 1999 | 34 | 9 | 21 | 27 | **57** | |
| 2000 | 17 | 5 | 10 | 8 | **23** | |
| 2001 | 21 | 7 | 8 | 14 | **29** | |
| 2002 | 24 | 9 | 6 | 11 | **26** | |
| 2003 | 10 | 4 | 1 | 4 | **9** | 309 |
| 2004 | 13 | 0 | 14 | 2 | **16** | |
| 2005 | 10 | 0 | 4 | 9 | **13** | |
| 2006 | 10 | 6 | 1 | 4 | **11** | |
| 2007 | 7 | 1 | 3 | 4 | **8** | |
| 2008 | 6 | 1 | 2 | 4 | **7** | |
| 2009 | 6 | 1 | 4 | 2 | **7** | |
| 2010 | 6 | 3 | 3 | 1 | **7** | |
| 2011 | 5 | 2 | 0 | 2 | **4** | |
| **1998-2011** | **231** | **69** | **113** | **127** | **309** | |
| **Total** | **1,329** | **308** | **503** | **1,101** | **1,912** | |

Table 1. Number of mine incidents and casualties in Croatia.

all mine-warning signs, placing special emphasis on checking in the spring (after winter weather has damaged or destroyed some signs) and when rural activities intensify. Currently, Croatia has 16,000 mine-warning signs. CROMAC makes and updates mine-situation maps for all endangered communities, also updating its online MISportal.[6] In addition, representatives of local communities and individuals can freely ask CROMAC to update and verify the marking status of mine-suspected areas. This form of two-way communication is important for maintaining a high level of marking accuracy.

Keeping the population informed also includes providing the location and scope of contaminated areas and mine-action activities undertaken so far. This information is necessary for citizens to take an active part in adopting priority plans. Municipalities and towns file requests for drafting county-priority lists. The priority list serves as the basis for the annual demining plan.[7] Cooperation with the local community often contributes to faster socioeconomic development, especially regarding agriculture and farming, upon completion of demining operations.

## Research Methodology

While CROMAC's MISportal helps combat sporadic media coverage of landmines, and serves as a platform for information exchange about the extent of mine dangers, additional and ongoing media coverage could also effectively raise mine awareness among individuals and local communities. If journalists act responsibly, newspapers could be an efficient medium, because they provide opportunities for more detailed coverage of a particular topic or event.

To further examine the local media's effectiveness, in 2008, CROMAC researched and analyzed the Croatian press' contribution to providing information and teaching MRE. Using the quantitative method, the study examined mine-related articles in nine Croatian daily newspapers: *Vjesnik, Večernji list, Jutarnji list, 24 sata, Slobodna Dalmacija, Glas Slavonije, Novi list, Zadarski list* and *Karlovački list*.

This media review covered 242 randomly selected newspaper articles published in the period 2005–2007. It investigated mine-related topics and content in order to analyze what areas should be addressed more frequently—all with the purpose of achieving socially-responsible reporting about the existing mine danger, including special emphasis on informative and educational stories about the danger.

## Results and Analysis

The analysis of mine action-related topics in the newspaper articles showed that most coverage focused on six main fields:

1. Informing the population about mine dangers
2. Providing MRE
3. Announcing mine-victim assistance
4. Advocating non-use of landmines
5. Reporting on the rights of demining staff
6. Discussing the socioeconomic impact of the mine problem

The remaining articles focused on other mine-related topics: reporting about different visits, signing cooperative agreements, demining companies' business operations, activities of nongovernmental organizations, etc. Table 2 presents the results obtained.

Of the topics studied in the selected articles, the most frequent topic, advocating non-use of landmines, was addressed

| Framework of the topic | Frequency | % |
|---|---|---|
| Informing of population about mine danger | 71 | 24.74 |
| Mine-risk education | 19 | 6.62 |
| Mine-victim assistance | 7 | 2.44 |
| Advocating non-use of landmines | 86 | 29.97 |
| Rights of demining staff | 20 | 6.96 |
| Socioeconomic impact of mine problem | 58 | 20.21 |
| Other | 26 | 9.06 |
| Total | 287 | 100 |

Table 2. Overview of the topic framework analysis.

| Framework of the topic | Frequency | % |
|---|---|---|
| Marking of mine-suspected areas | 9 | 12.68 |
| Notification for public about the beginning of demining | 10 | 14.08 |
| Information for public about definition of mine-suspected areas | 10 | 14.08 |
| Information for public about the course of demining | 12 | 16.9 |
| General information about mine situation of endangered communities | 30 | 42.26 |
| Handover of cleared areas | 0 | 0 |

Table 3. Overview of the analysis of the topic, informing about mine danger.

29.97 percent of the time. In the framework of this topic, the frequency of the following subtopics was analyzed:

- International Mine Action Standards
- Anti-personnel Mine Ban Convention
- Humanitarian action
- Donations for the purpose of technically surveying suspected areas and clearing known hazardous areas

The topic "informing the population about mine dangers" was recorded in 24.74 percent of the total number of topics analyzed. On the other hand, MRE appeared quite rarely, in 6.62 percent of the articles—an obvious lack of educational content aiming to increase the safety of citizens.

The socioeconomic impact as a result of the mine problem was represented in 20.21 percent of the articles. In the framework of this topic, the newspapers reported about different consequences of the mine problem: limitations in war-damaged family houses and the return of displaced persons, impact on construction of infrastructure and economic facilities, effects on agriculture and farming, etc. Articles of this nature discuss how mine-contaminated areas are an obstacle to the return of displaced citizens and increased economic activity.

Mine survivor assistance garnered only 2.44 percent of the attention, indicating that very few articles were dedicated to this topic. Also, contrary to what was expected, very few articles were dedicated to health care and psychological and social assistance for the mine survivors. In addition, very few articles were about projects of national institutions and NGOs intended for mine survivor-assistance purposes.

The topic entitled "reporting on the rights of demining staff" was covered in only 20 cases—in 6.96 percent of the total number of articles analyzed. In 1996, Croatia passed the Law on Humanitarian Demining and other laws that regulate demining-staff rights in a transparent manner. In addition, Croatia enacted a law specifically to cover the rights of demining staff in the event of an injury, and it is a States Party to the United Nations *Convention on the Rights of Persons with Disabilities* (ratified in 2007) and follows all of the rights of this convention.[1,8] Therefore, after a review of the articles, CROMAC concluded that reporting the rights of demining staff was no longer needed.

### Informing the Public

CROMAC then wanted to further analyze the articles focused on informing the population about mine dangers and providing MRE. In order to discover the informative value of newspaper articles, the presence of the following indicators were analyzed:

- Information for the public about mine-suspected areas
- Information regarding marking of hazardous areas
- General information on the current mine situation of endangered communities
- Information for the public about the commencement of demining operations
- Announcements about demining courses
- Reports about the handover of cleared areas

Table 3 presents the analysis of these results, revealing that the most frequent topic addressed—in 42.26 percent of the articles—was "general information on the current mine situation." Other categories were represented almost equally.

Very few articles were about specific terrain clearance, i.e., demining of particular areas. The fact that CROMAC did not find any articles about the handover of cleared areas confirmed this. However, the researchers believe that mass media must inform the local community about completed clearance projects, so locals know when it is safe to access demined areas.

To establish the educational value of the newspaper articles, the study analyzed the articles based on the presence of the following indicators:

- Information on organized forms of MRE
- Information about professional gatherings, symposiums and workshops
- Information on ERW types

- Information on clearance methods
- Information on procedures when encountering mines and ERW

The most represented indicators were information on mine and ERW types, with 31.58 percent of the articles mentioning this, and information on clearance methods, garnering 26.32 percent of the published articles (see Table 4).

| Framework of the topic | Frequency | % |
|---|---|---|
| Organized forms of mine-risk education | 4 | 21.05 |
| Professional gatherings, symposiums and workshops | 4 | 21.05 |
| Information on ERW types | 6 | 31.58 |
| Information on clearance methods | 5 | 26.32 |
| Information on the procedure when running into ERW | 0 | 0 |

Table 4. Overview of the analysis of the topic, mine-risk education.

Other categories were less frequently represented. The category "Information on procedures when encountering ERW" was never mentioned. According to these results, mine danger is poorly represented in newspapers except in the case of mine accidents, when such events become worthy of media attention. This analysis showed how newspapers use the space they have available. It also pointed out to the researchers that this space could be better used to invite the population to adhere to all possible measures of precaution and responsible behavior in mine-affected environments.

## Conclusion

Even though the press contributes to informing and educating citizens about mine dangers, a need remains for more frequent reporting about safe behavior. Publicizing the status of demining in particular areas and the handover of cleared areas is also important. Reporting about humanitarian actions and donations is not enough, neither is emphasizing the mine problem as an obstacle to socioeconomic development. Disseminating information more efficiently is necessary, as well as making MRE more available until all contaminated areas are thoroughly cleared and handed over to the final beneficiaries for safe use.

For this purpose, more information regarding demining activities and the demining process should be sent to media outlets. It would also be helpful if the media was invited to attend various demining activities, so that it could relay first-hand accounts of current dangers to the public and to periodically organize symposiums in which experts, journalists, activists and representatives of local communities participate in workshops designed to educate citizens about the mine threat.

The media's social responsibility should be based on joint liability of all social subjects, because its interactive relationship with the public requires ethical behaviors in protection of civil interests and needs. CROMAC informs the population about mine-action activities and the mine situation in particular communities, but the communication with media takes place directly between CROMAC and the media, even though the assistance of a professional public-relations agency would probably make communications more efficient. Good cooperation through PR services that provide reliable and timely information may contribute to quality reporting about mine problems.

*See endnotes page 82*

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# Peer-support Training for Nonliterate and Semiliterate Female Ex-combatants in Burundi

In September 2011, 25 female veterans of Burundi's civil war were trained to become peer-support workers. The five-day training, funded under a grant from the Stavros Niarchos Foundation and conducted by James Madison University's Center for International Stabilization and Recovery, was the first of its kind to offer peer-counseling skills to nonliterate and semiliterate women.[1]

by Cameron Macauley [ CISR ], Monica Onyango [ Boston University School of Public Health ] and Eric Niragira [ CEDAC ]

Between 1961—when Burundi declared its independence from Belgium—and early 2005, violence in Burundi killed an estimated 500,000 people and left the country in a chronic state of political instability. Following the assassination of President Melchior Ndadaye in 1993, ethnic conflict between Hutus and Tutsis, and attempts to overthrow the government, resulted in brutal military reprisals that forced many Burundians to take up arms in self-defense. Paramilitary organizations conscripted men, women and children at gunpoint to provide slave labor and fight on the front lines.[2]

By 2005, war had left Burundi without infrastructure or industry, and had reduced already low indices of health and education. At the height of Burundi's civil conflict, literacy among women ages 15 and above fell from 52.2 percent in 2000 to 44 percent in 2002. Although literacy among women had increased to 60.9 percent by 2009 (with an encouraging leap to 76 percent among girls ages 15 to 24), the United Nations Development Programme's 2009 Human Development Report ranked Burundi 174 out of 177 nations.[3]

| Year | Adult Women | 15-24 years only |
|---|---|---|
| 2000 | 52.2% [5] | |
| 2001 | NO DATA | |
| 2002 | 44%[6] | |
| 2003 - 2007 | NO DATA | |
| 2008 | 59.9%[7] | |
| | | 75%[8] |
| 2009 | 60.9%[9] | 76%[6] |

Table 1. Female literacy rate in Burundi.[4]
*All graphics courtesy of CISR/Cameron Macauley.*

As in much of traditional Africa, Burundian women are already on an unequal footing with men, enrolling less frequently in school and receiving fewer years of education.

Although French is an official language in Burundi, few Burundians are proficient in French, and the literacy statistics above refer mainly to literacy in Kirundi, a language in which few publications are available. In addition, literacy among women is significantly higher in urban communities, whereas the percentage of literate women is close to zero in some rural communities. Furthermore, opportunities for adult women in Burundi to learn how to read and write are sparse, and motivation to seek educational opportunities is low for women who devote long days to farming, working and raising children. Alternatively, male literacy in Burundi is typically about 10 to 15 percent higher than that of women.[10]

### Female Veterans in Burundi

For 13 years, during the darkest period of the war, unscrupulous warlords on both sides forced adolescents and children into military service in order to swell their fighting forces with obedient and resilient youths.[11] In addition, many thousands of teens willingly joined paramilitary units devoted to defending Tutsi communities from wholesale genocidal slaughter.[12] Many teachers fled, and 29 percent of Burundi's schools were destroyed, leaving education in Burundi severely affected for nearly a decade.[13]

Burundian women involved in military service were often little more than slaves.[14] Conditions were abysmal for those assigned to cook, wash clothes and act as "bush wives" for male soldiers. Life was only marginally better for women who received combat training and went into battle. Women suffered from hunger and sexual abuse at the whim of their male

Participants learn about trust in an exercise in which blindfolded participants are guided by partners.

comrades, and even those who had distinguished themselves in battle garnered little respect and few privileges.[15]

Demobilization created a dilemma for the Burundian Government, as the status of female veterans remained doubtful.[16] Many observers questioned whether women were ever combatants, and female claims for the same rights as male ex-combatants were routinely denied by the *Programme National de Démobilisation, Réinsertion et Réintégration* (National Demobilization, Reinsertion and Reintegration Program).[17] Initially, women were only eligible for assistance if they were married to male soldiers, and only then if their husbands had fought on the government's side.[18] Opportunities for land, housing, vocational training and health care slowly opened up to women when the numbers of female ex-combatants became apparent. Regardless, assistance was difficult to obtain for these female veterans' children.[19] Consequently, as many as 85 percent of women "self-demobilized,"[15] meaning they did not bother trying to register as ex-combatants. Of the estimated 55,000 ex-combatants believed to live in Burundi, 30,916 were officially demobilized as of April 2010, and of these, only 795 were female.[20]

Many female ex-combatants tried to return to their communities after demobilization, only to confront a variety of obstacles. Whereas male counterparts received praise and respect, female veterans were frequently stigmatized as "killers," and single mothers with children were accused of promiscuity.[17] When wanting to remarry, these women found that men believed they would be difficult to control.[21]

In some cases, there was a grain of truth to this: As a result of years of abuse, Burundian women in military service had acquired survival skills to avoid exploitation. Some had advanced in rank by challenging stereotypes and excelling in traditionally male-oriented activities, such as handling weapons, leading troops into battle, nighttime reconnaissance and interrogating prisoners.[22] These women were outspoken, fearless and protective of their more vulnerable colleagues.[22] However, they contradicted traditional norms of the subservient and docile wife that Burundian men find attractive.

### War-related Trauma

Research suggests that women exposed to combat are more likely to suffer from post-traumatic stress disorder than men.[23,24] For women, the social transformation into soldiers is more profound and potentially more disturbing. Men feel more comfortable in the role of warrior and defender in which they are required to kill or maim an enemy. For women, the traditional role of protector and caregiver is brutally violated during military service.[25] For female ex-combatants who were raped, the trust and self-confidence necessary to interact normally with men in their community is particularly difficult to regain.

A participant gives a presentation on what it means to be a veteran and a mother.

Because of their similar experience, female ex-combatants wanted to stay together after demobilization. Having spent years surviving in the bush and witnessing the same violent atrocities, these women found that their military friends were often closer to them than family. No one can understand the anguish and hardship of such a life better than those who have also experienced it.[26] Rejected by their parents, husbands and communities, many of these women established communal families in order to survive.

### The Center for the Training and Development of Former Combatants

Eric Niragira, an ex-combatant forced into combat at the age of 15, founded CEDAC (*Le Centre d'Encadrement et de Développement des Anciens Combattants*, or The Center for Management and Development of Veterans) in 2005 as an organization dedicated to helping demobilized veterans reintegrate into Burundian society.[27] Following CEDAC's establishment, many female ex-combatants banded together to form similar groups for advocacy and income generation, and now some 60 such associations exist in Burundi with more than 1,200 members.[28,29] Niragira realized that reintegration was especially difficult for women, and he obtained funding to establish a commune in which female ex-combatants could live, raise their children together and participate as a group in income-generating activities. However, many of the women continued to suffer from post-traumatic stress disorder, for which Burundi has limited treatment. CEDAC's work attracted the attention of Survivor Corps, which offered training on how to provide peer support.[27] In rural areas where counseling and psychotherapy are virtually nonexistent, the training proved to be highly successful, since it encouraged the women to help each other rather than rely on outsiders. Symptoms of PTSD diminished quickly among the commune population, and some of the recovered women chose to return to their home communities.

One difficulty Survivor Corps encountered was the very low literacy level among women living in the communes; this was a problem since all of Survivor Corps' training materials were developed for literate peer-support workers. In 2011, CISR proposed another training event for CEDAC, specifically designed for nonliterate or semiliterate women.

### The 2011 Peer-support Training Workshop

CEDAC selected 25 female participants from eight CEDAC communes in Burundi to take part in the workshop. The women, ranging in age from 28 to 54, served in the military or paramilitary forces during the Burundian civil conflict, and showed interest and skill in counseling other women. Most of the participants were abducted into service, and approximately half of the participants experienced combat for the first time during the war. The majority of the women suffered gunshot wounds or had been injured by landmines. Most were sexual-abuse victims. Fifteen of the participants were semiliterate, in that they could read and write some Kirundi. The remaining women were functionally

| | |
|---|---|
| Day 1 | • Personal introductions<br>• Exercises on helping survivors achieve emotional control |
| Day 2 | • Exercises and discussions on counseling techniques<br>• Role plays |
| Day 3 | The Survivor Story:<br>  • Therapeutic value<br>  • How to listen to it<br>  • Questions to ask<br>• Exercises and discussions on helping a survivor develop goals and objectives<br>• Role plays |
| Day 4 | • Exercises and discussions on building trust<br>• Exercises and discussions on building self-esteem<br>• Role plays |
| Day 5 | • Exercises and discussions on protecting privacy and confidentiality<br>• Role plays<br>• Closing ceremony |

Table 2. Workshop curriculum.

Participants learn how to help others relinquish painful memories by exhaling them into balloons.

illiterate,[1] although most could write their own names. None of the participants could speak French or English.

### Workshop Content and Methodology

The workshop focused on the human response to traumatic experiences, and how active listening, empathy and understanding can facilitate the natural recovery processes resulting from traumatic events. Teaching methodology was based on a series of interactive exercises, some of which were developed by Dr. Lennis Echterling and Dr. Anne Stewart of James Madison University.

Question-and-answer exchanges with the facilitator elicited responses indicating that most participants had a clear understanding of trauma's effects on survivors of war-related violence. The participants were willing—in some cases even eager—to tell personal stories of violence they had suffered, witnessed and participated in, describing how they overcame fear, depression and anger, and went on to help others do the same.

Participants practiced a series of exercises designed to localize the strong emotions (both positive and negative) associated with traumatic events. This allowed survivors to isolate feelings of anger and grief, and instead summon strength and calmness. This mastery of internal forces is essential to the next step in the recovery process—the "Survivor Story," which is the survivor's contemplation and analysis of his or her traumatic memories.[30]

Recalled with horror, sorrow and bitterness, the "Survival Story" represents how survivors understand the events and actions forming their traumatic experience. Decades of research support the theory that survivors who tell their story to a sympathetic listener or audience can better comprehend what happened.[31] Not only is this process therapeutic, but survivors' understanding can increase with each retelling of their story.[32] Within the workshop, exercises focused on teaching participants to ask questions designed to promote analysis of the survivor's own role in the survival story in order to emphasize self-efficacy and promote self-identification in a positive light. This was crucial for patients recovering from feelings of humiliation and guilt, which can plague survivors for years. Questions included, "How did you find the strength to go on?" and "What have you learned about yourself from this experience?" Finally, participants were instructed to encourage the survivor to look toward the future: "What will you need to do to rebuild your life?"[33] Storytelling is an important part of Burundian oral tradition and proved a valuable part of the training.

A major component of the workshop was role-play exercises in which a "peer-support worker" conversed with a "survivor," giving participants an opportunity to practice peer-support skills and analyze each other's performances. Role-plays gave participants an opportunity to present stories about not only trauma and recovery but some of the fundamental injustices of Burundian society toward female ex-combatants. The participants were skilled actors, depicting distrust, hatred, fear, grief and rage with great feeling, yet they also convincingly portrayed empathy, concern and understanding.

### The Future of Peer Support in Burundi

This workshop was unique: It was designed to teach counseling skills to participants who have had little or no formal education. Traditionally, counseling is considered an activity only literate individuals may engage in; however, peer support takes place naturally in post-conflict communities, especially where professional psychotherapy is inaccessible. Support for nonliterate groups does not negate the importance of literacy; instead, it acknowledges that an individual need not be literate to learn new skills and contribute to the rebuilding of a war-affected community. Providing these women with counseling skills is particularly important because of the high prevalence of psychological trauma among female ex-combatants, and the importance of their continued recovery as part of reintegration and reconciliation.

Participants play the roles of a peer-support worker counseling a female veteran in order to practice counseling skills.

CEDAC is interested in establishing a nationwide peer-support program for trauma survivors of all types in Burundi; however, the organization currently lacks the funding and personnel to do this. The current project relies heavily on the volunteer efforts of CEDAC's staff and the workshop participants. Under the current Niarchos grant, CISR will to return to Burundi in 2012 to offer peer-support training for other groups, including women with disabilities.

CEDAC views this workshop as a step toward gender equality in Burundi. CEDAC's communes gave female ex-combatants a safe environment to recover, but these women will need to return to society soon. Hopefully, building their capacity through workshops of this kind will help them become leaders, caregivers and advocates for women's rights in Burundi and throughout Africa.

*See endnotes page 82*

**Cameron Macauley, MPH,** joined CISR in August 2010 as Peer Support and Trauma Rehabilitation Specialist. He holds degrees in anthropology and psychology, and became a Physician Assistant in 1983. He has worked in a refugee camp on the Thai-Cambodian border, at a district hospital in Sumatra, as a Peace Corps volunteer in Guinea-Bissau, in Mozambique where he taught trauma surgery for landmine injuries, in an immunization program in Angola and in a malaria-control program in Brazil. Between 2005 and 2010, he taught mental-health courses for Survivor Corps in Bosnia and Herzegovina, Colombia, El Salvador, Ethiopia, Jordan and Vietnam.

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The program encouraged the women to help each other rather than rely on outsiders.

**Eric Niragira,** a former combatant in Burundi, founded CEDAC in 2005 to fight armed violence and assist ex-combatants. CEDAC has received support from CISR, United Nations Development Programme and the United Nations Development Fund for Women (UNIFEM) to undertake its peace-building and development initiatives, such as campaigns for the voluntary handover of firearms and training in peer-to-peer support. Winner of the Niarchos Prize 2010 which honors individuals who promote resilience in conflict-affected areas, Niragira is involved in several projects to promote the rights of women, veterans and people with disabilities in Burundi.

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# Firearms Safety in Somaliland: From Mine Action to Community Safety

Multiple border and civil wars have left Somaliland contaminated with explosive remnants of war and a surplus of small arms and light weapons. Today, unsecured firearms threaten daily life in rural villages, resulting in more deaths in Somaliland than from recent landmine incidents. Addressing the need for firearm security, Danish Demining Group provides training and awareness through its Community Safety program.

by William Vest-Lillesøe [ Danish Demining Group ]

Together with the rest of Somalia, the northwest region of Somaliland (previously British Somaliland) has a bloody past with years of civil war. Although it is not internationally recognized as a legitimate state, in 1991, it declared its independence from Somalia and became the Republic of Somaliland. Since then, the region has enjoyed relative peace and stability. With help from the Somali diaspora, Somaliland managed to establish a relatively well-functioning government with democratic elections and good (though mostly unofficial) diplomatic ties.[1]

### Mine Action and Community Safety

Following years of war, large areas of Somaliland became contaminated with landmines, explosive remnants of war and surplus small arms and light weapons. Funded by the United Nations Development Programme and the Danish International Development Agency, DDG began clearing minefields in Somaliland in 1999, alongside other agencies such as Rimfire, a British commercial mine-action agency. Shortly afterwards, The HALO Trust and Santa Barbara, a German nongovernmental organization, joined the effort.[2] By 2006, DDG had cleared more than 11,000 landmines and more than 124,000 ERW. With fewer contaminated areas and evidence of a greater rate of incidents caused by SA/LW than mines and ERW, DDG decided to shift its focus away from traditional mine action toward a broader approach addressing safety within local communities. In 2009, the Somaliland Mine Action Centre reported 19 incidents and 23 casualties from mines and ERW. DDG research from the same year estimated more than 7,500 firearm accidents and at least 11,000 incidents involving shootings or threats with firearms. Consequently, DDG started its Community Safety program in Somaliland in 2008 with funding from the Swedish International Development Cooperation Agency and the Netherlands.[3]

DDG envisioned that a much bigger impact on human safety (regarding physical harm and the psychological feeling of security) could be achieved by using its resources to address the SA/LW problem instead of continuing traditional mine clearance in Somaliland. The 2006 *Geneva Declaration on Armed Violence and Development* greatly inspired the new approach. The declaration highlights the role of armed violence as an obstacle to sustainable development and aims toward the fulfillment of the Millennium Development Goals, a

Close-up of a gun clamp developed by DDG. See larger photo on following page.
*All photos courtesy of the author.*

*In a small plain room in the village of Adan Abokor in rural Somaliland, around 20 locals squeezed together on benches along the walls: women on one side and men on the other. Latecomers peeked through a window as several curious children stood in the doorway. They had gathered to attend a session in firearms safety education, a part of DDG's Community Safety program in Somaliland. With the help of illustrations to teach risk awareness and prevent accidents, the facilitator covered different types of firearms and dangerous situations. The participants then contributed personal experiences and stories from their communities. In one instance, a boy and his sister were home alone and found a gun. They played with it, and the girl put her finger in the barrel while the boy pulled the trigger. The girl survived but lost her lower arm. Another man's father accidentally shot himself while trying to set a trap for a wild animal that was eating his goats. Still another young man almost killed his sister when he accidentally fired his father's gun. Fortunately, the bullet only grazed her head.*


In collaboration with local communities, DDG has developed safe-storage devices, such as this gun clamp as well as boxes for pistols and ammunition. The devices are locked with a padlock and chained to the foundation of the owner's house, and they have proven very succesful in preventing accidents and theft.


Inhabitants of Adan Abokor village in Somaliland attend a Firearms Safety Education workshop by DDG. The workshop teaches safe handling of firearms and sensitizes communities to the dangers of keeping firearms in the home.

group of eight goals that range from halving poverty and hunger to reducing child mortality and providing universal education by 2015.[4] More than 100 states signed the declaration so far, thereby committing to strengthen efforts to reduce and prevent armed violence, nationally and internationally.

As a guideline for policy, the Organisation for Economic Co-operation and Development created a tool, the Armed Violence Lens, which addresses firearms (instruments), the perpetrators of violence (agents) and the institutions that help sustain a culture of armed violence from national to global levels.[5] DDG also used OECD's Armed Violence Lens in the development of its Community Safety program, a comprehensive approach that not only deals directly with the prevention of physical damage but also helps people cope with the psychological aspects of violence, including feelings of stress and anxiety regarding perceived accidents and threats. Feelings of insecurity can be as devastating as the actual presence of danger. Finally, mitigation and successful resolution of conflicts is achieved through conflict management and cooperation with local law enforcement. DDG also deploys the Community Safety program in the rest of Somalia, including Puntland, and in other countries such as South Sudan, Uganda and Yemen.

### Firearms in Somaliland

In Somaliland, many families view firearms as a necessary means of defense. A 2009 DDG survey showed that 74 percent of Somaliland homes contained at least one firearm.[2] Although Somalia, including Somaliland, is one of Africa's most ethnically homogenous countries, it has a long history of fighting between different clans and subclans for territory, livestock and other resources. Clans are, in essence, extended families and can divide into several subclans or even sub-subclans and so on. The land is arid with little rainfall, and struggles between clans and within communities often revolve around control of scarce resources. If a clan or community is wronged, retaliation is expected, often drawing out conflicts for extended periods of time with extensive casualties until an agreement of compensation has been reached. These outbreaks of armed conflict have long been part of everyday life, especially in the rural areas of Somalia and Somaliland. Technological advancements in weapons manufacturing and years of civil wars throughout Somalia have replaced clubs and axes with pistols and AK-47s. The added destructive potential of these weapons, coupled with limited knowledge of the workings of firearms, results in thousands of accidents every year.

*In the village of Adan Abokor, most homes have had safe-storage devices installed and many have received firearms safety and conflict-management training. At the workshop, Yousuf Liswar, a teacher and community-safety volunteer, explained how the locals used to store their firearms, "In the past, we simply covered our weapons with a piece of cloth and hid them inside the houses or in holes or shrubs and we never felt completely safe doing that."*

*As the session came to a close, a woman stood up and spoke, "Our homes are scattered throughout the bush and are far between. We often need to visit our relatives and run errands when doing our domestic chores, and we used to feel very uneasy leaving the kids alone. Now we feel much safer and can do our work without fear of accidents."*


Years of war have resulted in a massive spread of firearms to civilian populations in Somalia, including the self-declared Republic of Somaliland. For many families, having a gun in the home is seen as a necessity to protect family and property. DDG addresses the problems associated with such a high frequency of gun ownership through its Community Safety program.

Part of DDG's community-safety work is to educate the local population on the dangers of keeping firearms at home and to teach safe handling and storage. For this purpose, DDG distributes safe-storage devices, including gun locks for rifles and metal boxes for pistols, both secured by padlock and chained to the foundation of the house. Their purpose is threefold:

- Prevent accidents in the home
- Guard against theft
- Create a barrier between the weapon and its user that gives time for reflection and second thoughts, especially when coupled with conflict-management techniques

Forcing people to disarm completely proves disastrous in many parts of the world, since it is often carried out selectively and without credible and accountable governmental security for the disarmed population afterward, making these populations vulnerable to attack. As a result, people see firearms possession as a necessary means to protect families, communities and possessions. DDG has had great success reducing violence by securing firearms with safe-storage devices and simultaneously providing alternatives to violence through education, conflict-management training and the establishment of safety committees at community and district levels.

## Conclusion

Privately held firearms are not likely to diminish any time soon in Somaliland, because weapons are perceived as necessary tools for protection. The normalization of violence has resulted in desensitization to the dangers they pose. Statistics of firearms-related incidents, however, reveal significant reasons to address the issue. Mines and ERW still pose a threat to security, but in most parts of Somaliland, where the high-risk minefields have been cleared, the physical and psychological impact of SA/LW safety remains significantly higher. A 2010 survey of DDG's Community Safety program showed a 47 percent increase in the number of respondents who said that the level of armed violence had decreased compared to the previous year, based on 509 households in 11 communities.[3] At the same time, only two percent of respondents had a firearms-related accident in the first year after the program launched compared to 14 percent before the intervention.[3]

*See endnotes page 82*

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Continent of Africa with Somalia in brown.
*Map courtesy of CISR.*

# Priority-setting in Mine Action: Getting More Value for the Investment

This article presents an overview of the main elements and key challenges involved in implementing sound national prioritization systems in mine-action programs. Since all mine/explosive remnants of war-affected countries are different, the article does not provide a standard blueprint; rather, it introduces the basic principles, components and considerations involved in prioritization. This will be valuable when implementing and designing priority-setting systems that cater to national and local contexts in each mine-/ERW-affected country.

by Albert Souza Mülli and Ted Paterson [ Geneva International Centre for Humanitarian Demining ]

Few topics are as hotly debated within the mine-action industry as prioritization. What actions should be done first? Which tasks should receive the most resources? Who should set the priorities: mine-action experts, government officials, people in affected communities or perhaps donors? How should the quality or effectiveness of prioritization be assessed?

This debate is warranted. The aim of priority-setting is to get the most value-for-money possible. The most important issue determining whether a national mine-action program performs well—whether it delivers good value-for-money—is not the quality of its survey and clearance technology, how hard its staff works or even how well-trained its managers are; rather, the most important issue is whether the program is doing the right tasks. Prioritization is about selecting the right actions and dedicating the necessary resources on a timely basis to ensure tasks are accomplished as efficiently as possible.

*"Achieving good value-for-money is essential for an effective and efficient national mine-action program to meet a country's strategic goals."*

A number of programs have experimented with approaches taken from decision theory and risk management, including Multi-Criteria Analysis and the PROMETHEE method—the most sophisticated technique applied to mine action thus far.[1,2,3,4,5] Through such experimentation and debate, many mine-action centers and operators have developed what appear to be good systems for setting priorities, with well-conceived criteria and opportunities for input from multiple stakeholders, including people in mine-affected communities.

However, an examination of how well mine-action priorities match country needs often leads to very disappointing outcomes, even in well-established programs in which each operator has seemingly sound prioritization procedures. For example, in one country, only 4 percent of a recent year's demining efforts took place in the most-affected communities (i.e., those that experienced multiple casualties in the previous three years). How could this occur in a country with experienced operators and a consensus that casualty reduction should be one of the most important criteria for determining demining priorities?

In Cambodia, for example, Mine Action Planning Units are provincial government units created in the most mine-affected provinces to assist in the identification of demining priorities and the formulation of provincial mine-action plans. The main task of MAPUs is to work with villages and communities to identify local demining preferences, but the actual pattern of clearance has little relationship to community preferences. As a result, in 2000, only 56 percent of the area planned for clearance was actually demined; the number increased in 2001 and 2002.[6,7]

### What's the Problem?

Prioritization is an effort to match resources with people's preferences, aimed at delivering the greatest possible benefits with the resources available. A key problem in mine action is that those providing the resources generally are not the ones who will benefit from mine-action services. Most resources come from donor countries and are delivered through a chain of intermediaries (United Nations agencies, international firms, nongovernmental organizations, local governments, etc.) before reaching affected communities and individuals.

Train-the-trainer workshop in Cambodia.
*Photo courtesy of Elke Hottentot.*

Even if each donor, U.N. agency, operator, etc., in the chain effectively sets its priorities, the national program's results are almost certain to be disappointing, unless national authorities (or the U.N. where it has been asked to take overall responsibility) can create and enforce a prioritization system for the overall national program.

Put simply, sound priorities for individual projects or programs will not add up to a sound set of national-program priorities, unless some agency has the authority to assess the overall package and convince or require individual donors and operators to make adjustments.[8] Achieving value-for-money demands a coordinated program-wide approach.[9]

### Toward National and Regional Prioritization Systems

Most national mine-action programs already have sound procedures for making decisions regarding which tasks to complete first. Local or regional prioritization deals mainly with identifying tasks that will produce the largest expected benefits and assigning resources to those specific tasks. While this local prioritization is crucial to ensure a national mine-action program's tasks are carried out effectively and efficiently, it will not deliver high value-for-money unless a broader system is in place to ensure the bulk of resources are allocated to the most heavily impacted areas.

National prioritization is concerned with how resources will be allocated among geographic areas, program components, operators, etc., whereas local prioritization is the determination of which specific tasks to complete first, once the resources are allocated at the national level. If a national mine-action program delivers value-for-money, the processes and procedures put in place for national and local prioritization must be interlinked and coordinated. Therefore, prioritization must be viewed as a system of inter-connected decisions across different levels. After all, assigning resources


Site visit outside Battambang, Cambodia.
*Photo courtesy of Pehr Lodhammar.*

to any one task will invariably make them unavailable for other tasks, so a broader perspective is required to ensure each piece fits together.

A national priority-setting system invariably includes actors, resources, information, a structure, processes (i.e., where, when, by whom and how decisions are made) and policies. A good priority-setting system must be informed by the following:

1. Consideration for the interests of relevant actors to make the right decisions
2. High-quality, relevant and complete data
3. Regular analysis of the data to guide decision-makers

Strategic, operational and task requirements are the three necessary levels of prioritization. Strategic priorities should be established at the headquarters of the national mine-action program and should take into account the preferences of all stakeholders; however, allocations must also be in line with national development priorities. Mine action is a means to an end, not an end in itself. Therefore, strategic priorities should be set according to broader political, economic and social priorities in the country as a whole. Operational priorities should be determined by the relevant program manager, who should identify priorities using relevant data from analysis of non-technical or technical surveys and the expressed perceptions of at-risk communities and landmine victims.

Afghanistan offers an example of successful prioritization. In 2009, the Mine Action Coordination Centre of Afghanistan found hundreds of minefields close to communities. These minefields were known as "low hanging fruit," because mine removal was considered an easy task—MACCA had the necessary equipment available. However, these areas remained for more than two decades without clearance. The minefields' small size deterred teams from clearing the area, since the fields would lower their productivity targets. However, after realizing this problem, MACCA instructed operators to establish small teams and created new productivity standards for small fields, giving "low hanging fruit" locations a priority.

Different program components and operators sometimes have diverging priorities, but in order for the national mine-action program to operate in a sensible and coordinated fashion, headquarters is responsible for ensuring that all three priority levels add up and fit well together. Ensuring these requirements are met usually depends on clear guidance from the national mine-action authority of the national government; a clear-cut list of strategic objectives will allow decision-makers at all levels to understand essential tasks. A national policy, even a simple one, is crucial to determine who does what, by which processes and through which structure.

### Sustainability and National Ownership

Sustainability is key to ensuring that a priority-setting system continues to function beyond the presence of the international community. The most important governmental processes for prioritization are planning and budgeting, but many mine-/ERW-affected countries lack proper planning and budgeting systems, particularly in the immediate post-conflict period. As a result, many mine-action programs are

set up as "parallel systems" (i.e., separate from the host government's own planning and budgeting systems), making the eventual transfer to national authority long and expensive. For this reason, mine-action officials need to understand that, even in cases where proper national planning and budgeting systems are not in place, they should align the priority-setting system with whatever national structures exist or ensure that this alignment occurs in the very early stages of transition to national ownership. If not, the essential capabilities of the mine-action program will probably not be sustained.

### Establishing and Adapting a Prioritization System

Mine-action officials need to be aware that a country's mine-action program will encounter significant changes as it transitions from post-conflict to reconstruction and eventually, development. As the political, social and economic environment evolves, people's needs change and priorities need modification.

Mine-action organizations should always focus on directing the most resources to support the most strategically important efforts identified by all relevant stakeholders at any given point in time, which may mean that during post-conflict stabilization, mine-action services will center on clearing roads or key infrastructure. However, as life returns to normal and previous mine-action efforts have helped return children to school and enabled access to key roads, priorities should align with longer-term development requirements, including shifting resources to demining agricultural land or land for natural-resource extraction (e.g., mining).

International actors will also play a smaller role as transition progresses. In a conflict's immediate aftermath, outside funding and expertise may be crucial for emergency clearance and risk-education services, but as a country moves from conflict into reconstruction and development, national ownership becomes increasingly important. Mine-action officials should expect rising levels of national ownership and more input from different government levels, from the national to the provincial, with local governments gradually assuming more responsibilities. As a result, international actors must switch from an operational focus to a capacity-development focus and should prepare for the mine-action program's full indigenization, including by providing operations and senior-management training to local mine-action and government officials.

### Conclusion

Achieving good value-for-money is essential for an effective and efficient national mine-action program to meet a country's strategic goals. In an environment where international donors try to get more results for money spent, well-coordinated program-wide priority-setting systems are critical to a national mine-action program's performance.

For a more detailed and comprehensive understanding of prioritization, see the first four of the Geneva International Centre for Humanitarian Demining's "Priority-Setting in Mine Action" Issue Briefs series, available on the GICHD website (http://snipurl.com/23jixsi). The objective of the series is to assist mine-action programs in achieving greater value-for-money by designing and implementing sound priority-setting systems. The Briefs enable mine-action officials to design and implement prioritization systems suitable to their respective place and time and adaptive to their changing national contexts.

*See Endnotes Page 82*

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# Canadian Scientist Receives Grant to Continue Developing Innovative, Low-cost Prosthetic

Economically impoverished survivors of landmines and explosive remnants of war not only face psychological and physiological trauma but also economic upheaval as they may not be able to continue previous professions, especially those involving physically taxing work such as farming, manufacturing or construction. Furthermore, a survivor of a mine-related accident "typically requires amputation, multiple operations and prolonged physical rehabilitation," all of which are extremely time-consuming and costly.[1] The reality is harsh for many landmine and ERW survivors in the developing world who lack access to adequate health care and safe, effective and affordable prosthetic limbs. Thus, one of the most fundamental questions facing victim-assistance practitioners is how to produce low-cost and robust prosthetics for underprivileged amputees around the world.

For trans-femoral (above-the-knee) amputees, the outlook may be brighter. For the past six years, Jan Andrysek, an assistant professor at the Institute of Biomaterials and Biomedical Engineering and scientist at Holland Bloorview Kids Rehabilitation Hospital in Toronto, Canada, has been developing the Low-Cost Prosthetic Knee Joint, also called the LC Knee.[2] Through a barrage of computer modeling, testing and optimization, Andrysek has developed a prosthetic that costs US$50—considerably more affordable when compared with other prosthetics, which may cost as much as $3,000.[2]

Developing an affordable and effective prosthetic is immensely difficult. The prosthetic must be durable so that constant and costly repairs are not needed, but it must also use cheap and available resources so that impoverished amputees in the developing world can afford to purchase it. The prosthetic should also be lightweight so that the amputee's mobility is not inhibited, but it should be heavy enough to withstand weathering and difficult terrain. The prosthetic must provide adequate weight-bearing stability so as not to inhibit the patient's natural gait or stride.[3]

To facilitate low-cost production and higher functionality, Andrysek employed topological optimization, a process that tests the durability of objects through various degrees of deformation and pressure.[4] Through topological analysis of various knee configurations, one design provided superior strength-to-weight ratios, allowing Andrysek and his team to use cheaper thermoplastic polymers while maintaining the same level of durability as more expensive prosthetics. To address stability and gait issues, the team employed a new "stance-phase control mechanism," which allows patients to stand securely without sacrificing their natural walking stride.[3] Most prosthetics in the developing world use outdated manual-lock knees, which only lock by fully extending the limb. These traditional prosthetics are cosmetically inferior, as patients must walk with "stiff knees," and functionally inhibiting, as patients' strides are limited to avoid unintentionally locking the knees with an extended step. Andrysek's model, however, "automatically locks and unlocks itself depending on how the person is putting their weight on the limb," allowing the patient a more natural gait.[2] Initial testing also revealed that the LC Knee improves the patients' mobility, as they can walk faster with less effort and less energy.[3]

"We can now mold all the pieces for a knee for about $15," says Andrysek.[2] Using an optimized design, he and his team use inexpensive thermoplastics that can be mass-produced with injection-molding techniques. The injection-molding technique essentially consists of pouring melted plastic into a mold where the plastic sets into its final form.[5] This quick and efficient process allows for the cheap manufacture of parts;

however, topological optimization of the design attempts to counter any sacrifice in performance that may associate with thermoplastic molding.

Thus, Andrysek and his team are well on their way to creating affordable and effective prosthetics for landmine victims and other persons with disabilities around the world. Their mission was further bolstered in February 2012 when the group received one of 15 US$100,000 grants from Grand Challenges Canada, an organization that promotes innovative projects to address health-care needs in the developing world. Andrysek and his group of researchers plan to use this money to continue testing the LC Knee in the developing world—Colombia, Ethiopia and Nicaragua, in particular.[2] Regardless of socioeconomic status, amputees worldwide will again inexpensively enjoy the freedom of mobility.

*~ Jeremiah Smith, CISR staff*

*See endnotes page 83*

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Research scientist, Jan Andrysek, displays the low-cost mechanical prosthetic that he created at the Holland Bloorview Kids Rehabilitation Hospital in Toronto, Canada. *Photo courtesy of Rick Eglinton/Toronto Star.*

# In Remembrance: Kaido Keerdo
## Estonian Demining Expert Killed in Libya

As efforts to clear landmines and other explosive remnants of war from Libya continue, international deminers risk their lives to eliminate the risks to people in the area. On 3 March 2012, a suspected Type 84 anti-tank mine, a Chinese-made cluster munition, killed civilian contractor Kaido Keerdo in Dafniya, 180 kilometers (112 miles) from the Libyan capital of Tripoli.[1,2] Although Estonia's Government has not deployed any demining specialists to Libya,[3] Estonian mine-expert Keerdo was working for DanChurchAid as a demining technician after having served six years with an explosive-ordnance disposal unit in the Estonian military.

On 1 March 2012, alleged in-fighting among Libyan militias caused a rocket-propelled grenade to strike a shipping container that housed munitions.[1] Hearing of the skirmish while traveling to a different clearance task, Keerdo and his team insisted that the site be evacuated, as one of the containers was still smoking.[1] Returning a day later, despite having the day off, Keerdo and his team assessed the area, found several Type 84 submunitions and surrounded the explosives with sandbags.[1] Whereas most anti-tank mines are buried by hand, the Type 84 AT mine is a scatterable cluster munition deployed via airborne rockets. It remains above ground, scatters submunitions over a wide area and relies on a magnetic fuze to detonate its internal explosive charge.[1] On 3 March 2012, Keerdo and his team returned to the site to determine how best to dispose of the explosives. Members of Keerdo's team say that he climbed to the roof of a nearby building to survey the area when, roughly 100 meters (328 feet) away, Keerdo's team heard an explosion and later found him dead.[1]

Experts believe a Type 84 submunition is responsible for Keerdo's death, as his team previously saw submunitions and rocket carriers scattered in the vicinity of the exploded shipping container. Moreover, pieces of a detonated submunition were also found near Keerdo's body. DCA spokeswoman Helen Rits told *Agence France-Presse* that Keerdo was killed "disposing of a charge."[3] Tragically, a few days prior, Keerdo was quoted as saying that he intended to leave the demining scene since he thought the work was too dangerous.[1]

Although Keerdo had only worked with DCA for three months, he encountered the Type 84 before.[1] In January 2012, he found a Type 84 outside Dafniya, cordoned off the area and used explosives to detonate it. Incidentally, the explosion left the fuze of the mine intact.[1] Unable to determine whether the rocket carrier that was still attached to the mine carried additional submunitions, Keerdo and his team buried two large explosive charges in two trenches on opposing sides of the carrier and left a "crater" where the Type 84 mine had been.[1]

Keerdo's death signifies the ongoing struggle to remove the landmines and ordnance remaining from Moammar Gadhafi's regime. Since the dictator's death, authorities within the Libyan National Transitional Council have requested foreign mine-action experts to help with clearance. Keerdo's death marks DCA's most serious casualty since two of DCA's international deminers were injured in Misrata in November 2011, also by a Type 84 submunition.[1]

*~ Blake Williamson, CISR staff*

*See endnotes page 83*

Kaido Keerdo preparing UXO for destruction in Dafniyah, Libya.
*Photo courtesy of Marcus Rhinelander.*

# RESEARCH & DEVELOPMENT

Research and Development Section Sponsored by

# Environmental Simulations for EOD Shaped Charges

This article describes the methodology and importance of environmental simulations and testing of shaped charges used for the disposal of explosive remnants of war and landmines. The author discusses a single sequence of tests conducted on a specific product as an example of the depth to which environmental factors should be investigated in order to address them before final production and manufacture.

by Reto Liechti [ Saab Bofors Dynamics Switzerland, Ltd. ]

Vibration caused by transportation, temperature changes and the natural aging process, as well as other environmental factors, can impact the safe operation of a product. Assessing environmental effects on a product can be time-consuming and expensive. However, in the case of explosive ordnance-disposal equipment, environmental simulations and testing are basic tools for the scientific investigation and production of safe new products.

## The Need for Environmental Simulations

When handling explosives, safety and reliability are key factors for a successful mission. In demining operations with *in situ* disposal, shaped charges are often used, especially when inducing deflagration of submunitions (cluster bomblets). Thus, using shaped charges speeds up operations and minimizes hazardous risks to deminers.

Many shaped charges are available on the market. Any of these charges used in the field can cause harm if not used properly. The shaped charges referred to in this article are proven through a program of extensive environmental tests, not only in their development phase but also throughout the manufacturing stage. These environmental test programs include assessment, clearance checks (to ensure operators can handle them) and transport-vibration checks (to test for worst-case land, sea and air conditions). Environmental tests also consider extreme environmental aggression such as rapid and extensive changes in temperature, pressure, humidity and adverse immersion environments such as sand, dust storms and water. These tests guarantee the product can withstand different circumstances and provide full performance until the end of its anticipated life cycle.

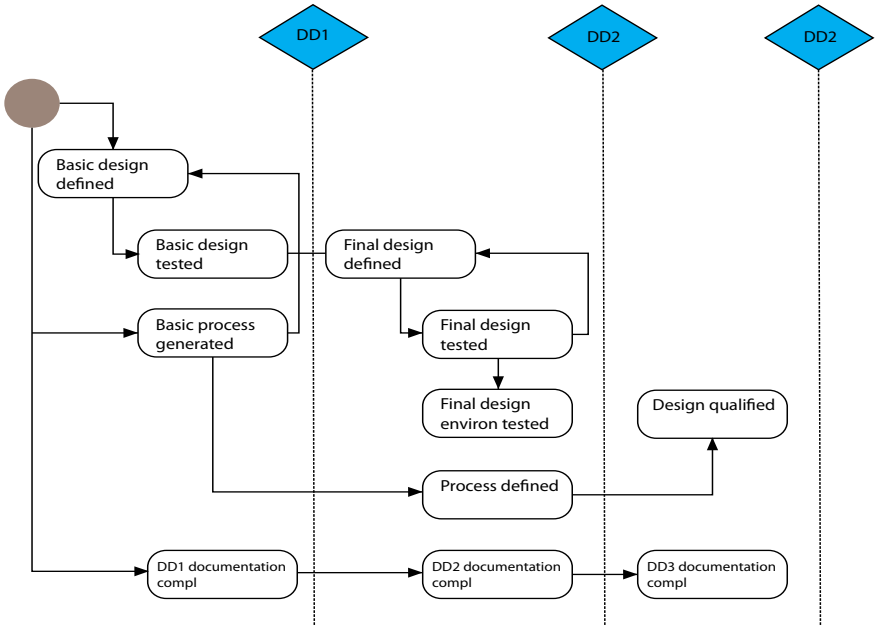



Figure 1. Diagram of development phases.
All graphics © Saab Bofors Dynamics Switzerland Ltd./CISR.

## Development Phase

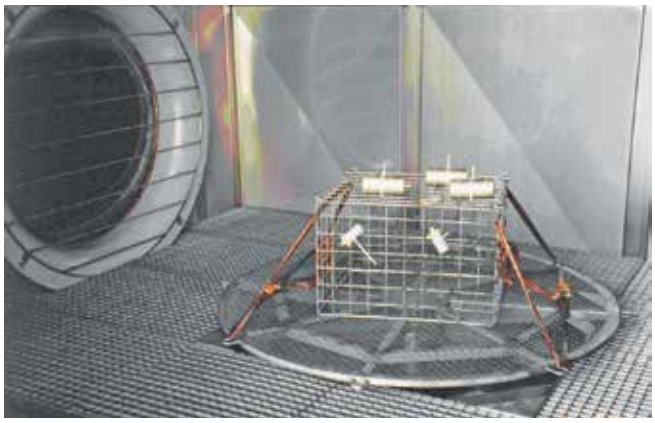
Environmental simulations are often performed either before a product is in its early development phase or when a product is about to enter the market and go into service. Development phases are usually detailed programs with a number of activities and individual phases that some countries refer to as a series of Design Definitions. The content for each DD phase varies from one project to another but generally takes the form as illustrated in Figure 1.

## Test Program

A test program can be performed with many individual and independent experiments that focus on individual test events. These tests do not represent real circumstances, and therefore a test program combines a variety of tests and possible scenarios either in parallel (each test performed independently) or in a sequence. Combinations are the most common and realistic approach. Figure 2 (right) shows six typical test sequences which are performed in parallel for the SM-EOD 33[1] explosive shaped charges. Each sequence can vary in the number of tests, and this example shows one or two tests in each sequence followed by an X-ray inspection and a static detonation at the end of each sequence.

## Sequence

In order to discuss a sequence for environmental testing, one sequence of the tests will be more closely examined now. Each test is dependent on its predecessor. With this dependence, potential failures can be summed; this summation results in better estimates than the product's mechanical limit of the product (see Figure 3 page 72).



Images 1 and 2. Rain plant setup.
*All photos © Saab Bofors Dynamics Switzerland Ltd.*

## Standards and Specifications

All tests should be according to certain test-method type standards such as:

- MIL STD 810[2]: Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests
- MIL STD 331[3]: Department of Defense Test Method Standard for Fuze and Fuze Components, Environmental and Performance Tests
- STANAG 4370[4]: Environmental Testing (AECTP 300[5] & 400)[6]
- IEC 60068-2-Series[7]: Environmental Testing

### Vibration Test

High-cycle fatigue materials performance[8] is commonly characterized by an S-N curve (S = stress, N = cycles to failure), also known as a Wöhler-curve. A vibration test simulates the effect with vibrations often experienced during transportation and operation. The test attempts to cover all occurrences the product will encounter during its product life cycle. In the case of explosive charges, the more intense the vibration environment, the faster the aging process occurs and the higher the possibility of discovering cracks and gaps in between the explosive filling and the mechanical body.

X-ray inspection will prove if the vibration tests had any influence see Figure 3). In this illustrative example, the procedure is undertaken according to MIL STD 810E, method 514.4, category one (basic transportation) with the following characteristics:

Vibration test specifications.

| | |
|---|---|
| Configuration | Products in original packaging |
| Vibrator V 964 | Horizontal, transversal and vertical axis vibrations |
| Frequency | 10 - 500 Hz/1.04 g |
| Testing time | 1 h per axis (3 axis) |
| MIL STD | MIL STD 810E, Meth. 514.4, Fig. 514.4 -1 |
| Number of test pieces | n = 30 – batch no. 2050 – 2079 |
| Packing | Wooden box no. 047 with polystyrene-foam |
| Temperature | Room temperature |

## Rain Test

The rain test simulates a strong rainfall on the field. In this illustrative example, a method of a 360-degree rain toward the product with specific intensity for a certain time was chosen. The details are as follows:

Rainfall test specifications.

| | |
|---|---|
| Test order-No. | 4182 09682 and 4185 09690 |
| Used facility | Rain plant No. 80 |
| Frequency | 10 - 500 Hz/1.04 g |
| Type of test | Rain test unpacked |
| MIL STD | According to 810D, meth. 506.2 |
| Rain quantity | 100 mm/h, wind velocity 18 m/s |
| Duration | 30 min. |
| Rotary table | Turning |

The rain test determines the effectiveness of seals and cases in preventing water penetration. The test also shows the product capability to satisfy performance during and after exposure to water.

## X-ray Inspection

An X-ray inspection is performed after each individual environmental test in a sequence. It is a real-time nondestructive subsurface inspection and shows the product's internal characteristics. The inspection is a dynamic 360-degree live image where the object is rotated in front of the X-ray source. During a visual inspection by trained operators, the X-ray will indicate any hairline cracks or air gaps.

The advantage of the X-ray inspection is that no harm will reach the product, but it will provide full information about the object's density, which is directly linked to quality and performance. Any cracks or gaps detected would expectedly have a negative impact on product performance and accuracy.

## Performance Test

In addition to all previous tests, a final performance test simulates a mine or unexploded ordnance-disposal operation where, for instance, a mine body or artillery shell requires penetration before deflagration or detonation. The setup for such a performance test with a defined target can utilize multiple rolled homogenous armor plates as shown in the Images 4 and 5.[9] The penetration will show any performance problems such as variation, dispersion or inadequate penetration of the jet's tip that may not be detectable in any of the previous tests. The requirements for the performance penetration test are that it must be reproducible and permit comparisons to identify penetration performance, which is the most important testimony of a high-quality product. In the field, high accuracy and reproducibility will permit fast intervention and safe and successful operations.

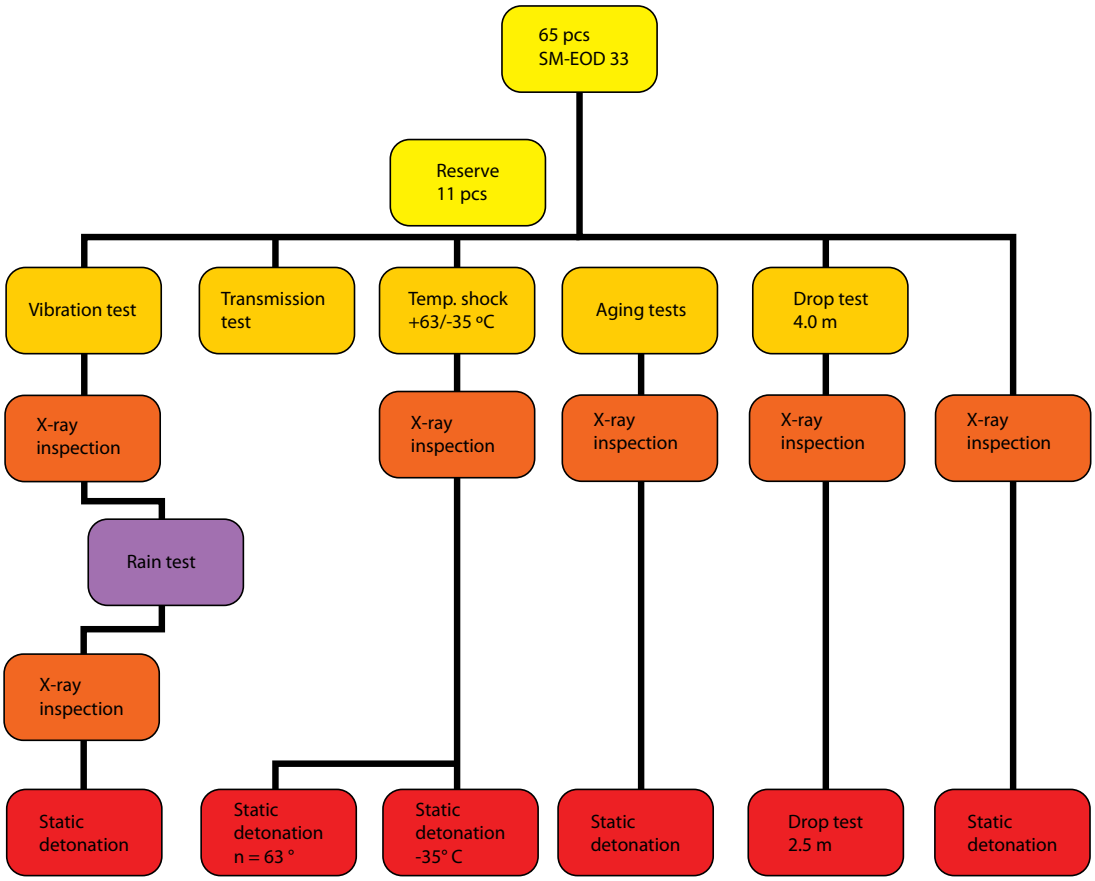



Figure 2. Example of a test program.

Performance test specifications.

| | |
|---|---|
| Test order-No. | 33, charge 18 |
| Used facility | Bunker No. 3 |
| Type of test | Rain test unpacked |
| Test temperature | + 7° C (44° F) |

## Additional Tests

In addition to the tests described above, the SM-EOD 33 products are subject to:

- Sand and dust tests
- Heat and cooling tests
- Water dip tests
- Visual structural inspections
- Weight inspections
- Size and density inspection of explosives

Image 3. Dynamic X-ray inspection.

## Independence

Environmental simulation and testing can have a higher credibility if a neutral, independent company performs the testing and analysis. An external laboratory without any affiliations to the supplier is common. However, not all laboratories can undertake tests with explosives, which in the case of explosive products, limits the number of test suppliers available.

## Conclusion

This article discusses a single sequence of tests conducted on a specific product as an example of the depth to which environmental factors should be investigated in order to address life-cycle problems before final production and manufacture.

In the early development phase of most products, environmental simulations and testing can uncover potential future risks and reduce the eventual time to market. Simulations and testing can improve designs and ensure the product is safe and reliable throughout its full life cycle. These environmental assessments can be time-consuming and expensive, but assessment prior to product use in the field is more economical and ethical than marketing untested products that may result in considerable damages and loss of life.

*See endnotes page 83*

Images 4 and 5. Penetration performance witness.

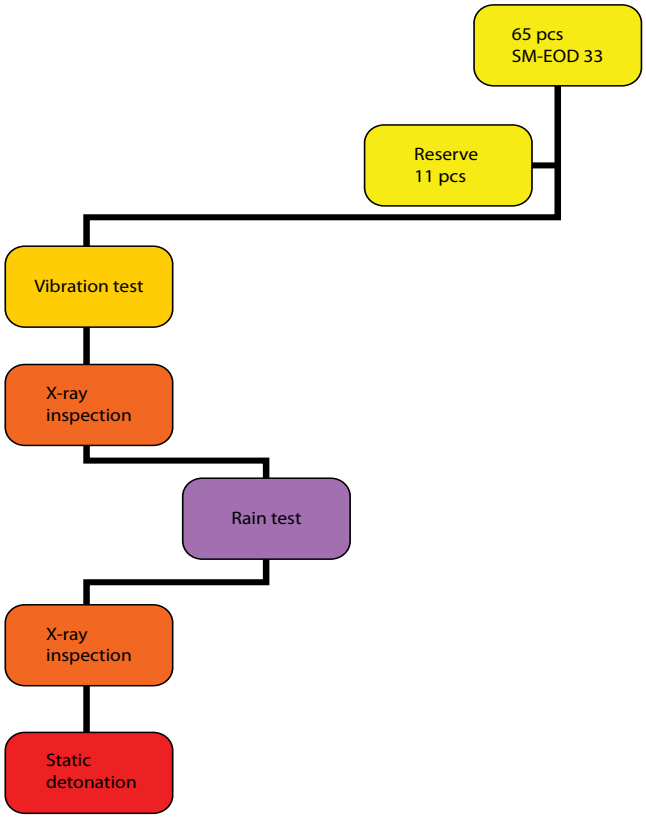



Figure 3. Single sequence of test program.

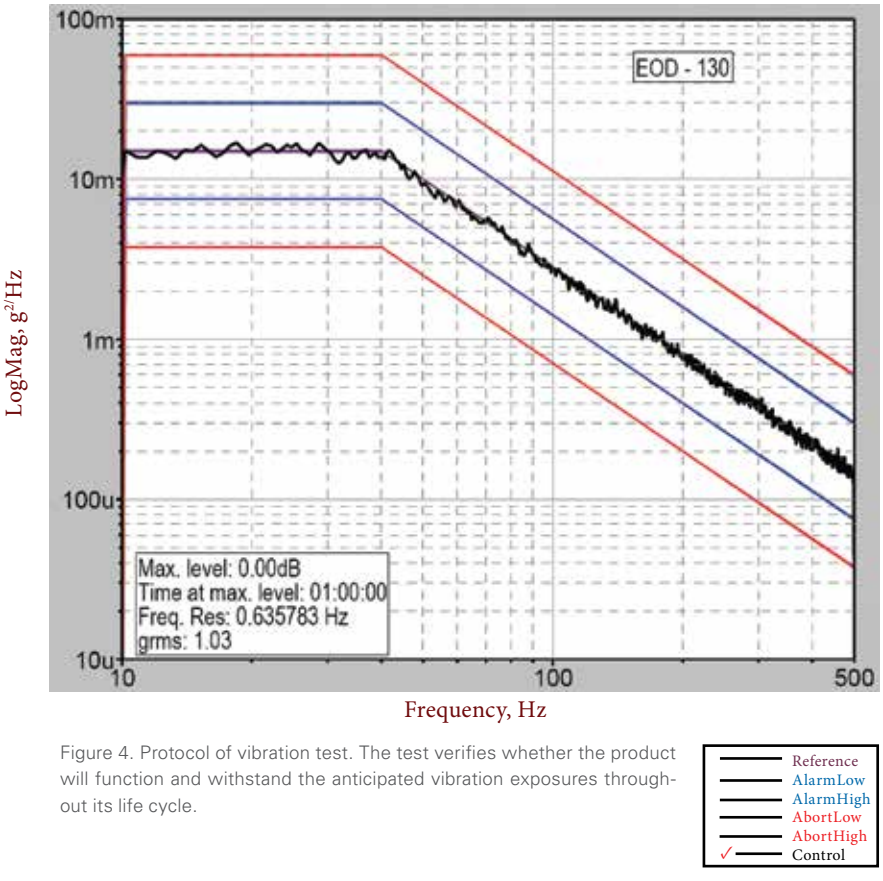



Figure 4. Protocol of vibration test. The test verifies whether the product will function and withstand the anticipated vibration exposures throughout its life cycle.

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# Environmental Determinants of Landmine Detection by Dogs: Findings From a Large-scale Study in Afghanistan

This article's purpose is to examine the strengths and weaknesses of mine-detection dogs in different environments. The experiments employed a total of 39 dogs in Afghanistan between October 2002 and July 2003. The results are discussed here.

by Dr. Rebecca J. Sargisson [ University of Waikato ], Dr. Ian G. McLean [ Consultant ], Dr. Jennifer Brown [ University of Canterbury ] and Håvard Bach [ Norwegian People's Aid ]

Image 1. Dog, handler and supervisor; observer with camera in the background.
*All photos courtesy of the authors.*

Mine-detection dogs were first used during and after World War II and have been used with increasing frequency in Afghanistan since the first humanitarian mine-clearance operations began there in 1989.[1,2] Employing dogs to detect landmines and explosive remnants of war is comparable to the use of dogs to detect cryptic animal species, such as ground squirrels, which occur at low densities and tend to burrow underground.[3] Dogs may offer advantages over other methods of detection in these situations due to their ability to cover large land areas more quickly than other detection methods, while minimizing damage to fragile ecosystems.[4]

Given the long history of mine-detection dogs, it is reasonable to assume that the limitations on their use as mine detectors are thoroughly understood. Unfortunately, little research accompanied the original training and deployment of dogs as mine detectors. Essentially no published research existed on the principles underlying a dog's ability to detect mines before the Geneva International Centre for Humanitarian Demining began its work in 2000. Handicap International's 1998 review of the use of mine-detection dogs for humanitarian purposes appears to be the first significant review on the subject, and it concentrates primarily on operational issues.[5] In 1999, a meeting to discuss the use of dogs as mine detectors convened in Ljubljana, Slovenia, and the mine-dog community formally recognized the general absence of information for the first time.

Mines are routinely found in difficult and variable environmental situations. Therefore, the environmental influences on any detection technology should be understood and the constraints defined. Specifically, for any mine-clearance technology, it will be valuable to define the environmental conditions under which detection reliability declines or the limits beyond which the technology should not be used. This study was designed to sample the full range of conditions under which dogs are utilized in hot, dry, semi-desert environments in order to determine the ideal conditions in which to use dogs.

Mines were laid in an unused golf course near Kabul, Afghanistan. Dogs from the Mine Dog Centre were filmed while attempting to detect those mines using normal operating procedures. Weather conditions were recorded in the long-term and at the precise moment that a dog crossed a mine. These data enabled us to link detection success to context (season, vegetation) and weather (wind speed, temperature, humidity) during the search.

## Method

**Participants/subjects.** A request for dogs was made through the Monitoring Evaluation Training Agency ahead of each proposed experimental trial, and the research team was normally assigned eight dogs and handlers and two supervisors for the period of the trial (one working week of six days).

A total of 39 dogs (22 male and 17 female) were used in the five trials. Of the 39 dogs, 28 were German Shepherds and 11 were Malinois (Belgian Shepherds). The average op-

Image 2. Datum recorders with portable weather station (the temperature gauge is shaded by the box).

erational experience was 3.4 years (s.d. = 1.7). The average number of strips searched by one dog was 3.8 (s.d. = 1.9, range 1-11). "Strips" are defined below.

None of the 39 dogs shared a handler. All handlers were male with an average operational experience of 5.4 years (s.d. = 3.9).

One dog, Axel, was used in October 2002 and July 2003 (when four dogs were employed for the entire trial); this dog searched an unusually high number of strips (11). All other dogs were used for one trial only.

During operational search in Afghanistan, a handler and dog work closely with a supervisor who observes the search and monitors details such as ground missed by the dog (see Image 1). This practice allows the handler to concentrate on the details of the dog's search behavior, while the supervisor has a broader view to ensure complete coverage of ground and safety.[6] The experimental trials employed the same practice.

The researchers supplied two teams, between two and four people each. The observer used a video camera to record the dog throughout the search and verbalized details of the search into a microphone connected to the camera (see Image 1). The datum recorder ensured that weather data were noted when the dog crossed a mine (see Image 2).

Thus, at any one time during a trial, two pairs of teams worked: a **dog team** consisting of dog, handler and supervisor; and a **research team** consisting of observer and datum recorder(s) (see Images 1 and 2).

| Mine | Origin | Explosive | Weight of explosives | Weight of mine |
|---|---|---|---|---|
| **P4AP** | Pakistan | Tetryl | 30 g | 140 g |
| **Type 72 AP** | China | TNT | 50 g | 140 g |
| **YM1** | | RDX | 50 g | 190 g |
| **PMN2** | State factories | TNT/RDX | 100 g | 420 g |
| **PMN** | State factories | TNT | 240 g | 550 g |
| **P3AT** | Pakistan | TNT | 5 kg | 7 kg |
| **TC-6** | Italy, various | TNT/RDX | 6 kg | 8.4 kg |
| **TM57** | State factories | various | 6.3 kg | 8.5 kg |

Table 1. Mine types, names and sizes used in the Kharga test field.[7]

Image 3. The Kharga site showing an old pond (center right), a demining clearance site (center left) and the old golf-course clubhouse. Kharga dam in the background.

**The site.** The test field was established in a steep-sided valley at Kharga, 15 km north of Kabul just below a reservoir dam (see Image 3). The site was originally established as a nine-hole golf course as part of a larger recreational and commercial development. In previous history, it was a battlefield. When GICHD first visited the site in 2001, a crater from a large bomb was in the middle of the site, some artillery pieces were stored on site and most of the buildings were destroyed.

Prior to establishment as a research minefield, the site was searched using MDC's dogs. The dogs found some explosive items; a large number of indications at which nothing was found suggested that considerable explosive contamination occurred on-site. Battlefield clearance was conducted in the hills surrounding the site during early 2003.

Up to 30 cm. of topsoil was therefore removed from about two-thirds of the site prior to the test mines being laid, with the aim of removing most of the contamination left by the partially exploded bomb. After topsoil removal, the site was cleared using dogs, and the indication rate was considerably reduced. Although not ideal for the trials, the site was realistic, because dogs routinely work in highly contaminated situations in Afghanistan. The MDC training area in Kabul where the dogs are trained is also a highly contaminated site.

| Mine type | 0 | 7.5 | 15 | 20 | 25 |
|---|---|---|---|---|---|
| **P4AP** | 0 | 1 | 3 | 0 | 2 |
| **Type 72 AP** | 4 | 4 | 8 | 4 | 4 |
| **YM1** | 0 | 4 | 4 | 0 | 4 |
| **PMN2** | 4 | 4 | 4 | 0 | 0 |
| **PMN** | 4 | 4 | 4 | 4 | 4 |
| **P3AT** | 4 | 4 | 4 | 4 | 0 |
| **TC-6** | 4 | 4 | 4 | 0 | 0 |
| **TM57** | 0 | 4 | 4 | 0 | 4 |

Table 2. Number of mines of each type laid at each depth in the Kharga test field.

Image 4. Method of defining a quadrant for vegetation sampling. A surface-laid mine is in the center of the one square-meter quadrant.

**Site preparation.** After soil preparation, the site was laid out into 31 strips, each 40 m x 8 m. The length of 40 m provided a realistic search baseline, and the width of 8 m was the standard line search distance for Afghanistan dogs.

Test mines were laid in March and May 2002. Table 1 (page 75) gives details of the mine types. Using eight mine types, a total of 114 mines were laid at five different depths (as shown in Table 2 on page 75). The number of mines in a strip was randomly assigned using a weighted mean (average of four per strip) and restricted range (minimum 2, maximum 5). Once a mine was assigned to a strip, location within the strip was assigned randomly with the limitations that a mine was a minimum of 3 m from any other mine and 0.5 m from any boundary. Having randomly defined 120 locations in 30 strips (one strip was left empty), mine x depth combinations were then randomly assigned to each location in replicates of 4 (this is a total of 30 mine x depth assignments for 120 locations).

Mines were laid following strict International Mine Action Standards protocols, involving washing and sterilizing the mines three times over several days.[8] All handling and digging tools were sterilized in boiling water. Once sterilized, mines were handled with plastic gloves. All soil not returned to a hole was removed completely from the site.

After completion of the study, all mines were dug up to ensure that they were still in position. All were in place except one, which was displaced 0.5 m from its assigned location. Whether this discrepancy was an error in original placement or the mine had shifted after burial is uncertain. However, the mine was considered close enough to the assigned position for data associated with that mine to be used normally.

**Apparatus**. Portable weather stations were set up (see Image 2, page 75) to record weather variables during the dog searches. Equipment was used to record temperature in the soil's surface layer, temperature at ground level in exposed sun, temperature in shade at chest height, relative humidity in shade at chest height, soil-moisture content (based on conductance), mean wind speed over 20 sec (m/s) and peak wind speed over 20 sec (m/s).

Digital video cameras were placed on tripods and positioned to capture the dog's searching behavior. Additionally, microphones clipped to the camera operator's clothing allowed voice recording of observed behavior, including notification of the dog crossing a mine. Cross referencing between observer (on tape) and datum recorder (on paper) was achieved using coordinated time records. The observer and the datum recorder also held a mapped layout of each trial strip to ensure that weather records, dog behavior and mine position could be linked.

Measuring tapes were used to measure the distance from a dog's indication to the site of the buried mine. A knotted rope defined a 1-sq. m. quadrant around the mine in order to measure vegetation (see Image 4).

## Procedure

The research team arrived at a strip before the dog team. The camera was positioned at an angle to the predicted search direction (deter-

mined from wind direction). A small portable weather station (a shaded stand, Image 2) was placed about 15 m from the strip. When the dog team arrived, they established a search direction and went to work.

Search direction was frequently adjusted as the wind changed. The observer and camera were moved as necessary to ensure an appropriate camera angle and lighting.

The weather recorder took records every four minutes or immediately if the dog crossed a mine at a moment when no data were being recorded. About two minutes were required to make a full set of weather records. The dog always worked across the wind, and down wind and search direction was adjusted frequently, so wind direction was not recorded.

When the dog gave an indication, the supervisor marked the site with a flag or rock, and then the dog continued to search. The indication was recorded on a map of the strip with a time and number in order to ensure that it could be linked to the weather records and video. A time and number were also noted if a mine was missed.

The distance between the mine and the indication marker was recorded, up to 2 m. Distances greater than 2 m to a mine were ignored, and the indication was treated as a false alarm (a false alarm is the same as a false positive).

In most cases, the dog searched the entire strip in one sequence. A complete search of a strip required between 16 and 77 minutes of search time (mean = 42, s.d. = 14). The time required to search a strip in Trial 2 (April 2003) was significantly longer (mean = 55 min.; $F(1, 4) = 16.86$, $p < .001$) than in any other trial (mean range 33 to 40 min for the other four trials). After completing the search of a strip, the dog team left the trial area, returning about 30 minutes later to search the next strip. Once the dog team had left, the datum recorders moved into the strip to measure the distance from the dog's indications to the mines and to measure vegetation cover around the mines. Total vegetation cover was measured on a 4-point scale: 0–25%, 25–50%, 50–75%, 75–100%. Cover was viewed as any vegetation that could be a barrier between the dog's nose and the ground, and thus included all dead vegetation. The presence of spiky or aromatic plants was measured separately on 4-point scales: 0=absent, 1=present, 2=common and 3=dominant.

### Data Analysis

All mines having an indication within 2 m were treated as found mines in the analyses. Detection success was calculated as a logit transform of proportion of mines found. Specifically, detection success is shown as logit $p$, which is calculated as logit $p = \log_{10}(p / (1 - p))$, where $p$ = proportion found (found mines/(found + missed mines)). Logit $p$ has the advantage of being an equal-interval scale and is not bounded by upper and lower limits, as is proportion found, enabling the use of parametric statistical analyses. In the situation in which proportion found was 1.0 (indicating zero misses), misses were recorded as 0.25 in order to avoid an infinite logit $p$. Higher values of logit $p$ reflect higher detection success, much in the same way as proportion correct. If 99% of the available mines were detected, logit $p$ would be two, while a 50% find rate would result in a logit $p$ value of zero. A find rate less than 50% produces negative logit $p$ values, and the larger the negative number, the poorer the detection success.

Image 5. Weather station with dog and research teams working in the background.

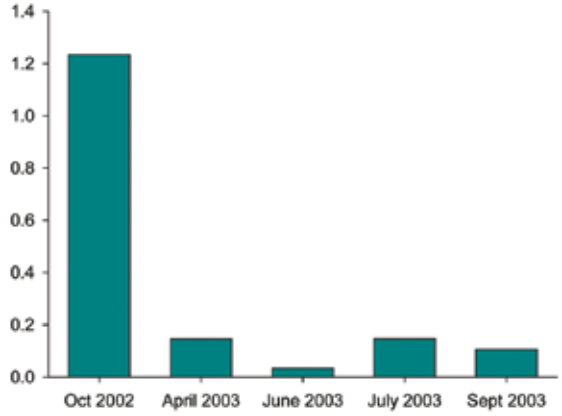


Figure 1. Mean detection success (logit p) calculated across dogs for each trial.

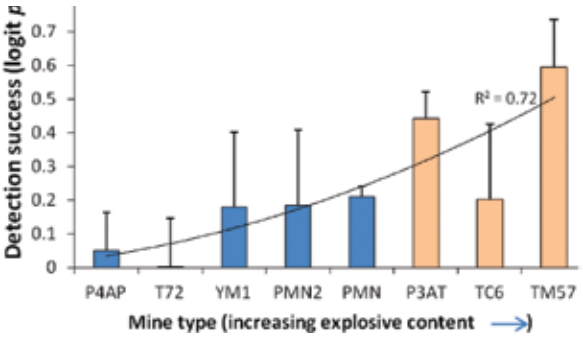


Figure 3. Mean detection success (logit *p*) calculated across trials for each mine type. Anti-personnel mines are shown in blue, and anti-tank mines in orange. A polynomial curve was fitted to the data, and error bars represent the mean's standard error.

**Detection success under different weather conditions.** Mean detection success (logit *p*) differed significantly across the five trials according to a one-way analysis of variance using the success scores for individual dogs ($F(4, 36) = 3.41$, $p = .018$). Detection success was significantly higher in October 2002 (mean = 1.23) than for any other trial and was lowest in June 2003 (mean = 0.03), although the other four trials did not significantly differ from each other (Fisher's LSD post-hoc test) (see Figure 1). Kabul experienced heavy rains in the spring of 2003, and the increased humidity and soil moisture appear to have hampered the dogs' ability to detect mines, as rainfall occurred immediately prior to the April and June trials (see Figure 2). The false-alarm rate was lowest in October 2002 and rose to higher and similar levels in all subsequent trials, supporting the hypothesis that heavy rains hampered detection success.

Informal observations suggested that the heavy spring rains may have distributed mine odor around the site, particularly along drainage channels running through the strips. Chemical analysis of soil samples supported this conclusion.[9]

The detection success achieved in October 2002 is most representative of drought conditions. Given the rarity of rain in Afghanistan before spring 2003, the dogs were unfamiliar with wet soils or working conditions, and detection success seemingly decreased as a result of rainfall immediately prior to the trials. Therefore, training of mine-detection dogs should include the full range of environmental conditions that may be encountered (even if that requires simulation of unusual conditions) or that mine-detection agencies withdraw dogs for retraining and licensing when unusual weather patterns occur. This precautionary approach may be particularly necessary when dogs move from dry to wet conditions (and not the reverse).

**Mine type and depth.** The proportion of each mine type found for each trial was converted to logit *p* and averaged across all trials (see Figure 3). Detection success was significantly positively correlated with weight of explosive ($r = .38$, $p = .02$), showing that detection success improved with the increasing size of mine. Type 72 anti-personnel mine (see Table 1) was the most difficult to find, and TM57 the easiest. Although a one-way analysis of variance showed no significant variation in detection success for the different mine types ($F(7, 32) = 1.47$, $p = .21$), a Fisher's LSD post-hoc test[10] showed that P4AP ($p = .01$) and T72 ($p = .02$) mines were significantly harder to find than TM57 mines.

Detection success varied significantly with mine depth (one-way analysis of variance ($F(4, 20) = 2.97$, $p = .04$) and was significantly negatively correlated with mine depth ($r = -.39$, $p = .008$). Thus, detection success decreased as depth increased, although with exceptions: The small T72 mines were poorly detected at all depths; for small YM1 mines, detection was poorest at the shallowest depth (7.5 cm); and the large TM57 mines were detected more successfully at deeper depths. The overall mean in Figure 4 represents the mean of all mine types at all mine depths and shows most clearly the decrease in detection success as a function of mine depth.

**Vegetation.** A significant effect of the amount of vegetation cover on detection success was found ($F(3, 16) = 5.28$, $p = .01$), with detection success decreasing with increasing vegetation cover near the mine

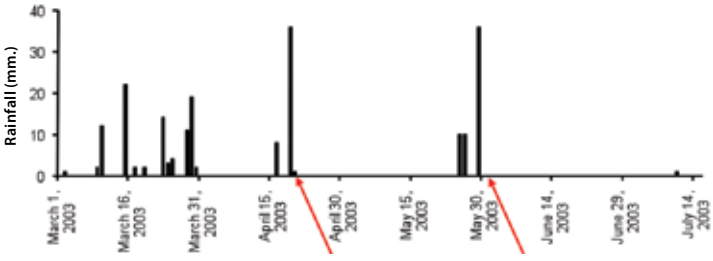


Figure 2. Rainfall (mm) at the Kargha field site in spring and summer of 2003. Arrows mark the first day of the April and June field trials.

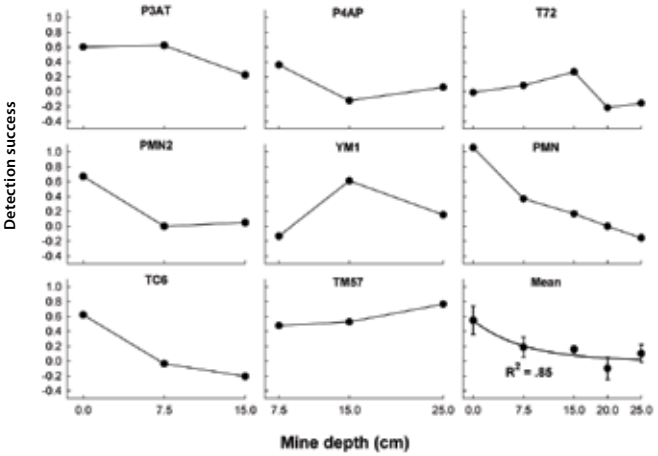


Figure 4. Mean detection success (logit *p*) for each mine type at each depth and for the mean across all mines at all depths. For the overall mean figure, an exponential decay function was fitted to the data, and error bars represent the standard error of the mean. Note that three possible X-axis scales are shown which reflect the fact that different mine types were laid at different depths (P3AT, PMN2 and TC6 at 0, 7.5 and 16 cm; P4AP, YM1 and TM57 at 7.5, 15 and 25 cm; and T72 and PMN at all five depths. (See Table 2.) The mean graph shows all data for all mine types for the depths at which they were available.

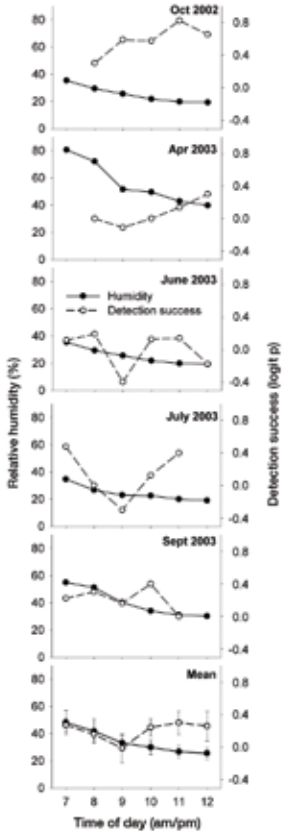


Figure 5. Relative humidity (%; filled circles) and detection success (logit *p*; open circles) plotted for each month against time of day (e.g., 7 represents 7 a.m.). The final graph is the mean of all five trials, and standard error bars represent standard error of the mean of the five trials.

($r$ = -.65, $p$ = .002; mean logit $p$ = 0.32, 0.23, 0.11, -0.33 for 0–25%, 25–50%, 50–75% and 75–100% vegetation cover in the 1-sq m quadrant around the mine). The spikiness of plants surrounding the mine had no significant effect on detection success ($F(3, 16) = 0.44$, $p$ = .72), with a correlation revealing a negative but nonsignificant, relationship ($r$ = -.13, $p$ = .59). The strength of plant aromas surrounding the mine also had no effect on detection success ($F(3, 16) = 0.02$, $p$ = .996), with no correlation found between these two variables ($r$ = -.009, $p$ = .99).

**Weather variables**.A principal component analysis identified humidity as contributing the most explanatory power to the data, in that detection success was poorer in high humidity. However, when humidity was included in a logistic-regression analysis involving month, mine type and depth, humidity did not explain significantly more variance than was already explained by month. However, Figure 10 shows that, for most months, humidity rarely varied. For October 2002, June 2003 and July 2003, relative humidity rarely climbed higher than 30%. The greatest variability in humidity occurred in April 2003, and its implications are discussed below.

Overall, none of the microvariation in environmental variables measured at the time a dog crossed a mine affected the probability of that mine's discovery. We conclude that the probability of dogs finding mines was robust with respect to the environmental variation normally experienced by dogs in Afghanistan. Despite the possible effects of humidity discussed below, in general terms, dogs worked with similar effectiveness under all typical working conditions.

**Detection success across the working day.** Some evidence, shown in Figure 5, indicates that detection success was occasionally higher in the early morning, dropping across the morning and increasing again at midday. As shown in Figure 5, this pattern particularly occurred for the trials conducted in April 2003, June 2003 and July 2003. The mean data clearly show that detection success decreased simultaneously with humidity until 9 a.m. However, after 9 a.m., humidity continued to decrease, whereas detection success increased. We suspect that, if greater variability in humidity was encountered during more trials (and not just for April 2003), the effect of humidity on detection success would have been stronger than that reported here.

We believe that two effects are operating here, as described by Phelan and Webb.[11]

- First, overnight dew wets the surface of the soil and displaces surface odor. Little air movement happens overnight, thus displaced odor tends to concentrate immediately on and above the ground. When the sun first hits the ground (the time at which the dogs begin work), evaporation of surface moisture and overnight accumulation of odor together provide an increased concentration of mine odor near the ground surface for a short period (probably 20 minutes to 1 hour, depending on local conditions). Therefore the dogs detected the mines relatively easy in the early morning, giving the initially high detection rate.
- Second, as the soil surface warms up and convection disperses the overnight accumulation of dew, humidity begins interacting antagonistically with detection success. Relatively high humidity makes detection difficult, and detection improves as relative humidity declines through the morning. This effect is predicted because, when sniffing, the dog rapidly alternates exhalation and inhalation of moist air over the ground surface. This moist air displaces mine-odor molecules attached to surface dust into the vapor, allowing inhalation. When humidity is high, the process is less effective than with low humidity, because the key factor influencing odor-molecule release is the high moisture content of the dog's exhaled breath.

The lesson from these results on detection success through the morning suggests that some micromanagement of dog searching could improve overall detection success in arid environments. Specifically for the conditions experienced near Kabul, on calm mornings, dogs should take a break during the second hour after dawn, which is the period when detection success is predicted to be lowest as a result of humidity effects.

The reality is that use of dogs in arid environments is routinely limited by high temperatures later in the day, and mid-morning is a desirable time of day to be working dogs. It may not be realistic to stand dogs down for part of the morning.

Fortunately, there are other options. For example, maintenance training could include humidity management (such as spraying of water on training fields) in order to mimic the relatively difficult high humidity conditions experienced during mid-morning, and/or maintenance training could be focused on that part of the day at which humidity is highest in the operational theatre.

We encourage monitoring of relative humidity through the day in any operational theatre in which dogs are being used, but particularly in arid environments. Further, regular maintenance training should be conducted under the most challenging conditions likely to be experienced by the dogs—in general terms, meaning that part of the day when relative humidity is highest.

An issue that arose in this study was the distribution of odor as a result of heavy rainfall in arid environments. Odor of mines was clearly transferred downstream in runoff channels, resulting in detection of individual mines by dogs at distances well outside the standard clearance perimeter for manual demining. While the mine itself should still be found, the consequence is numerous, apparently false indications. Recognition of this effect may help to improve the efficiency of use of demining resources in operational situations.

## Summary

The overall aim of this study was to explore the effects of environmental variables on mine detection by dogs working in Afghanistan. Data were gathered during five trials carried out in October 2002 and April, June, July

and September 2003. Detection success was highest in October. After the October trial, Afghanistan experienced heavy rains, which appeared to lower detection success. No significant variation was apparent in detection success of the different mine types, although mines with higher explosive content (weight) were detected more easily than smaller mines. Detection success decreased with increasing mine depth. Higher levels of vegetation reduced detection success, but the presence of spiky or aromatic plants did not affect detection. While standard weather variables (temperature, relative humidity, wind speed) had no overall significant effects on detection success, humidity appeared to be the most important variable. Evidence indicated that high humidity results in poorer detection (in arid environments), except in the early morning, when dew on the ground's surface appeared to facilitate detection.

A key implication arising from this research is that relative humidity should be monitored in any operational theatre in which dogs are used, particularly in environments where humidity varies considerably through the day. Variation in humidity appeared to influence detection success, and this effect could be dealt with by either standing dogs down when humidity is high, or by undertaking maintenance training under the most challenging humidity conditions experienced in the operational theatre.

Odor was clearly conducted downstream from mines during severe rainfall events in the arid environment in which this study was undertaken, resulting in numerous apparently false indications in drainage channels. Understanding this phenomenon could result in more efficient use of clearance resources in operational situations.

*See endnotes page 83*

*Authors' Note: GICHD undertook this research with funding from the U.S. State Department through the United Nations, and the governments of Norway, Sweden and the United Kingdom. We thank staff of the United Nations Mine Action Centre for Afghanistan, Monitoring Evaluation and Training Agency and the Mine Dog Center for their essential support. Many other people supported the project, and we particularly thank Sayed Mustaffa, Ray Wills, Asif Khan and staff of the Swedish Rescue Services Agency, all of whom provided field support.*

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# Endnotes

## Unplanned Explosions at Munitions Sites: Concerns and Consequences by Berman and Reina [ from page 4 ]

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Peer-support Training for Nonliterate and Semiliterate Female Ex-combatants in Burundi by Macauley, Onyango and Niragira [ from page 52 ]

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Firearms Safety in Somaliland: From Mine Action to Community Safety by Vest-Lillesøe [ from page 57 ]

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it means that the development of Somaliland is in large part due to the remittances (money sent back from abroad) and the intellectual support of Somalis who have been living abroad, studying and working, thereby gaining knowledge and experience that can benefit their kin back home in Somalia/Somaliland (although it is sometimes also detrimental to the place of origin, as those in the Somali diaspora often have their own agenda according to clan affiliation).

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9. Rolled Homogenous Armor is a type of steel used to armor vehicles from velocity metal projectiles. It is made by processing cast steel billets and then rolling them into plates. Hot rolling homogenizes the structure of the steel elongates the grain structure, thus strengthening the steel and allowing stress to be loaded throughout the metal instead of concentrating on one area.

Environmental Determinants of Landmine Detection by Dogs: Findings From a Large-scale Study in Afghanistan by Sargisson, McLean, Brown and Bach [ from page 74 ]

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# CALL FOR PAPERS

Photo top: New techology demonstration at the U.S. Department of Defense, Humanitarian Demining Workshop, 2012. *Photo courtesy of Lois Carter Fay/CISR.*
Photo left: A young Afghan boy recovering from limb-loss. *Photo courtesy of Jed Puretecinc.*

**ISSUE 17.1 | Deadline: 15 October 2012 | Publication: Spring 2013**

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## **FOCUS:** Clearance Operations Trends and Technologies

Issue 17.1 will look at trends and innovations in mine action. What new procedures and equipment have been developed to increase the speed that land can be returned to a conflict-affected community? What tried-and-true methods are best for clearance? How do governments decide what is an acceptable level of residual risk? Case studies showing effectiveness of clearance methods and technologies will be considered. What is the mine-action community seeing regarding donor funding, government support, clearance methods, land release, and new techniques developed?

## **FEATURE:** Post-conflict Recovery: Gender and Age Issues

The Feature section will address gender and age issues in post-conflict situation. How does gender affect the ability of men, women, girls and boys to seek and obtain assistance following an injury from an explosive remnant of war or traumatic war injury? Is one gender or age group better able to recover from ERW injuries than another? If so, why? Is there a difference in how gender and age affects survivors or how survivors are served? How are survivors of different genders and ages included in mine action? What inconsistencies affect employment and how? What is being done (or can be done) to address these inequities? Are these discrepancies long lasting? Or do the differences ease as time passes? What programs have proven effective in addressing post-conflict age and/or gender issues? How does age and/or gender affect the employability of healthy people in post-conflict situations? How have solutions to these concerns matured since the onset of humanitarian mine action?

## Peer-reviewed Research, Technology and Development Section

All articles on current trends and developments in R&D will be considered for this section. Topics will include but not be limited to Detection and Neutralization, Manual or Mechanical Equipment, Data Fusion, Biosensors (including dogs, rats and bees), GIS, Mapping and Terrain Analysis, Personal Protective Equipment, Demining Tools, Metal Detectors, Needs of Users, Lessons Learned, Test and Evaluation, Information Technology, Mine-detection Test Facilities, Landmines, ERW and Ordnance.

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Office of Weapons Removal & Abatement
Bureau of Political-Military Affairs
U.S. Department of State

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Issue 16.2 | printed July 2012