

# A STUDY OF MANUAL MINE CLEARANCE

## 2. The Management of Manual Mine Clearance Programmes



# **A STUDY OF MANUAL MINE CLEARANCE**

## **2. The Management of Manual Mine Clearance Programmes**



---

The **Geneva International Centre for Humanitarian Demining (GICHD)** supports the efforts of the international community in reducing the impact of mines and unexploded ordnance (UXO). The Centre provides operational assistance, is active in research and supports the implementation of the Anti-Personnel Mine Ban Convention.

---

*For more information, please contact:*

**the Geneva International Centre for Humanitarian Demining**

7bis, avenue de la Paix  
P.O. Box 1300  
CH-1211 Geneva 1  
Switzerland  
Tel. (41 22) 906 16 60  
Fax (41 22) 906 16 90  
[www.gichd.ch](http://www.gichd.ch)  
[info@gichd.ch](mailto:info@gichd.ch)

*A Study of Manual Mine Clearance — 2. The Management of Manual Mine Clearance Programmes*, GICHD, Geneva, August 2005.

This project was managed by Tim Lardner, Operational Section ([t.lardner@gichd.ch](mailto:t.lardner@gichd.ch)).

ISBN 2-88487-031-8

---

© Geneva International Centre for Humanitarian Demining

The views expressed in this publication are those of the Geneva International Centre for Humanitarian Demining. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Geneva International Centre for Humanitarian Demining concerning the legal status of any country, territory or area, or of its authorities or armed groups, or concerning the delimitation of its frontiers or boundaries.

---

# Contents

|  |    |
|--|----|
| <b>Summary</b>   | 1  |
| <b>Introduction</b>                                    | 3  |
| Objectives   | 4  |
| <b>Task definition</b>                                 | 5  |
| Historical   | 5  |
| Future   | 5  |
| Technical survey and risk reduction                    | 6  |
| Funding issues   | 7  |
| <b>Required structure to address tasks effectively</b> | 9  |
| Organisational structure and comparison                | 9  |
| Capacity-building                                      | 10 |
| Management differences                                 | 11 |
| Benchmarking   | 12 |
| Management tools                                       | 13 |
| Resource planning                                      | 14 |
| Exit strategies and motivation                         | 14 |
| Planning   | 15 |
| Organisational issues                                  | 15 |
| <b>Capacity-building</b>                               | 19 |
| The deminer  | 19 |
| Recruitment  | 19 |
| Training   | 21 |
| Demining activities and performance                    | 22 |
| Lane deployment  | 24 |
| Working patterns                                       | 25 |
| Dehydration  | 26 |
| Combating the effects of dehydration                   | 28 |
| Effects of personal protective equipment               | 28 |
| Influence of management style on performance           | 30 |

|  |    |
|--|----|
| Team management  | 32 |
| Middle management  | 33 |
| Other middle management roles                                    | 34 |
| Senior management  | 38 |
| <b>Task management</b>   | 41 |
| Performance issues   | 41 |
| <b>Conclusions and recommendations</b>                           | 43 |
| <b>Annex: Approach to problem areas in manual mine clearance</b> | 45 |
| <b>Bibliography</b>  | 51 |
| <b>Glossary of acronyms</b>                                      | 53 |

---

*Photo credit:*

Cover: British Army mine clearance of a road in 1945, "Soldiers using their rifles and bayonets to detect mines. This is called the 'prodding' method and the ground is prodded with the bayonets to clear a lane the width of six or seven men. White tapes are used to mark the boundary as it is cleared"; photograph courtesy of the Imperial War Museum, London ©Crown Copyright, negative number H 29725.

---

# Summary

This section provides the results of a sub-study on the management of manual mine clearance. This section was conducted over a period of seven months, involved non-governmental (NGOs) and governmental organisations, commercial firms and military personnel from several countries and included field visits to three countries.

The scope of this section included all aspects of a demining organisation, from the individual deminer through to headquarters level. Each organisation was assessed on a range of criteria including:

- organisational structure;
- project management skills;
- decision-making and communication;
- management style and performance;
- equipment and personal protective equipment (PPE);
- standing operating procedures (SOPs);
- operational deployment methods;
- career progression, including recruitment and training;
- “top-down” pressures, such as political, donor and financial issues; and
- “bottom-up” pressures, such as the environment, culture and health.

A number of factors made it difficult to study all the stakeholders involved in demining activities. These included the following:

- the study could not be conducted on a “level playing field” because the performance data supplied by organisations was never based on the same criteria and had too many variables;
- complete data could not be collected from all organisations; and
- the figures collected for square metres cleared from some organisations may not be accurate; this is due to a number of factors including an accumulative error budget (i.e. rounding up), which is apparent with each handling of the raw data, from the first assessment at a site up to the reported national figures; and while some organisations made these figures available others did not, meaning that it was difficult to measure performance accurately and compare methodologies.

The section identified many areas where the demining community could improve the efficiency and effectiveness of manual mine clearance. Essentially, the main areas for improvement were not at the individual deminer level — although some issues, such as detector types, drill routines, working practices and personal protective equipment, could enhance performance and assist in error reduction (these issues are expanded on in Section 3).

The management section concludes that the greatest scope for improvements exists at middle and senior management levels, where significant wastage of time and resources were observed. These include management of the minefield site and the decision-making associated with designated areas for clearance. The section also identifies a number of areas such as recruitment and training, team deployment, team and task management and benchmarking where significant improvements could be made.

# Introduction

The terms of reference for this section stated that:

*“Manual mine clearance equipment and techniques for mine action have evolved over the years from an adaptation of fundamentally military skills to a specialised civilian activity... At the management level, there are wide variations in the recording of clearance rates (in various soil or vegetation types) and no standardised methodology to calculate the costs and rates of manual mine clearance.”*

This assertion has been clearly confirmed during this section of the management of manual mine clearance operations. The demining industry has come of age and is now, for the most part, a serious international business, involving considerable investment in equipment and manpower, and management of million-dollar budgets. The evolving nature of the business and the types of location in which it operates should mean that demining organisations must be able to consistently field considerable business, political and technical skills if they are to continue to provide an efficient level of performance.

The manual mine clearance management section looked at many types of demining organisations, but two fundamental desires appeared to be common to all organisations:

- 1. to sustain themselves:** this has different implications depending on the organisation, but the primary focus is on obtaining funds (from donors or by winning bids).
- 2. to provide a demining service:** the delivery style of the service is highly dependent on whether the route to sustaining the organisation is via the availability of donations for specific projects (i.e. is it topical to donors, in which case an exit strategy is not desirable), or whether the route is via a fixed price contract to deliver a site cleared within a specified timeframe.

The different routes to organisational survival have produced different approaches to management policy and organisational philosophies. However, the physical process of conducting manual mine clearance is very similar between all groups.

## Objectives

The terms of reference for the section noted wide differences in opinion about the best way to organise mine clearance teams. The aim of the section was to document and analyse the different techniques and methodologies for conducting manual mine clearance operations and to recommend improvements with a view to instituting a more effective management system. In addition, the section was asked to consider how management affects clearance rates.

Data gathering was achieved through visits to Cambodia, Croatia and Mozambique, involving governmental and non-governmental bodies and organisations at national and local level. Interviews were also conducted with commercial demining companies and with relevant UN personnel.

# Task definition

## Historical

The history of manual mine clearance was reviewed in Section 1, but it is worth restating some important aspects in order to understand the industry's current status.

Mine clearance organisations were set up in response to a specific need to remove explosive remnants of war after conflict, specifically landmines and unexploded ordnance (UXO). Strong-minded and innovative individuals created rapid-reaction, military-style organisations able to deploy anywhere in the world to train local personnel — typically ex-military or ex-combatants themselves — in essentially safe and effective demining practices.

This model was welcomed as it provided employment for former local military personnel, while encouraging further demobilisation and demilitarisation of local forces. It was also a way of gathering local intelligence as to where the hazards may be located.

Such a demining capability is essential as part of a rapid response, but it is not the most effective approach for sustaining a programme. Further, the *ad hoc* manner in which NGOs often deploy once a country needs their services may also contribute to difficulties in making the transition to a long-term model.

In addition, many organisations (commercial and NGO) have expanded rapidly from an initial state where they had one or two programmes to a situation where they are now managing many more, but without necessarily having altered their management structure significantly.

## Future

The view is rapidly emerging that as demining programmes become more established they should be considered as part of the overall development effort in a country.<sup>1</sup>

---

1. See for instance GICHD (2001).

Afghanistan's Mine Action Programme has some 8,000 deminers and represents the country's largest employer. The socio-economic and environmental impact that the removal of mines brings to a country is well documented in a recent report<sup>2</sup> and provides ample evidence to support the view that mine action should evolve as part of a country's overall national development plan.

Current mine action however, demands a coherent and collaborative approach between mine action stakeholders, with enhanced means of collecting and sharing data. These factors appear to be lacking in the industry at present, based on the findings of this section. Currently the industry tends to be *resource*-driven rather than *needs*-driven, which is inappropriate, not least because it contributes to the "disintegrated" nature of the industry.

A number of NGOs reported an emerging lack of trust between the community and the NGOs, as the physical demining process is so slow and the pressure on land so high that villagers are compelled to move into areas before clearance takes place. Experience shows that locals are fully aware of the dangers, but necessity drives them on, sometimes along with political fears of land grabbing.

### Technical survey and risk reduction

Technical surveys are an extremely important part of the future of demining, as they can redefine suspected hazardous areas identified in a Landmine Impact Survey (LIS) and ensure that expensive demining resources are targeted at the most necessary areas. Yet, the process of technical survey is not well defined and no definition has yet found consensus within the mine action community. As a result, each organisation refers to it slightly differently. Likewise, the International Mine Action Standards (IMAS) do not offer a clear description of what technical survey should consist of and how it should be conducted.

For such a potentially important activity, it is unclear who is trained for the task, how they are trained, and what the specific skills needed might be. This is clearly an area that can impact on cost-effectiveness and efficiency.

There is a mixed view of area reduction across the industry. It is, however, a highly effective way of ensuring cost-effectiveness, increasing efficiency and releasing low-risk land back to the population, as long as the perception of risk is appropriately addressed. The decision-making associated with area reduction is closely linked to the acceptance of risk by the organisation, the donors and the government. The local population also has to be persuaded to buy into the process and to trust the techniques being deployed.

Area reduction is often carried out on lower-risk land where there have been no incidents and local intelligence is negligible. Processes of reducing the risk on the land are usually a mix of mechanical aids and dogs, or possibly clearing the edges of boxes manually, then if no mines are found the land is declared as having "no known risk". These processes are by no means universal and definitions, some of which are defined in IMAS, are not universally used or understood.

There was evidence to suggest that areas are being cleared that were globally encompassed by the LIS, but with minimal risk of mines, and in some cases, no mines.

2. PRIO (2004).

There are documented cases of large demining units (30–60 deminers plus support) being deployed on areas where subsequently, after complete processing, no mines were found. If this is the case, it is not a good use of scarce resources, nor is it an appropriate response to the urgent need for land to be released for local use. It is also dispiriting for the deminers and the organisations involved. On some sites, confidence was so high that no mines were present that deminers carried on working while animals grazed in front of them.

Clearing areas that are subsequently found to be free of mines is fraught with potential problems, for example:

- the deminer becomes over-confident and takes risks;
- development of lax drills and violation of SOPs;
- loss of motivation (pointlessness of task);
- cost implications;
- loss of confidence of locals in NGOs — frustration; and
- loss of donor confidence in demining management.

One of the most significant and potentially profitable uses of machines may be in area reduction in conjunction with another method, such as dogs. However, the mine action community has yet to universally accept the risk of declaring land treated in this way as safe. The Croatian Mine Action Centre (CROMAC) and the Croatian government have structured an approach to the use of mechanical demining methods for area reduction and the acceptance of risk, in order to advance the completion date of demining in the country.

The topic of risk reduction is one of the keys to the whole mine clearance issue and requires further study.

## Funding issues

The actions of a donor can inadvertently prevent organisations from conducting efficient programmes. Regular donors and supporters of mine action would help demining NGOs greatly if they were to encourage them to be proactive in their resource planning. Also, if they were to commit funds over several years rather on a yearly basis, this would allow the NGOs to develop a long-term strategy, rather than the current “hand-to-mouth” situations. Donors can inadvertently create additional costs and slow programmes down by placing limitations, conditions and restrictions on the types of activities an NGO undertakes.

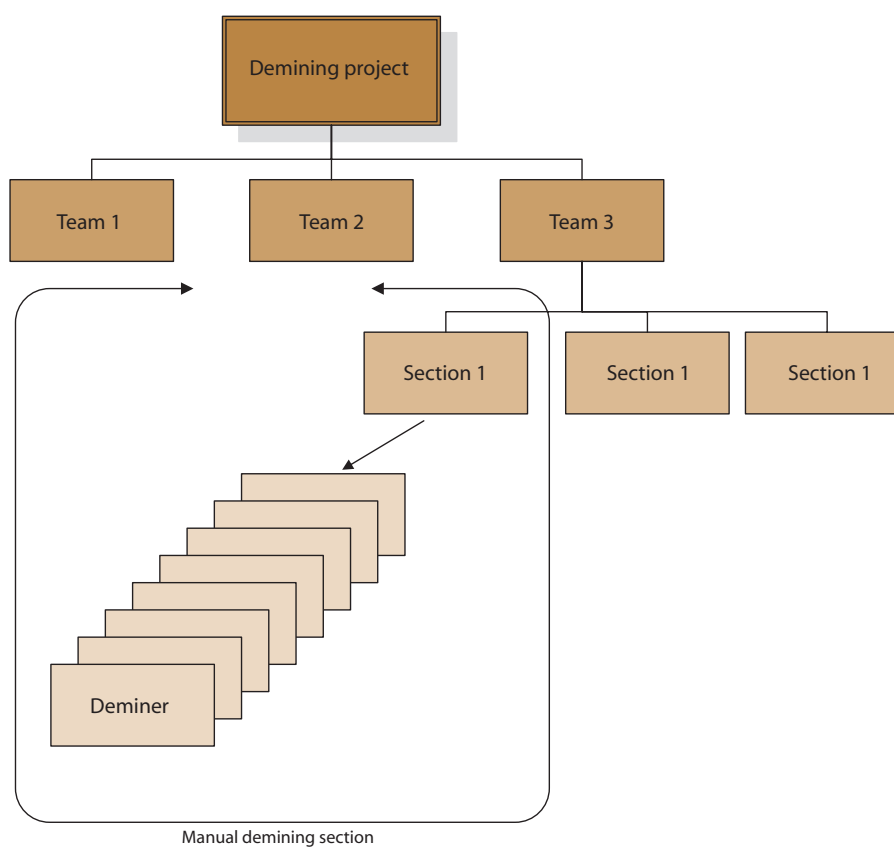


# Required structure to address tasks effectively

## Organisational structure and comparison

A typical example of a demining organisational chart is presented in Figure 1 . Some are much larger and have more layers, but on the whole this is a fair representation across the board for hierarchy and reporting structure.

Figure 1: An example of a typical demining organisation structure



There is a clear divide between NGOs and commercial companies in approach and attitude, although this is primarily affected by local conditions and constraints. This section looks at some of those differences, which primarily are those of management and process, generated by the different philosophies regarding profit. Demining methods and equipment, however, are very similar.

Although the two types of organisation may be complementary, it is worth noting that while the NGOs may appear to be less efficient in the short term, at least when working under a grant with loosely defined performance requirements, in general their capacity development orientation is more significant in the long run. If, as occasionally happens, NGOs engage in competitive contracts then their performance can be similar to commercial companies.

This also works the other way around, and if tenders and contracts are well written, capacities can also be successfully developed by commercial organisations. Many of the current capacities in northern Iraq, for example, were developed by a commercial operator under contract to the UN, which directed the building and transfer of capacity.

## Capacity-building

The concept of capacity-building is often cited as the main discriminating factor between NGOs and commercial companies. Capacity-building is viewed as a long-term objective, where the end strategy is for the local population and government to develop the skills required to run their own programmes with their own people. There are very few cases where this has been achieved in its purest form. In some cases it has not been achieved at all, while in the majority of cases a blend of local and expatriate skills continues to work together in different ways.<sup>1</sup>

When a foreign NGO leaves a country (which is not often), it appears to prefer to disband its capability rather than hand over the reins to a local project manager for a number of reasons, including lack of funds.

There may be an argument to suggest that the concept of capacity-building in national NGOs is a misnomer, bearing in mind that many commercials will also train local workforces to conduct their demining projects. This view is put forward based on the following assumptions:

- the inflated wages paid to deminers may distort the economy and expectations;
- the skills are not easily transferable to any other job;
- there is no continued professional development of the deminer to encourage him to be promoted and develop a career structure, therefore he is encouraged to stay on, probably well past the age when he is efficient;
- the military style of care (which an ex-soldier may be used to) looks after the individual in one aspect, but does not encourage him to develop civilian skills or to be reintegrated into the community;
- there are few programmes where deminers are offered retraining with other skills so that they can rotate through the NGO into the general population, which would free jobs for new and younger deminers, so spreading the wealth and keeping the demining population young; and

1. UNDP defines capacity development as: *"The process by which individuals, groups, organizations and countries develop, enhance and organize their systems, resources and knowledge, all reflected in their abilities, individually and collectively, to perform functions, solve problems and set and achieve objectives."* See [stone.undp.org/undpweb/eo/evalnet/docstore3/yellowbook/glossary/glossary\\_c.htm](http://stone.undp.org/undpweb/eo/evalnet/docstore3/yellowbook/glossary/glossary_c.htm).

- there appears to be a higher incidence of HIV-positive deminers than among the general population,<sup>2</sup> suggesting that the wages and travelling lifestyle promote promiscuity and that HIV/AIDS education programmes are not successful.

Commercial companies operate in one of two ways: (a) they train and employ locally on a fixed contract (as with NGOs), but for a short period of time, using people who live close to the project; or (b) they have a permanent workforce, taking their own deminers who travel the world as part of a team with the organisation. These deminers are given opportunities that others are not, and the organisation gets a trained and efficient workforce that allows it to start demining within minimum timeframes.

The Mines Advisory Group's (MAG) community demining programme in Cambodia addresses the issues described above by employing residents of the village to be cleared for a two-year period, and on lower wages than for a professional deminer. This keeps the income within the community, provides jobs for anyone willing to work (often women), which frees the men to farm or trade. The following points were made by MAG with respect to their community scheme:

- resources on the ground increased by 50 per cent for the same money (and represented true capacity-building, as the work was kept within the community);
- money was injected into the community;
- Employment can be targeted to most needy families (not an exclusive few), allowing them to farm;
- HIV risk-reduction is promoted as workers live at home;
- communities can be given a bonus if deminers attend for whole month, which has reduced sickness rates by up to 70 per cent;
- deminers get written contracts from commune authorities so that they cannot work informally with others in MAG's name;
- it helps to promote the employment of mine victims as deminers; and
- the maximum working life for local deminers is two to three years; MAG claims it takes six months to get a community deminer up to speed.

If, as suggested by a number of organisations, capacity-building is to be a primary focus and discriminator of NGOs in relation to the commercial companies, the demining sector should be educating and preparing its personnel for a role in the outside world after they have left the demining task, rather than continuing to teach them to be dependent both on the levels of care they receive and unrealistic wages. However, the current status is that NGOs tend not to have exit strategies in the same way as commercial companies, so they may not see this as being a problem. The northern Iraq capacity was built by a commercial company with a clear direction and exit strategy.

## Management differences

In fact, the most significant differences between the two types of organisation (NGO and commercial company) are the way they are managed, particularly with respect to planning and project management.

Commercial companies can only conduct a demining project if they have won a contract. This means they have developed a plan that addresses the lifespan of the project, and which has been fully costed. If they are not effective at planning, they will

2. This assumption is based on discussions with mine action operators in Cambodia and Mozambique.

not win the bid, and valuable time and money will have been expended to the detriment of the long-term health of the organisation. The other possibility is that they will make a loss for having miscalculated the costs, difficulty or length of the project, which is also highly negative.

NGOs do not make a loss in that way as they do not have to complete a task on fixed timeframes and fixed budgets, so they can adjust their timeframes and raise more cash if required. There is, of course, no reason why commercial projects could not be let on a contract basis with NGOs bidding and indeed in the case of Norwegian People's Aid (NPA) in Iran, in direct support of the commercial oil company, Norsk Hydro, this has happened.

The processes and planning that are required prior to winning a contract become the blueprint for the delivery of the programme. In the case of commercial companies, the project manager must develop a beginning, middle and end in order to be able to monitor the progress and achieve milestones that deliver payments. The need to ensure the company is successful from a commercial, as well as a demining, perspective means that resource planning and allocation must be as accurate as possible. The process influences the manner in which the demining teams are organised and the task is conducted.

In comparison, NGOs tend to develop their programmes in a reactive manner, because they are never sure how much money might be available and therefore do not plan their resource requirements for the following year in the same way as a commercial company. In addition, they often have other developmental aims that are complementary to their demining tasks, but that can confuse any direct comparison with the commercial sector. NGOs do not have the same motivational influence to be as efficient or as financially accountable to themselves: providing they have donor money, they can continue to operate in a manner that enables the donor to see that they are getting a job done.

## Benchmarking

The ability to benchmark performances, both from an internal perspective and from an industry perspective, is a valuable asset to any organisation. Benchmarking provides a clear reference against which the organisation can measure itself to determine strengths, weaknesses and promote self-improvement in a structured and informed manner.

Currently there does not appear to be any means of providing this capability and many organisations felt that it was not feasible, given the large number of diverse variables that impact on any one project. However, there are many other international industries that experience similar variables and have been able to formulate criteria against which they can measure performance, such as the oil, mineral and agricultural industries. Without a strong lead from a governing body or from the organisations themselves, getting benchmarks accepted will be difficult.

Certain countries, however, are trying to implement benchmarks. The example of CROMAC and the Croatian government shows that it can be done. In Croatia, the Government of Croatia is represented by the CROMAC council. Demining work in Croatia is implemented on free market principles. CROMAC, as the national mine

action authority, awards demining contracts through public tenders to qualified demining companies. CROMAC selects the best bidders and performs quality assurance of their work.

CROMAC has defined numbers of square metres that can be achieved per deminer per day, given a set number of hours in a working day. They have mandated the pay rate of Croatian deminers (at a cost to the company of around US\$2,000 per month) and they have imposed stringent requirements on any company wishing to conduct demining activities within the country. Despite extremely tight constraints, there are still 27 active demining companies bidding for work in Croatia. Even with the imposed high overheads, they appear to be making a profit (estimated by one source at around 20 per cent) from an average charge of between US\$0.50 and US\$0.80 per square metre, although these figures appear to also take into account large area reduction tasks.

On this basis, and with a strong commitment from the government (both financially and through the acceptance of risk in their approach to area reduction) Croatia sets itself the objective that the country will be free from mines in two to three years. There is a firm commitment to this plan. The commercial company interviewed appeared to be supportive of the approach, and is capitalising on the experience by exporting its remote machinery expertise around the world to diversify its business. In other words, they are preparing to meet the changes in their market.

Commercial companies have to benchmark their performances for internal audits and make use of management tools and processes to ensure they stay on track. This is not something that the NGO management has adopted in its entirety. There appears to be a level of “bashfulness” in sharing some information and, when it is shared, it is often done with a touch of spin. The commercial operator has to be accountable to many stakeholders; therefore he must have processes and audits that are fully transparent.

## Management tools

Many organisations, especially companies, but also a number of NGOs, are seeking ISO 9000 accreditation, demonstrating their quality system. ISO 9000 is generally understood to be a sign of a reliable and efficient organisation. Although the philosophy and intent is good, it should be pointed out that ISO accreditation is no indication of levels of performance or efficiency. In some instances, it may be argued that the ISO process increases costs and slows activities down; but it does assist with audits and transparency, which are critical for business.

Another management tool, which is mine-action specific, is the Information Management System for Mine Action (IMSMA). This was designed to help national mine action programmes collate data on work completed and compare it against mine presence and land prioritisation requirements. However, as IMSMA is designed for national use, it relies on data coming upwards from the various organisations conducting mine action, which is difficult to obtain accurately and in a timely and efficient manner.

The current version of IMSMA (version 3) is complex to manage, and data collection is an issue within organisations in terms of quality and availability. Furthermore, many governments feel that this type of information should not be made available generally, and so do not disseminate the data. As the organisations that provide the information

do not benefit from IMSMA, they feel that the costs involved in collating and sending the information represent a waste of time. Indeed without the ability to make use of this information, this appears to be the case.

## Resource planning

Resource planning is critical to effective business practice; it helps identify what the organisation's core business is, what it needs to achieve, and its desired status and defined goals. NGO planning tends to be in response to what has been done before in that programme and to be reactive to donor requirements. The policies of donors inadvertently become the driving force behind an NGO's business plan.

Commercial organisations do not have these constraints; they can create a clear marketing and business development plan that allows them to recognise when a bid is no longer viable, and ensure that work undertaken plays to their strengths. They can employ people under short-term contracts, maintain smaller headquarters, and do not require permanent regional offices, thus keeping their overheads to a minimum. They are also able to contract machinery to suit each task rather than purchasing it, although some commercials have chosen to buy. The commercial company's potential weakness is its inability to understand the local politics and develop the networking capability essential to a smooth operation.

Logistics, which are an essential part of planning, could also be improved. One demining organisation visited had 50 separate sites in a single country, widely spread over large and difficult terrain with poor transport systems. This situation appears to have arisen from externally driven requests for responses, rather than from a long-term development plan of the organisation's skills, resources and ambitions. Sustaining such an extended programme is costly, inefficient and unlikely to be effective.

Thus far, no NGO surveyed appears to have conducted a formal exit strategy. NPA in Mozambique is currently planning an exit strategy, but it is in its early days yet.

## Exit strategies and motivation

Earlier sub-sections have looked at how current motivational factors in the demining community are inappropriate. NGOs do not have any incentive to finish a task within a country, provided funding is available. They rely on money from donors to clear mines; if demining is completed to a level where the NGO is no longer required then there is no reason for donor funding.

Commercial companies, on the other hand, may be able to offer incentives for early completion as they can recoup costs if the contract is finished ahead of schedule. Therefore, their employees, who were only hired for a set period, can benefit from efficiency, while NGO employees do not.

Deminers naturally will protect their jobs regardless of whether they are good at it, enjoy it, or are physically still able to do the job well. Local government laws often prevent dismissal and legal proceedings are initiated regularly. The development of a workforce that is motivated by pay alone has long been recognised as self-defeating, with focus on self development and advancement being acknowledged as more beneficial to the individual.<sup>3</sup>

3. Maslow (1970).

## Planning

CROMAC, which has stringent rules and regulations about price structure, time and resources when it comes to assessing a bid, declares that the only difference between one organisation and another is in their planning and ability to get the job done. Important bid differentiators for planning were cited as: coordinating with the local police and authorities, developing networks with local communities, management of the logistics of accommodating deminers, and moving resources around a country. This highlights how critical an experienced planner is to the success of a demining project.

During the course of the study, many examples were found of poor logistics and planning, such as the location of accommodation and headquarters in relation to the minefields. A huge amount of time, and money, is spent on unnecessary travelling and transport. Also, lane deployment and site management was not conducted effectively, as is discussed below.

Other areas of concern include procurement and the allocation of essential donor resources to tasks. During a country visit, an area was being cleared that was known to be free of mines, yet the task had been in progress for several months. Once the area was clearly recognised as such, the team should have been immediately moved to a more useful task.

Efficient performance is a mix of understanding local cultures and how business gets done, while sticking to good management practices for global benchmarking and consistency. This includes the ability to deploy teams effectively. To plan the site clearance effectively, making maximum use of resources in relationship to the geographical implications of the site should be fundamental to all demining projects.

## Teams

The team structure of deminers varies little between organisations, although numbers vary considerably depending on the task and the location. Teams are often referred to as “platoons” and usually consist of three sections. Each section typically has nine people, i.e. eight deminers and a Section Commander, who may be trained in mine identification and who oversees the process.

In some cases, “multi-skilling” is achieved through combining medical training, explosive ordnance disposal (EOD) skills and machinery operation. This is the most cost-effective and productive approach, as it also allows the deminer to collect skills to enhance pay and promotion prospects (*see section on motivation*). It also ensures that the right skills are available on site and reduces downtime, particularly in the case of EOD. In other organisations, however, skills are kept separate: dedicated first-aid personnel and mechanical operators do not usually conduct other activities.

## Organisational issues

The multi-country UN study, *The Development of Indigenous Mine Action Capacities*<sup>4</sup>, published in 1997, made several observations and recommendations about management

4. Eaton et al (1997).

within the mine action community, notably that: “A major impediment to effective mine action programmes is poor management”. It is here that the most significant potential benefits lie. This section attempts to identify some of the key issues.

### ***Inherent skills***

Many small demining organisations have evolved into multi-skilled entities that require a significant range of skill sets. Finding these skill-sets locally is not a simple task. Box 1 lists the skills currently required of a demining organisation. It is not exhaustive, but gives some idea of the diverse range of expertise.

#### **Box 1. List of skills required of a demining organisation**

- International law.
- International politics.
- Local employment law, and health and safety issues.
- Local culture and environmental knowledge.
- Management when working in hostile environments.
- Safety and Protective measure in hazardous environments.
- Equipment procurement.
- Communications equipment, VHF, HF, etc.
- Logistics, road, freightage, buildings, travel and accommodation, etc.
- Maintenance, fleet and equipment.
- Financial skills of a general nature.
- International fund-raising and fund management.
- Technology-advancing techniques for mechanical.
- Animal husbandry and management.
- Training – varied and non-standardised.
- Management at all levels, resource planning, etc.
- Human resources (total needs for 24-hour care).
- General medical.
- Emergency responses.
- Project management.
- Detailed data management.
- IT – database and Excel.
- Senior management – leadership, business skills, strategic decision-making, communication, organisational skills.
- Middle management – leadership, business skills, tactical decision-making, language skills, teamwork.
- Mapping and survey skills.
- Risk management.
- Driving skills.
- Machinery operation and remote operation skills.
- And, last but not least, EOD and demining skills.

Some NGOs and commercial operators also provide the following as an additional part of their “cross-cutting” mine action capabilities:

- Community liaison teams.
- Mine risk education teams.
- Educators and training skills.
- Health education, such as on HIV/AIDS, malaria and dysentery.
- Life skills, money management, etc.

### ***Quality management***

The approach to quality management activities varies between mine action organisations but is normally conducted in-house, as external assessors are few and

far between. In principle, NGOs reported that they were not averse to external quality assurance (QA) and quality control (QC) but “it didn’t really happen” so had not been adequately put to the test. Commercial companies are all subject to external QA.

Some QA activities observed in the field indicated significant skill fade as processes were lax and somewhat *laissez faire*. There were also verbal reports from operators and authorities to suggest that mines are found after land has been cleared, suggesting that manual demining methods still leave a residual risk, while endorsing the view that errors and skill-fade sometimes remain undetected.

Again, training for QA activities appeared to be more *ad hoc* than formal, often with only a few people available to cover not only vast territories but also other tasks such as technical surveys. These individuals may spend considerable time driving between sites and may not be able to conduct QA in a timely manner. Skill fade may be an issue if they are not able to conduct tasks as frequently as they should.

The commercial view is that external QA appears to ensure adherence to SOPs. This view is supported by Section 4 (*Risk Assessment and Risk Management of Mined Areas*).



# Capacity-building

## The deminer

The person responsible for the physical detection of mines is nearly always employed in-country, although some commercial firms (and occasionally NGOs in start-up operations) move teams from country to country, capitalising on their initial training investment from previous projects.

## Recruitment

Recruitment of deminers does not appear to present a problem. There is seldom a shortage of local people willing to offer themselves for training. A major reason for this is probably because average deminer salary is significantly above all national average pay rates. Rates quoted for developing countries were universally US\$150 to US\$250 per month (roughly equivalent to eight times national average pay, and three times more than a teacher in the majority of countries where demining is undertaken). Some organisations questioned paid more, but none paid less than \$150, with the exception of NGOs involved in “locality” demining projects.

There is no industry standard outlining the minimum entry level required of a deminer. The following examples demonstrate this:

- some organisations will only recruit former local military personnel (this applies to NGOs and commercial firms);
- some deminers who are sick may nominate a member of their family to take their place;
- some organisations are happy to recruit women and amputees if they can do the job;
- often, no educational standards are required, even a literacy test;
- there is often no physical standard or test to pass before acceptance as a recruit, the only criterion mentioned was sight; and
- hearing and physical fitness are not always tested.

However, in Croatia, there are stringent selection criteria for all organisations and applicants must have:

- a high school education;
- completed military service;
- no criminal record;
- good physical and mental health; and
- attended a special Police Academy training course (six months) and successfully passed the final examination.

Some organisations do have a minimum age limit of 18. There was no stated upper age limit, although it became clear from research that age is a factor in performance for demining.

Recruitment is often predominantly from the ranks of the local military and in some cases (for example, Cambodia and Mozambique) such recruitment has formed part of the peace accord and demobilisation, both providing employment (thereby promoting demilitarisation) and because many soldiers had been involved in laying the mines and were therefore considered a good source of knowledge as to their location.

In many countries, ex-military males form the core staff. The rationale was that such people would readily adapt to the military style prevalent in demining organisations and that they would be easier to manage and train. This may be a self-fulfilling prophecy. The two organisations (MAG Cambodia and NPA Mozambique) breaking the mould reported that both non-military and female deminers adapted very well to the task. In particular, women, who traditionally in developing countries do menial and repetitive tasks in all climates, have better and more sustained levels of concentration and are more compliant with rules than their male counterparts. Women also tend to be better at sending money back to their families and less inclined to spend their wages on gambling, drink and sex.

One drawback to employing females is the manner in which NGOs typically deploy to minefields, that is, by locating teams around the country rather than training local people. This would typically preclude the involvement of women unless they had either no family or an extended family to care for children.<sup>1</sup> The locality demining projects, which are set up to use local populations to clear their own villages in a formal process — such as those run by MAG and, in Afghanistan, the Agency for Rehabilitation and Energy Conservation (AREA) — provide ample evidence that the proper employment of women can be successful.

### Comment

Manual mine clearance is routine and monotonous and is often carried out in rather unpleasant conditions. It requires high levels of internal motivation that allow individuals to overcome boredom, to remain alert and to sustain high levels of attention to detail. Although local employees are used to the conditions, the working rhythms and shift cycle may be alien for agricultural workers and farmers, although they are expert at working the soil for long periods in all conditions.

Personality type plays a significant role in the ability to sustain attention, and soldiers recently demobilised after extended time in high-stress environments may find such mundane, routine work hard to sustain and lack motivation.

<sup>1</sup> Interview with MAG, Cambodia, March 2004.

Some NGOs affirmed that part of their role is to build capacity. It is not clear that recruitment of ex-military personnel supports capacity-building as it keeps the new income from mine action in a small section of the population, which may not, for a variety of reasons, be invested in their families or villages. Additionally, deminers may become stuck in the job as their skills do not easily transfer to other occupations. Thus, the training of demining may well not contribute to capacity-building. An exception is said to occur in Lebanon, where many deminers have left for other employment despite the high wages.<sup>2</sup>

## Training

Typically, organisations that have recruited deminers put them immediately on a salary and send them on a training course supplied in-house. There are small fluctuations in training length, with the shortest period for training a deminer being one week. Additional time is allocated to training EOD skills and for render-safe procedures.

The average training period is about two weeks for completion of demining training. As a general rule, a recruit seldom fails — but just takes longer to go through training, until the requisite standard is attained. This is not efficient as all training is conducted on some pay and, in many cases, full pay. It also suggests that training does not cater to different aptitudes, reinforcing a view that there are no minimum standards of entry at recruitment.

Refresher training was mentioned but did not appear to take place systematically, only on an *ad hoc* basis as and when it was deemed necessary. Many organisations stated that “skill fade” was not an issue as the deminers were doing their task every day. This is often not the case as each site has different demands and deminers may become complacent when working in low-risk areas.

Apart from the initial training at the onset of a demining project, there did not appear to be any further training requirements. Generally, deminers tend to stay not only within the industry, but also within the same organisation for many years and only leave if they are sick or if they are no longer fit for the task. There is, however, no standard by which deminers may be measured as to whether they are fit for the task or not — apart from a complete inability to conduct the activities. There may be a case for clearer guidance to be offered to organisations employing deminers.

## Comment

Training on full pay with no standards of entry is generally inappropriate for three reasons: cost, motivation and the potential for corruption. Very few jobs in other domains (except the military) expect to pay new recruits to receive training. The provision of free training without pay provides an incentive for individuals to attain proficiency and move on into the job. The clothing trade in Cambodia, a major employer in the towns, expects recruits to have trained themselves prior to applying. Construction companies canvassed for this sub-study reported that they recruited and provided free training without pay in developing countries, and expected recruits to be trained in developed countries.

Refresher training should be provided regularly, as many of the sites being cleared did not have many mines present. This results in a long-term “de-sensitising” effect where

2. Lardner (2002).

deminers can easily become complacent in their work. Such a situation tends to lower the expectancy threshold, which, if a mine is then encountered, increases the risk of it not being discovered. It may be beneficial to provide a short refresher course to all deminers when they start a new site, to raise their awareness of the particular issues that are relevant to that site, i.e. soil type, detector behaviour, fragmentation management, clearing hilly land, and so on.

There does not appear to be a grading system for deminers that would allow for novice deminers to be “buddied” or supported in the early stages of their career. MAG reported that it takes six months for a deminer to become fully proficient. Salary scales could be graded to reflect this, so as to continue motivation to maintain high standards.

## Demining activities and performance

The deminer’s primary tasks are to carefully segment the ground in a marked lane with a metre-long stick, cut vegetation, sweep with a detector and investigate the ground using a prodder or excavator. These activities are fairly universal across all organisations, with only minor differences in tool type. Deminers are provided with a variety of tools. In most cases, a metal detector of some sort is used but this is not universal: detectors are not deemed suitable for some environments and conditions, and in others, there may not be enough to equip every deminer.

Measurement of performance through the number of square metres a deminer clears in a day is one that all organisations have adopted, and was, until recently, also the donors’ preferred measurement of performance. But data is only collected accurately by a few organisations to provide more detailed performance analysis and/or to create a means of incentive for deminers. And the demining industry generally acknowledges that square metreage, on its own, is not a particularly useful measure of efficiency because so many variables affect a deminer’s daily progress. Along with such measures as battery and fuel usage, these figures can form the basis of good planning figures and clear performance indicators need to be defined.

The study team found discrepancies at several levels in the quoted figures for square metres cleared. Virtually all organisations quoted an average clearance rate per deminer of about 50 square metres a day. However, when calculations at individual sites were made on the presented data for total area cleared, divided by deminer days worked, the figures appeared, on average, to be closer to 15–20 square metres per deminer per day. In the more detailed case studies in Section 3, this latter set of data was confirmed as realistic. In terms of planning capacity this represents a significant capacity gap and organisations need to be clearer about their outputs.

In an exception to the norm, the Mine Action Coordination Centre Southern Lebanon has maintained a detailed record of all clearance undertaken under its auspices. This has enabled them to develop a series of detailed planning figures based on previous clearance.<sup>3</sup> While clearly rates will be affected by the terrain, degree of contamination and prevailing climate, the Centre uses the following general figures for operational planning for manual mine clearance operations in South Lebanon:

- 20 square metres per deminer per day using a metal detector on military-laid, pattern minefields with low metal contamination;
- 17 square metres per deminer per day using a metal detector on suspected hazardous areas with low metal contamination;

3. MACC South Lebanon, Task Planning calculations, 2004.

- 8 square metres per deminer per day using a metal detector and then excavating signals on suspected hazardous areas with medium metal contamination; and
- 3–5 square metres per deminer per day using full excavation on suspected hazardous areas with high metal contamination.

These rates give an example of “real” clearance rates and are similar to the rates developed as part of the GICHD Study of Global Operational Needs.<sup>4</sup> This study classified 12 separate terrains and modelled the rates that might be expected to be produced from such terrains. The results are shown in Table 1.

| <b>Type of scenario</b> | <b>Model estimated square metres per day (general)</b> | <b>Model estimated square metres per day (Cambodia)</b> |
|-------------------------|--|---|
| Grassland               | 10.0   | 20.7  |
| Woodland                | 9.6  | 24.5  |
| Hillside                | 9.5  | 12.2  |
| Routes                  | 7.3  | 0.8   |
| Infrastructure          | 4.4  | 0.8   |
| Urban                   | 3.7  | -   |
| Village                 | 3.5  | 2.0   |
| Mountain                | 12.6   | -   |
| Desert                  | 104.2  | -   |
| Paddy field             | 16.9   | 29.7  |
| Semi-arid savannah      | 8.0  | 17.5  |
| Bush                    | 7.1  | -   |

It is worth noting that the figures do give the same order of magnitude to, and compare favourably with, the trials described in Section 3, which reinforces the belief that the actual productivity figures from organisations often lie below the figures quoted by those organisations, and that are often used for planning.

Performance levels are affected by:

- fragmentation levels and contamination;
- soil type;
- topography;
- weather and climate;
- use of mechanical ground preparation methods (a mechanically-prepared area has a huge positive impact on performance);
- area reduction techniques;
- vegetation;
- number of mines present;
- management style;
- detector performance (suitability for soil, sensitivity, weight, etc.);
- personal protective equipment;
- lane management (one-, two- or three-man lanes);
- standing operating procedures (SOPs); and
- the age of the deminer.

4. GICHD (2002).

### Comment

The development of demining techniques has been evolutionary. The original military approach has been universally adopted by all companies around the world and is seldom challenged or subjected to analysis for alternative approaches. However, in terms of safety, if SOPs are adhered to, the military approach does appear to be a robust method that is well proven. Nonetheless, a number of countries with particular environmental issues have developed different techniques; for example, in Sri Lanka, operators employ raking techniques because of soil type, and the technique works well. However, such a technique would not work in hardened soils or in areas where there is heavy root growth, for example.

The day-to-day monitoring of metres cleared per deminer on each site is a useful means for providing an intra-team comparison of deminer performance. As data is collected it can be used as a benchmark to inform performance expectations at other sites and projects, and to improve the management's ability to plan, and predict timescales and costs.

Data also provides the management with a clearer understanding of individual performance levels. This data can be used to build better teams and to enable fair and accurate motivational schemes to be implemented. It also supports more accurate data collection of total area cleared. But, of course, this only works if the reporting system is meticulously implemented and audited. In many instances, the method of data collection as it progresses through the management cycle can only be described as "round up, round up, round up". In one case encountered, Section Commanders were rounding their day's clearance figures upwards and passing to Platoon Commanders. The Platoon Commanders were then rounding their figures up before passing on to the regional office, and this rounding up happened again before the figures eventually made it to the central database.

Although there are no generally accepted standards in terms of the output expected from manual mine clearance deminers, the rates outlined in the Study of Global Operational Needs<sup>5</sup> and earlier in this section, appear to be reasonable and could offer good planning figures for the community.

### Lane deployment

One area where process can differ is the manner in which deminers are deployed in a clearance lane. The traditional post-1945 methodology was that of using a number of men (two or three) in one lane, with roles switching in the process was undertaken. As humanitarian demining developed the same principles were applied but, with time, organisations attempted to better focus their efforts by using different numbers of deminers in lanes with different roles. This was considered to be more efficient and cost-effective. However, it became obvious that there was a problem with definitions, as it was not clear exactly what each organisation was describing when it used the term "one-" or "two-" man lane deployment.

The following definitions were identified:

- a) *one-man-one-lane (version 1)*: all deminers work in a single lane (detecting and investigating) and then all rest — little spare capacity (relief deminers only);

---

5. GICHD (2002).

- b) *one-man-one-lane (version 2)*: one deminer doing all tasks and one deminer resting per lane (this definition appears to be interchangeable with one type of definition for two-man drills);
- c) *two-man lane drills*: one deminer detecting at the front of the lane with the second some distance behind observing and, when a reading is indicated, prodding and investigating the signal; and
- d) *three-man lane drills*: one in the lane either as per (b) or two men as per (c), and one completely resting.

The organisations that have adopted “one-man” methods are, on the whole, those which have enough metal detectors for each deminer in the field and, given no limitations on resources, it appears that the “one-man-one-lane” methodologies have now been accepted as the norm.

While IMAS offers general guidance on the destruction of mines found during operations and suggests that “best practice” is to destroy each item *in situ*, more and more programmes are leaning towards neutralisation and subsequent off-site destruction of mines and UXO, as this is less disruptive to other deminers or to adjacent community activities.

The use of multi-skilled deminers on site appears to be more practical and time-efficient. Incentives such as pay increases and bonuses for conducting other tasks may be a useful means of persuading deminers to become multi-skilled.

The efficiency of site clearance is highly dependent on the layout of the site and forward planning of the Site Supervisor. Multiple lanes must be open to ensure that deminers can continue safely if their original lane has been closed waiting for a mine to be rendered safe or destroyed if “*blow in situ*” procedures are being used. Safety distances between working deminers can limit the number who can be deployed.

## Working patterns

Many accept that the local Site Supervisor should use his discretion as to how long each working period should be and how often breaks are implemented. Clearly, climate plays a significant role. However, there was a clear discrepancy at every site visited between the periods claimed by senior management and those actually worked. This has implications for the planning and management of a site and prevents effective benchmarking.

In general, any work requiring sustained concentration benefits from frequent, short breaks.<sup>6</sup> If the working period is too long there is an increased risk of error through fatigue and loss of attention resulting from dehydration and boredom. If, however, the breaks are too long there is a risk of concentration and motivation decreasing. Optimum attention levels and performance are achieved through maintaining sustainable momentum. Small frequent breaks and sufficient stimulation to maintain interest can achieve this.

If deminers are spending long periods with no stimulation between working periods, (as in two-man-lane drills) they are more likely to be “out of the loop” when returning to the task and will have more frequent occurrence of slips, lapses and mistakes. An

---

6. Gyllenhammer (1977).

additional factor in two-man-lane drills is the increased potential for communication failures when handing over a lane.

A working day normally consists of transport to the site (outside of working hours), briefing and a seven/eight-hour day in the field (i.e. 7am to 3pm), with breaks. However, many organisations stipulate that a deminer should not physically be demining more than five hours a day. The rest of the working day is designated for personal maintenance of issued uniform and equipment.

### Comment

Over recent years, the industry has seen increased use of one-man drills. This has tended to increase outputs but is inevitably linked to increased capital costs due to the increased amount of equipment that needs to be procured. This section did not have the scope to consider this in detail, but it is recommended that every programme manager reviews their programme to undertake some form of cost-benefit analysis before making decisions on this.

For working routines, there should be a balance between breaks and working periods so that they are not too long or too short, and this decision should be made at the local level.

The organisation should also consider seriously (where permissible), the pros and cons of destruction *in situ*, and consider the alternatives available, including neutralisation and removal for bulk disposal.

## Dehydration

Nearly all people living in moderate climates have a degree of dehydration of around 1 per cent or more. When dehydration reaches 2 per cent there is a significant impact on performance — in particular cognition — and a fall-off in reactions and mental responses of up to 15 per cent has been recorded in sports and other activities that require attention and decision-making.

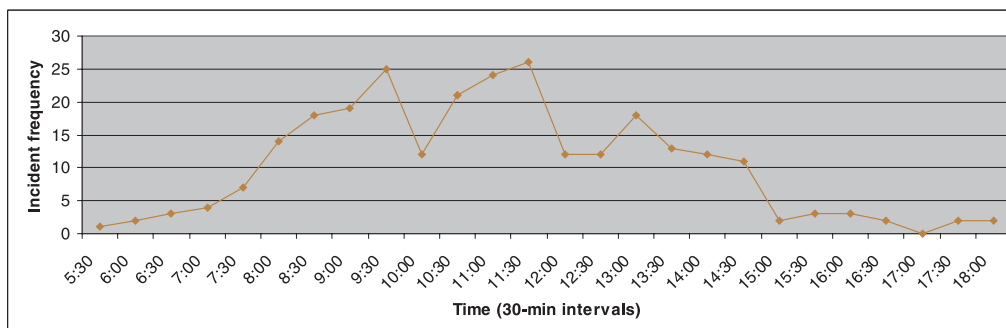
Slow thinking and slow reactions are the least desirable effects for deminers, as they need to be mentally alert to spot very small clues and to discriminate between auditory tones. Fine motor skills are also badly affected by dehydration, which are also critical to deminer safety and effective performance.

Some organisations did not provide water to deminers, who are therefore responsible for ensuring their own water supplies. If a deminer is working in extremely hot conditions, is hung over, has any form of dysentery or any other condition that involves depletion of water from the body, then he/she will experience dehydration, which can be severe.

Given the limited amount of accident data and the lack of standardisation of that data, it is impossible to draw conclusions about the link between error, fatigue and dehydration. Of the 268 (of 409) accidents in the Database of Demining Accidents (DDAS) that have a time linked to them, there is a general trend for more accidents in the period between 9.30am and 12.30pm (*Figure 2*). Unfortunately, because of the variations in working routines and break times, we cannot draw conclusions other than to suggest that demining during this period appears to be more dangerous than

at any other time, perhaps because of the climate or perhaps simply because this is the period when most deminers are working.

**Figure 2: Occurrence of accidents throughout working day**



### **The effects of heat**

To maintain the required 37°C body temperature, a person's body must continually adapt to changes in:

- air temperature;
- humidity;
- air movement;
- solar radiation;
- barometric pressure; and
- clothing insulation.<sup>7</sup>

Muscular exertion and food intake also increase production of heat, which must be removed from the body. Failure to remove heat results in hyperthermia.

The back and chest have the greatest sweating rates and the arms and legs the least. Sweat evaporates from the heat of the skin and cools it. Evaporative cooling is most effective when the skin remains wet and, in high environmental temperatures and strenuous exercise, liquid loss may be as high as 1.4 to 2 litres an hour.

In hot, dry conditions, evaporation accounts for 85 to 90 per cent of heat dissipation, emphasising the need for wet skin and lightweight, loose-fitting porous clothing. When air temperature and humidity levels are high, means of body cooling are stifled and the body stores most of its heat. PPE prevents heat loss from the body, meaning that there may be a higher risk to the deminer by wearing PPE through error induced by dehydration and/or heat exhaustion than if the deminer were not wearing it.

### **Physical and psychological effects**

The following are the main physical and psychological effects of dehydration:

- heat exhaustion;
- exertional heatstroke;
- heat cramps;
- heat syncope (fainting);
- severe discomfort, and in some cases distress; and
- loss of mental capacity and lethargy.

<sup>7</sup> Sanders and McCormick (1992).

## Combating the effects of dehydration

Plenty of care is taken in the logistical and procedural elements of managing deminers (i.e. parades and inspections, etc.) but not in the general refreshment and comfort of the workers. More emphasis should be placed on rehydration, and thermal and physical comfort to aid performance.

The following are ways to combat the effects of dehydration:

- acclimatisation;
- hydration;
- loose, lightweight clothing;
- porous clothing;
- cold water on skin; and
- drinking water and electrolytes.

### Comment

Discomfort is an inevitable consequence of operating outside in harsh environments. In the case of deminers, this is compounded by the heavy-duty PPE generally worn during the course of their work, which contributes to the heat build-up and liquid loss during work.

There are limited mitigating procedures that can be undertaken to overcome these potential problems. Regular water intake, measured workloads and regular breaks will all assist with the problem. But deminers should not be expected to regulate all these by themselves and managers should ensure that these issues are being dealt with in a sensible manner by the deminers.

There is also a wider question as to the justification for wearing PPE. It is the view of this Study that there should be a full review of IMAS on PPE and that clear guidance be should be given to operators on the factors to be taken into account when planning what PPE to wear.

## Effects of personal protective equipment

The introduction of mandatory PPE has been one of the major safety innovations in recent years. However, the degree and standard of PPE vary considerably between organisations. Moreover, although PPE plays a vital role in the protection of the individual, a number of factors should be considered when purchasing a particular type, as it can have a negative influence on performance, and the wearer can be affected in several ways:

- **Increased risk of error through visual distortion caused by the visor**, particularly if it is poorly maintained, scratched or otherwise damaged; this is a main reason for wearers to violate SOPs and lift their visors, putting their eyes and face at risk.
- **Accelerated fatigue**, caused by the body and joints having to work against the weight and bulk; there appears to be an increased risk of trips and falls, in particular if the wearers cannot see their feet when wearing body protector and the visor.
- **Dehydration**: PPE accelerates the sweating process and the risk of dehydration, which has an implication for performance.

- **Increased risk of musculo-skeletal injuries:** the human head is heavy and for demining tasks it has to be extended forward and downward, which, even without a helmet, puts the neck and shoulders under strain as the head is out of balance. Wearing a helmet and visor exacerbates this considerably, which will probably accelerate the effects of fatigue, headaches and muscle strain; this is another reason for lifting the visor as it helps to rebalance the weight on the head.

The DDAS has identified that 27 per cent of demining accidents are caused by missed mines. The majority of accidents cause lower limb injuries, against which there is little physical protection available. Other frequent injuries are to hands and fingers yet gloves are not typically provided, and when they are, they are typically gardening gloves which offer little protection. Visors do protect against the other frequent type of injuries — i.e. those to the face and eyes — but because they are uncomfortable, hot and distort vision they are often not used correctly and thus contribute in a roundabout way to the accidents. Thus, the protection being provided by a body protector does not address the main type of injury being experienced.

Body protectors are primarily designed for protection against fragmentation injuries, which are best prevented by good lane drills, site management and adherence to the safety procedures in SOPs. Body protectors come in many shapes and sizes: some just cover the torso; others the groin and legs. Those protecting the thighs hamper movement and increase exertion, so accelerating fatigue. They also inhibit any airflow around the skin for cooling purposes.

Those at most risk from fragmentation are the supervisors walking between lanes when deminers are working, yet in many observed incidents these were also the very people not wearing body protectors — contrary to SOPs. The size and purpose of body protectors should be examined for cost-effectiveness, as reported body injuries appear to be few, they are expensive,<sup>8</sup> and they may have a detrimental effect on performance, especially when comparing the protection they actually provide as against a greater threat of injury to other body parts.

In fact, body armour may be a legacy from the military combat role when lane distances could not be sustained as the rate of advance would be a priority and clearance was conducted standing up. In these situations, the risk of injury from fragmentation was therefore much higher. Section 4 (*Risk Assessment and Risk Management*) further supports the view that the necessity of PPE needs to be reassessed.

### Comment

There are still several schools of thought on the use of PPE. It is the view of this Study that much more flexibility should be allowed in the use of PPE and, in certain circumstances, there may not be a requirement for body PPE. From the evidence available, it is believed that eye protection is vital and should remain an absolute requirement for deminers. This does not mean, however, that the common visor needs to remain the *de facto* standard.

The Study therefore recommends that the IMAS be reviewed urgently with a view to downgrading PPE requirements. This could perhaps be done through a “risk zoning system”, and a review of safety distances in areas believed to be contaminated to allow for closer working and, by default, easier of site management.

8. Although this appears to make no difference to the output costs of cleared land: see Section 5 on the costings of manual mine clearance.

## Influence of management style on performance

Management style has a major influence on the effectiveness of demining at all levels. This section addresses in turn issues of SOPs, working patterns, shift lengths and incentives.

### *Standing operating procedures*

The development of SOPs has been enhanced with the introduction of the IMAS. The SOPs to which the study team had access were detailed — in some respects, perhaps too detailed<sup>9</sup> — and rigorous. For instance, some of the levels of checking and rigid reference to times and processes could mean that individuals are not given the latitude to ensure that their procedures best fit the situation.

One NGO staff member made the point that the organisation did not update its SOPs as they were constantly out of date and not readily available. However, he also later claimed that all the demining incidents experienced by that organisation were attributable to a failure to comply with SOPs. If, however, SOPs are too detailed then they are likely to be violated or deemed irrelevant to a site.

Many SOPs do not refer to calibration of detectors, testing or any other physical feature of performance by the deminer. Radios and machines are typically covered in detail, but the physical condition of the deminer is not. In general, the more effective SOPs appeared to be those that were short, discrete and which reflected daily realities.

### *Shift lengths*

The regular working schedule for most organisations visited by the study team was a 40-hour working week with a regular five-days-on, two-days-off pattern, plus annual leave. However, there were some variants, such as the HALO Trust, NPA and MgM (Menschen gegen Minen), who work for extended periods and then allow more time off so that deminers can return to their families (i.e. 24-days-on and seven-days-off in the case of HALO, and up to 48 weeks of work a year for MgM<sup>10</sup>). However, they still work an eight-hour day on average, with the start/finish time varying with the climate. However, given the various types of drills and rest breaks, deminers generally operate for between four and six hours a day.

The number of days worked consecutively has a significant impact on performance levels over time. It may be that the extended shift routines are detrimental over the long term for the following reasons:

- **Extreme fatigue through accumulation of boredom and no downtime:** people are not good at sustaining quality of work when tasks are not only mundane but also arduous.
- **Too long a break:** the break period means that deminers are likely to switch off completely, therefore taking longer to get back into their routine and increasing

9. For example, the SOPs reviewed were detailed in the conduct of parades and timings but not so detailed in the description of tasks and how to solve problems should they occur.

10. MgM have a structured and military-style day of four-hour shifts, working 20 minutes on and 20 minutes off. The day starts at 6am going through until 6pm. Deminers work seven days a week, relying on weather conditions and machinery breakdown to account for breaks (excursions and sports are also organised). This is a mirror of a military structure, including parades and making camp, with a “lights-out” end to the day. A team is as big as it needs to be for the task.

the risk of error; supervisors of this regime reported higher near-miss incidents during the beginning and end of the shift; this will be true of any shift pattern but will be more pronounced in longer shifts.

- **Too long a period away from family:** causes some degree of anxiety.
- **The boring nature of the job:** this means a higher risk of long-shift employees developing social problems, such as drink, drugs, gambling, etc.; the level of incidence of HIV in the demining population also suggests this may be the case.
- **Infrequent visits to family and increasing “vices”** prevent money from being sent back to the villages and families.

### Incentives

A number of organisations work on a disciplinarian model, such as a monetary “fine” for every minor mistake in the field. There does not seem to be any consensus on motivational factors for performance.

Deminers are given sick pay and some have paid annual leave over and above national holidays. One example of an incentive encountered was to set a daily target to be cleared by each deminer, which, when achieved, meant he/she could finish for the day. This created a situation where deminers were encouraged to go faster, and some were achieving their targets within a couple of hours. Such targets are inflexible with regards to ground conditions and are not conducive to positive safety.

The organisation involved felt that quality had not been traded off for speed. This is debatable, however, as in the particular minefield where this incentive was implemented, there were no mines and very few fragments — but there was very clear evidence during our visit of at least one serious safety error being committed with regard to an item of UXO. This may be attributable to the incentive, or reflect the urgent need for refresher training.

Few other incentives are offered, the potential for promotion is low and no cash bonuses are given for a well-cleared area or high performance levels. Some organisations do present a prize for the most productive deminer but, given the variables affecting productivity, this may not be seen as a fair system. The only benefits are sick pay and holidays, a system which may actually promote a “sickness” culture where beating the system for days off is more important than productivity.

A “big stick” approach has long been proven to be an inappropriate management tool for motivating employees over the long-term, whereas job design has shown to be one of the most important aspects in improving performance. Two methods are considered to be most effective: *job enlargement*, which means giving people a wider range of skills – despite the additional training costs, this has shown to be cost-effective in improving performance;<sup>11</sup> and *job enrichment*, which adds additional responsibilities and skill requirements or control into the widened range of tasks.<sup>12</sup>

Motivation is multi-faceted and sometimes the different driving factors may conflict — for example, the desire to please one’s employer against the risk of alienating one’s fellow employees by showing them up through excessive diligence and output. An international survey of eight countries<sup>13</sup> showed that the two most important motivating factors for all nations was achievement and performing interesting work.

11. Campion and McClelland (1993).

12. See, for example, the “Volvo Study”: Gyllenhammer (1977).

13. Elizur et al. (1991).

Sustaining motivation when individuals have no sight or feedback of their performance and cannot see the benefits or long-term gains quickly causes disillusionment. Lack of promotion opportunities in organisations that do not want to decentralise (disseminate responsibility and decision-making) may cause individuals to suffer from burnout, resulting in degradation of performance.

The best practices experienced by the study team were those observed during a visit to a MAG locality demining project in Cambodia. Safety was observed without fail (the only site on which this occurred during research for this sub-study). The area was well laid out and the deminers (of mixed sex and age) were well equipped for the task. They were working near their village and lived and ate in their villages at night.

Pay for deminers working on this MAG locality demining project is considerably less than that earned by a “conventional” deminer and locality deminers are only hired on a two-year contract. As soon as the site is cleared, the deminers can return to farming. The money is spent in the community and no negative side issues were observed. Typical pay for a locality deminer is around US\$80 per month and there seems to be an additional motivation factor in that the deminers are clearing the areas near to where they live. The recent Donor Evaluation of Cambodia<sup>14</sup> reminded the mine action community that the true beneficiaries of mine action should be the local communities, rather than the workforces of the mine action agencies.

### Comment

In Section 3 (*Operational Systems in Manual Mine Clearance*) improvements that can be obtained by altering technical issues are clearly identified. It is, however, important to realise that the **key** factor — the factor that will most affect the outputs, productivity, safety and efficiency of demining — is the management of the programme.

## Team management

### Box 2. A military perspective?

The Section Commander's duty is to actively correct any faults the deminer may commit, and to prevent the deminer from deviating from the SOPs. One Section Commander can supervise up to eight deminers, but in some cases will supervise no more than four. According to some SOPs examined, each deminer is supposed to be checked at least twice every 30-minute period. This means, in these examples, one-fifth of the Section Commander's time (assuming one quarter of time spent observing and some transit time between deminers) is spent watching others work (while typically being closer to operations than the 25-metre safety distance).

In addition, there is often a safety officer who checks on everything, as well as performing quality control. This is the work of the Platoon Commander. A Platoon Commander would also be responsible for the work of the Section Commander (of which there would traditionally be four). This implies that a very large proportion of time is spent checking and overseeing a small number of people.

Box 2 demonstrates the deep-rooted military perspective on demining. The military-style section model described is heavily process- not task-focused. Military lifestyle has

14. Keeley and Griffin (2004).

historically operated the “bull” system:<sup>15</sup> that is, a reliance on meaningless tasks to ensure discipline and order but which are not task-focused and do not contribute to effectiveness. The military organisation may get a job done, but not necessarily as efficiently and effectively as one that is task-focused.

Most former military personnel will recognise the term micro-management, and those who have been subjected to it have usually resented it, but it seems to have found a significant following in the demining community. Such an approach may work in developed countries to a degree, but it is not clear how well it transfers to developing countries.

## Middle management

A Field Officer or Site Supervisor is responsible for overseeing the demining site. The Field Officer is typically responsible for destruction of the mines — whether *in situ* or not. Site Supervisors are also trained to make minefield maps, maintain records and check the quality of the work. A quoted salary example in Cambodia for this role was US\$700 per month.

Even though the Site Supervisor is responsible for the running and management of the site they are often not entrusted to make decisions such as risk reduction processes on the site, and is likely not to have received training in decision-making.

A Site Supervisor has a great deal of responsibility and requires a number of skills that are not inherent in a deminer. She/he can make a large difference to the performance of the deminers and the site in terms of timescale, costs and safety. The abilities to complete a large amount of paperwork and to accurately assimilate and estimate lots of data are required on a daily basis. Organisation of the lanes in relation to the topographical features and manpower available and the management of mined areas are specialist skills that need to be trained. The following are examples of some of the skill-sets required of a Site Supervisor:

- calculation of area to be cleared;
- calculation of area cleared;
- site planning — how and where to clear to optimise deminer performance;
- site set-up and ongoing management, including movement of poles, fragment collection and recording, etc.;
- daily clearance rates for each deminer and total cleared — what has been cleared, where has it been cleared, residual issues (trees, mounds, etc.), daily disturbances, mines destroyed or moved;
- map updating;
- Quality Assurance management and reporting: where and what and by whom;
- equipment reports — detectors, PPE, and machines;
- dog performance reports;
- explosives management;
- injury and sickness reports;
- transport reports — mileage and mechanical failures, fuel recording;
- supplies and stores — batteries, food, water, medical supplies (out of date, used);
- pole painting — each organisation appears to have its own marking system;
- management of visitors and recording visitors onto site;
- disciplinary reports; and

15. Dixon (1976).

- decisions about the implications of threats found, their location and type, their possible impact on boundaries and lane clearance, and the allocation of potential mined lanes to deminers who have the right experience and who are not tired or sick.

The Site Supervisor is responsible for a large amount of monitoring, both for safety and to ensure that tasks are done correctly. It was not clear in the organisations studied how these skill-sets and comprehensive knowledge requirements were trained and monitored. Many reported in-house training, which actually translated in practice to on-the-job training.

### Comment

Deminers are not inherently managers. Many programmes in the past forgot this and promoted deminers without providing the backstop of training. This has changed to some degree, yet there are still a number of managers without the prerequisite skills to undertake the job they are required to do.

On many occasions, the Supervisor's responsibilities did not appear to be put into practice in the field. A considerable number of errors and SOPs violations appeared to go undetected and uncorrected by the team leaders and supervisors.

For instance:

- large, obvious (almost complete) ordnance, such as mortars, in the fragment bin;
- obvious signs of skill fade (e.g. poor use of metal detectors, prodding techniques, etc.);
- failure to comply with SOPs, no monitoring or overseeing, not stopping work when people came close, no PPE offered when walking in the cleared areas of minefields;
- poor mine area marking;
- poor safety procedures during blowing up *in situ*; and
- very cursory QA and checking procedures.

### Other middle management roles

There are several roles within the middle management sector of a demining organisation. As with the Site Supervisor, within the NGOs it is not clear how, and according to what criteria, these positions are filled. These positions are critical to making demining organisations function correctly, as they are responsible for such tasks as technical survey, overseeing mechanical demining, area reduction, logistics and — most critically — the management and flow of information for daily reporting between regional offices and the minefields.

It is also not clear what training is provided within programmes to support the staff who occupy these roles.

Cranfield University's Resilience Centre (formerly Cranfield Mine Action) in conjunction with the United Nations Development Programme (UNDP) and regional delivery partners, runs generic management training courses for middle managers, which aim to develop management skills of managers throughout mine action organisations, but the training does not address these functional field tasks

In-house training appears to be the most popular approach. There is, however, a significant risk of a gradual erosion of content and quality if the training is not conducted in a structured and efficient way, and the influence of external factors such as emerging trends and technologies are not included in a formal manner. In addition, if training is too internally focused it often reduces creativity and fails to detect developing flaws or knowledge gaps.

NGOs and some commercial companies do not appear to have any formal method of recording events and their consequences (at all levels). Failure to do this means that there is often no “corporate knowledge” captured and recorded within the organisation. This prevents forward momentum being sustained and tends to lead to perpetual reinvention of the wheel.

### *Decision-making*

The emerging number of technologies and methods for conducting clearance mean that the middle manager has a growing number of day-to-day decisions to make. If the Site Manager or other middle managers are to be able to conduct their tasks effectively they must be able to make these decisions immediately — and without having to refer up the chain of command. Some of the decisions observed, for which it was not clear where responsibility for determining the answer lay, are listed below:

- choice of detector for a task;
- where to stop and start a minefield’s boundaries;
- the layout of a minefield and deployment of the teams;
- the repositioning of fragmentation dumps and maintaining the site as clearance continues;
- how to approach trees and fallen logs and raised ground; and
- how to deploy operators.

These decisions have a huge impact on efficiency and effectiveness, yet they seem generally to be ignored. Middle managers are not taught how to make decisions, and cultural differences often create problems as it is not customary to contradict or face up to superiors. This is often reinforced by a lack of trust by expatriates who are not confident that local staff can make good decisions.

Training an individual in decision-making relies on trust and the ability to allow the person concerned to gain experience and learn about the consequences. A free and open organisational culture must be established to create confidence to allow open exchanges between managerial levels and create autonomy. If it is not, there is often a resultant “no decision” action, which stultifies and prevents progress being made, and often masks any signs of an unfolding incident. This was apparent at many sites where poor practices were being followed religiously because no-one was confident enough to query prior decisions, despite unfolding evidence that clearly superseded original plans and decisions. In one case, this resulted in leaving a potentially dangerous strip of land between a village and a railway uncleared.

There were many examples witnessed of poor site management, for example:

- confusing marking and clearance methods for fallen trees, earth mounds, or undulating ground;
- a lack of consistent mine or lane marking methods;
- poor site layout, or a failure to update the site layout to match progress;

- safety measures varied hugely between organisations and sites; and
- standards of mapping and date recording at some sites were poor.

Other examples of problems of decision-making at the junior or middle management levels can be found in some of these case histories:

- Money is often the primary factor in decision-making. A deminer in Cambodia suffered more damage to his hand than he should have done because, instead of the helicopter being called out (when freely available), he was driven six hours to hospital. Therefore his perception of senior management is “cost first, human safety second”, which appears not to be the senior management’s intentions at all.
- Middle management reports did not include anything more significant than a request for additional paint to paint mine marking sticks, and the requests are justified with long detailed explanations. Again, money is deemed to be the overriding factor, no queries or questions were raised in any other areas.
- Suggestion boxes limit themselves to similar levels of management. When asked why, it was because staff did not want to rock the boat or imply criticism. This was observed in both Cambodia and Mozambique.
- There was no evidence of good communication between senior and middle management but junior managers are often caught in the middle and don’t wish to be seen to be disloyal to one or other of their managers. They become frightened of which policy to adopt so do nothing, or adopt a half-way position.
- Cultural issues often prevent explanations of why they appear to have disobeyed orders and there is resultant resentment and distrust.

### Comment

The biggest area of saving may be achieved by addressing the problems at middle and senior management levels. Apart from a few organisations, there was clear evidence of poor project management skills, with considerable focus on micro-management. This results in the implementation of process-driven rather than task-focused management style.

This is not to say that process is undesirable in the demining community: it is. However, because of the variables involved with every task and the number of uncontrollable elements, the process should support adaptability and flexibility, not rigidity. Process must be relevant to the situation, not too specific or at too low a level, and must be easy to administer given the distributed nature of the organisation and the communications issues that prevail. A great deal of effort has been put into the detail of operating a platoon, such as command structure, shifts, manning levels, pay, parades, transportation and accommodation. Far less attention appears to have been focused on recruitment, training, human factors of the deminer or the career and performance of the supervisors and their managers.

Although demining is an international and multi-million dollar industry, the culture is still largely to operate using a “small-business” approach to management. The culture of the demining industry promotes success of strong-minded and independent individuals who are able to raise the profile of their individual organisation through sheer force of personality. This often results in a general reluctance to comply with anything that is perceived as “big brother” or meaningless process. If the industry is to avoid donor fatigue, and continue to develop the programmes in a safe, efficient manner, then organisations with the will and ability to deal with this issue are likely to be the ones that continue to prosper and grow.

If we follow the assumption that demining will eventually become part of an overall national development programme, all demining organisations will need to develop internal structures to support the more stringent management skills of conglomerate organisations. If this is to work — and it is probably the most constructive and effective way to develop the demining industry — then change is required in all NGOs if they are to compete with the better developed management skills of commercial demining companies.

A few organisations, both commercial and NGO, are starting to appreciate the benefits of employing the services of external non-military personnel with no demining experience. They have identified the need for a fresh approach and understand that commercial understanding and programme management are complex skills and are not easily home-grown. At the middle manager level, skills and training need urgently to be addressed. Decision-making needs to be flowed downwards and away from the senior management level for day-to-day site running issues. There are, of course, also former military personnel who have taken the time and effort to expand their education to broaden their perspective.

At the lower management levels and at the deminer levels it may be constructive to compare the approaches adopted by other commercial non-demining organisations that operate in similar environments. Discussions with them highlighted the following:

- they recruit locally or get personnel to relocate; they expect the person to pay for their own training i.e. to come already qualified for the job, or not to receive wages until they have completed training, or to complete a more menial job until they have completed their training in their own time;
- they expect employees to be responsible for their own transport to and from the main workplace;
- they expect employees to be responsible for their own food and accommodation;
- they develop a career structure for their employees;
- they have some means of performance evaluation;
- they consider motivational issues and get employees to buy in to their strategy;
- they develop skills within the organisation through external training;
- they put more emphasis on the effectiveness and completion of the plan from start to finish, rather than just the start; and
- they promote an open philosophy.

While not all the above bullet points are appropriate all the time, it is worth noting all these issues for consideration when reviewing an organisation's management policies.

### ***Error budgets***

Discrepancies were often apparent between the actual area cleared and the area reported to have been cleared. This appeared to continue throughout the system, often being rounded up generously at every stage in the process. In general, data recording was suspect, in that some areas being marked as cleared were not representative, and some of the figures were clearly inaccurate, i.e. the area cleared was larger than the actual stated minefield size. This clearly distorts upward reporting.

In one case, a single person received 32 calls every evening from survey teams, site managers, mechanical teams and dog teams. Every evening he had to manually collate

the data into a meaningful picture of what had been achieved that day. This entailed converting verbal reports into visual mapping of areas identified for clearance, areas reduced by dogs and mechanical means, and areas manually cleared at three sites. The ability to interpret such a large amount of verbally reported information of this nature correctly is almost impossible, and certainly more than one person should have to manage every week, let alone every evening. The potential for serious errors in data recording is quite considerable.

This phenomenon was not limited to one organisation although it is less likely to occur in commercial settings as companies typically have more tangible targets and more developed reporting systems. If data is not being collected and reported accurately, organisations cannot predict or provide accurate figures for their own records.

Practical site layouts for all environments appear not to be taught in the official courses available and nor are they included in IMAS. Thus, for example, poor allocation of resources in the field results in time-consuming and ineffective use of assets such as machinery or the inefficient use of dogs.

## Senior management

Many senior management posts in international demining organisations are filled by expatriates. There is a concerted effort in all organisations to keep the number of expatriates to a minimum, due both to the costs and to the aim of capacity-building. All international NGOs have headquarters in other countries where the central coordination and administration takes place, and where other senior management personnel are based.

Nearly all international NGOs and commercial firms are staffed by international ex-military people, and few heads of any major clearance organisation do not have a military background. In addition, there are currently only five UN-employed Senior Technical Advisers (effectively programme managers and political advisers) out of 30 who are non-military and, as far as this Study believes, only a small proportion of technical advisers in the field are non-ex-military.

A number of demining organisations have an individual strong leader, who is not running a small business in terms of size and turnover, yet still persists in running it with a small business philosophy. The risk of having a complete community run by one group of like-minded individuals is the threat of “group think” and a lack of innovation and creative problem-solving.

The most critical role identified in a demining organisation was that of Project Manager. This person requires a multitude of inward- and outward-facing skills, including:

- financial;
- planning and scheduling;
- logistics;
- process, including ISO accreditation;
- people management;
- coordination and communication skills;
- networking;
- creativity;
- attention to detail;

- understanding the big picture;
- ability to delegate;
- leadership;
- team-building;
- inward-facing;
- information technology (IT) skills; and
- domain knowledge of demining.

The ability to conduct demining tasks is not seen as a priority and there are usually Subject Matter Experts (SMEs) available to provide the detail of the day-to-day running of a project, although the Programme Manager must clearly have some technical background, if not necessarily in demining *per se*.

The current project management role may need to be altered to meet the changing demands of the mine action community as it evolves. This is something that some commercial firms are already addressing as they have to meet the stringent demands of large conglomerates in order to win business. For example, one commercial firm has implemented a deliberate policy of employing project managers from the construction industry for running demining projects.



# Task management

## Performance issues

### *Deminer performance*

Section 3 (*Operational Systems in Manual Mine Clearance*) attempts to go some way to developing a set of benchmarks for clearance rates and, earlier in this section, a number of examples were given identifying orders of scale for clearance rates. The industry may benefit from developing a clear benchmark of what a deminer should be expected to achieve given a set of criteria, and at what cost. The example of Croatia, which has taken a firm grasp of its demining requirement, has enabled the Croatia programme to understand exactly how much it should cost to clear a piece of land and how long it should require. CROMAC has understood the acceptance of risk and has developed a methodology that has enabled the release of mine-suspected land if it passes several tests.

Interestingly, CROMAC has the information available to compare the common features of several companies, such as skill levels, working hours, equipment, etc. As CROMAC estimates how much a square metre in a particular area should cost and how long it should take to clear, it is able to identify the variations in their hidden costs and to compare their performance levels. CROMAC reported that the only difference in performance, apart from costs (these costs are dictated by the efficiency levels and overheads of each company), was the management structure. The major differences were stated as being forward planning for:

- accommodation — poor accommodation/site selection can lead to additional costs and labour;
- medical support;
- transport;
- coordination and communication;
- local councils if roads or services need to be disrupted (there are delays in getting appropriate licensing or ensuring the right authorities provide the necessary support if local utilities or amenities have to be disrupted); and

- networking to gain support of local agencies.

The implications of this may be that a stable government and legal system are necessary in order to achieve the level of reporting required for a well informed evaluation to be made.

### *Data gathering to support management*

Statements to the study team confirmed that reports of performance may be overestimated by as much as 50 per cent. There was also evidence to support claims that there is sometimes clearance for clearance's sake, such as area clearance undertaken in areas with no potable water and therefore unsuitable for resettlement, or areas with no mines. This is often a matter of poor tasking and planning and should be reflected in a revised risk assessment.

There appears to be a general lack of trust between national government organisations, such as the Mozambican IND (National Demining Institute) and the Cambodian Mine Action Authority (CMAA), on the one hand, and the operators, on the other. This creates tensions that impact on QA, information flow and survey/site allocation. It was not immediately clear whether these organisations were in fact fulfilling the role for which they had been created, or were contributing to the management conflicts.

### *Implementing change*

A number of studies of the demining community have been conducted over the past few years, and it is fair to say that there appears to have been a concerted effort from the operational community to respond to the findings and implement changes. The general findings however imply that significant problems remain at the management level and that the demining community is mostly too conservative and inward-looking.

There is a general belief in many management models that efficiency comes from control, and that by producing standardised "best practices" and routines all problems will be solved. However, sometimes these "best practices" can prove to be "grooved and inflexible".<sup>1</sup> Because the demining community is so diverse, a grooved and inflexible approach to management may only serve to undermine its members' ability to be adaptive.

The demining community is clearly entering a period where external issues are creating a need for change. It is not clear if current studies have addressed future impact and evolution, therefore if organisations have responded to the calls for change from previous studies, but have not considered the impact of the future, they may be asked to change yet again. As this iterative process continues, cynicism about change sets in. The general perception is that the industry as a whole is resistant to change.

The argument for using a change approach is also supported by other factors — such as manual demining activities not being able to keep up with clearance requirements of expanding population when war has ceased and refugees return and families reunite. The mismatch encourages village demining to be conducted through desperation. Therefore the policy on technical survey, area reduction and attitude to risk may have to change if this is to be addressed.

1. Anderson (1999: 113–152).

# Conclusions and recommendations

## Conclusion 1.

**The management of manual mine clearance operations could be improved and this would lead to significant gains in productivity.**

### *Findings*

Apart from a few commercial companies, there is continuing and clear evidence of poor project management skills, with considerable focus on micro-management. This results in the implementation of a *process-driven* rather than a *task-focused* management style.

This section has noted the military background of the majority of personnel engaged in mine clearance in one capacity or another. It is increasingly understood that the skills and experience that serving or former soldiers bring to mine action are invaluable, but they are also insufficient. What is often missing today is project and programme management experience acquired in the development and/or the commercial sectors, bringing a corresponding drive for efficiency, innovation, creativity and flexibility. Deminers typically are only operational for five hours per day and many organisations stipulate this. At the individual deminer level, it appears that dehydration is a significant factor in performance and safety.

Funding for mine action projects is often short term and limits the abilities of programmes to plan in any long term manner.

Training also appears to be an issue in some cases. It may be beneficial to provide a short refresher course to all deminers when they start a new site.

Problems are particularly acute at middle manager level. Although middle managers are ostensibly responsible for running and managing their particular area of responsibility, in many cases they are not equipped with the resources to undertake this task and are often not given the necessary autonomy.

*Recommendation 1.*

- a. Manual mine clearance organisations need to move towards a task-focused management style. One way to achieve this is by bringing in project and programme management experience acquired in the development and/or commercial sectors.*
- b. In all cases, decision-making needs to be delegated downwards and away from senior management to middle management for day-to-day issues, such as running a demining site. At the same time, middle managers need to be recruited and trained to be able to take the necessary decisions as well as having the support of the senior management in those decisions.*
- c. Greater emphasis should be placed on rehydrating deminers, and on their thermal and physical comfort to aid their performance.*
- d. Donors would assist NGOs to be more proactive in their resource planning if they offered longer term funding.*

**Conclusion 2.**

**Actual average rates of clearance appear to be in the region of 15 to 20 square metres per deminer per day.**

*Findings*

Although the feedback from many operators on the ground suggested that they believed they were clearing much higher rates, on the evidence of the data gathered and after consultation with several well documented mine action programmes, the rates for manual mine clearance (as opposed to area reduction, technical survey, battlefield area clearance, etc.), were close to the figures identified in the GICHD Study of Operational Needs.

The most effective work is produced from a deminer when he/she is taking frequent short breaks and operating with comfortable PPE, when and where appropriate.

*Recommendation 2.*

- a. Programmes should be more vigilant about effectively recording clearance rates and develop a benchmark to work to.*
- b. Discomfort is inevitable in harsh climates, but can be ameliorated by well-designed PPE. Managers should consider this when purchasing PPE.*
- c. SOPs should be developed to ensure working deminers take frequent short breaks and field management should ensure deminers are maintaining hydration.*

---

Annex

## **Approaches to problem areas in manual mine clearance**

| Number | Problem area                | Problem focus  | Level of source of problem   | Solution  |
|--------|-----------------------------|--|--|---|
| 1      | Inflexible management style | (a) Leadership and team work<br><br>(b) Failing to adapt to meet differences between Immediate Response and Sustained operations or future requirements. One size fits all approach. | International and national HQ  | <ul style="list-style-type: none"> <li>· Implement change management to meet future demands to reflect identified vulnerabilities, such as culture, communication and management style.</li> <li>· Communication techniques must be improved – e.g. use of tools such as advanced team decision-making.</li> <li>· Improve team working skills throughout the organisation – tools as above.</li> <li>· The organisation should be flattened and less hierarchical to aid communication and the risk of messages failing to be passed on from fear of retribution and cultural norms.</li> <li>· Encourage a more open and less defensive organisational culture.</li> <li>· Develop SOPs for immediate response.</li> <li>· Develop guidelines for sustained development operations.</li> <li>· Conduct gap analysis and implement transition strategy.</li> </ul> |
| 2      | Military management model   | (a) Incentives and motivation<br><br>(b) Not cost effective<br><br>(c) Trust and delegation  | National management, task management<br><br>National management<br><br>Task management | <ul style="list-style-type: none"> <li>· Devise career structures, diversify tasks and delegate.</li> <li>· Improve communications, information flow and decision-making policy.</li> <li>· Importation of skills from outside the military community (may bring some valuable management insights).</li> <li>· Outsource.</li> <li>· Improve logistics.</li> <li>· Improve planning.</li> <li>· Incorporate developing country problems into plan and mitigate not accept.</li> <li>· Reduce micro-management reduces flexibility (see number 1).</li> <li>· Implement external training for middle management.</li> <li>· Decentralise decision making.</li> <li>· Increase accountability.</li> <li>· Increase individual task type.</li> <li>· Reflect cultural issues.</li> </ul>  |
| 3.     | Benchmarking                | (a) Resistance to agreement of common standards  | International management, national management, task planning                           | <ul style="list-style-type: none"> <li>· Strong leadership for change and development of criteria for benchmarking.</li> <li>· Educate all stakeholders in management techniques that permit benchmarking and benefits of implementation.</li> </ul>  |

| Number | Problem area             | Problem focus  | Level of source of problem  | Solution  |
|--------|--------------------------|--|---|---|
| 4      | Recruitment and Training | (b) Criteria to enable bench-marking<br>(c) Capacity-building issues | International & national management<br>International, national, local | <ul style="list-style-type: none"> <li>· Identify and agree influencing criteria at appropriate level (international and national).</li> <li>· Develop matrix of impact of conditions and methodologies.</li> <li>· Agree costings and performance levels associated with each cell.</li> <li>· Understand the real costs and benefits of capacity building approach.</li> <li>· Employ a systems approach to cost/benefit analysis (e.g. is national capacity better developed as a military capability, enhancing the peacekeeping skills and role of national military personnel, and using a more commercial approach to support National Development Programmes as part of a larger picture).</li> </ul> |
|        |                          | (a) Entry skills   | Local management  | <ul style="list-style-type: none"> <li>· Define qualities required of a deminer (fitness, age, hearing, attitude, etc.).</li> <li>· Conduct physical tests on entry.</li> <li>· Recruit from entire population.</li> <li>· Recruit locally for defined contract period (i.e. two years).</li> </ul>   |
|        |                          | (b) Initial training   | Local management  | <ul style="list-style-type: none"> <li>· Standardise training syllabus and time scales.</li> <li>· Develop levels of training.</li> <li>· Candidates must be able to fail.</li> <li>· Candidates should not be paid during training to provide motivation to achieve performance levels and give a sense of achievement.</li> </ul>   |
|        |                          | (c) Use of in-house training   | Local management  | <ul style="list-style-type: none"> <li>· Not self-critical and often perpetuates problems. Gradual degradation occurs naturally, and there are no external benchmarks for standards and assessments.</li> <li>· Outsource training, or</li> <li>· Create dedicated peripatetic training team that is kept current and is fully qualified to train.</li> </ul>   |
|        |                          | (b) Refresher training   | Local management  | <ul style="list-style-type: none"> <li>· Should be provided:                             <ul style="list-style-type: none"> <li>· on starting a new site (specific training for site conditions).</li> <li>· if deminers are working in a low mined site.</li> <li>· when changing detector types.</li> <li>· when in two or three man lanes if metal detectors not used frequently.</li> </ul> </li> </ul>   |

| Number | Problem area       | Problem focus              | Level of source of problem     | Solution  |
|--------|--------------------|----------------------------|--------------------------------|---|
|        |                    | (c) Management training    | National, local management     | <ul style="list-style-type: none"> <li>· Ensure all practical management skills are taught in context specific manner (not general management).</li> <li>· Employ naturalistic decision-making training (e.g. advanced team decision-making tool).</li> <li>· Train fully in site management and layout.</li> <li>· Communication skills.</li> <li>· Use external providers who can bring experience of other organisations and cultures.</li> </ul>  |
| 5.     | Project Management | (a) Recruitment and skills | International, national        | <ul style="list-style-type: none"> <li>· Recruit from outside industry.</li> <li>· Seek innovative and flexible attitudes.</li> <li>· Good communication skills.</li> <li>· Ensure planning and predictive skills available.</li> <li>· Apply benchmarks.</li> <li>· Apply exit strategy - these should be included for all operators, time limits with end dates which are adhered to, should be mandated with penalty clauses. This should improve the inaccurate square metreage calculations and enable better planning.</li> </ul> |
| 6.     | Efficiency         | (a) Area reduction         | International, national        | <ul style="list-style-type: none"> <li>· Agree acceptable risk - use different criteria to determine risk.</li> <li>· Determine methodologies to be used in area reduction, conduct cost benefit analysis.</li> <li>· Agree effectiveness and acceptability of dogs in area reduction to help understand benefits/offset costs of their deployment.</li> <li>· Use of machines - which ones should be used and how they are deployed.</li> <li>· Agree and define acceptable levels of fragmentation residue.</li> </ul>                |
|        |                    | (b) Technical surveys      | International, national        | <ul style="list-style-type: none"> <li>· Agree definition and goals.</li> <li>· Standardise methodologies.</li> <li>· Employ structured training (mapping, site marking, etc.).</li> <li>· Standardise international approach for site marking, post painting (if there is one it is not employed).</li> </ul>  |
|        |                    | (c) Methodologies          | International, national, local | <ul style="list-style-type: none"> <li>· Employ multi-skilling approach.</li> <li>· Agree and define lane working methods and expected performance given terrain and use of equipment (see benchmarking).</li> </ul>  |
| 7.     | Human factors      | (a) Dehydration            | National, local                | <ul style="list-style-type: none"> <li>· Identify impact of dehydration and effect on performance.</li> <li>· Identify impact of clothing on dehydration.</li> <li>· Ensure water is supplied by organisation.</li> </ul>   |

| Number | Problem area | Problem focus                                | Level of source of problem | Solution   |
|--------|--------------|--|----------------------------|--|
| 8      | Donors       | (b) PPE                                      | National, local            | <ul style="list-style-type: none"> <li>· Examine benefits of use for electrolytes in certain conditions.</li> <li>· Understand the real effects of PPE and clothing on performance.</li> <li>· Conduct performance/cost/safety/benefit analysis.</li> </ul>  |
|        |              | (c) Age/length of demining service           | National                   | <ul style="list-style-type: none"> <li>· Develop performance criteria derived from benchmarking to determine when a person may have increased error risk through fatigue, burn-out, etc.</li> <li>· Introduce physical tests for fitness to work.</li> <li>· Use of multi-skilling/job rotation/promotion structure should increase deminer lifecycle.</li> </ul>      |
|        |              | (d) Shifts and work patterns                 | National                   | <ul style="list-style-type: none"> <li>· Recruitment of local deminers should enable 5-6 day working shifts, reduce travel and subsistence costs and reduce sick rate.</li> <li>· A working day may benefit in this case from two shorter periods of 3-4 hours divided by a longer period off mid day.</li> <li>· Extended shift lengths are not advisable.</li> </ul> |
|        |              | (a) Donor support to planning and management | International              | <ul style="list-style-type: none"> <li>· Provide donors with education of how they can influence and support good management practices.</li> </ul>   |



## Bibliography

- Anderson, P. (1999)  
 “Seven levers for guiding the evolving enterprise”, in J.H Clippinger III (ed.), *The Biology of Business*, Jossey-Bass, San Francisco.
- Campion, M. A. and C.L. McClelland (1993)  
 “Follow-up and extension of the interdisciplinary costs and benefits of enlarged jobs”, *Journal of Applied Psychology*, 78:339—351.
- Dixon, N. (1976)  
*On the Psychology of Military Incompetence*, Jonathon Cape, London, 1976.
- Eaton R., C. Horwood and N. Nilan (1997)  
*Multi-Country Mine Action Study: Study Report - The Development of Indigeneous Mine Action Capacities*, Department of Humanitarian Affairs, United Nations, New York.
- Elizur, D., I. Borg, R. Hunt, and I.M. Beck (1991)  
 “The structure of work values: A cross-cultural comparison”, *Journal of Organisational Behaviour*, 12:313-322.
- Gyllenhammer, P.G (1977)  
*People at Work*, Addisson Wesley, Reading, MA .
- GICHD (2002)  
*Mine Action Equipment: Study of Global Operational Needs*, GICHD, Geneva.
- \_\_\_\_\_ (2001)  
*A Study of Socio-Economic Approaches to Mine Action*, GICHD, Geneva.
- Keeley and Griffin (2004)  
*Joint Evaluation of Mine Action in Cambodia for the Donor Working Group on Mine Action*, 4 December 2004.
- Lardner, T. (2002)  
 “Towards a Better Mine Action Programme”, Master of Science Dissertation, Cranfield University, UK.
- Maslow, A.H. (1970)  
*Motivation and Personality*, 2<sup>nd</sup> Edition, Harper & Row, New York.

PRIO (International Peace Research Institute) (2004)

*Mainstreaming Mine Action in Development, Policy Recommendations for UNDP*,  
International Peace Research Institute, Oslo.

Sanders, M.S. and E.J. McCormick (1992)

*Human Factors in Engineering and Design* (7th ed.), McGraw-Hill, New York.

# Glossary of acronyms

|        |   |
|--------|---|
| AREA   | Agency for Rehabilitation and Energy Conservation (Afghanistan) |
| CMAA   | Cambodian Mine Action Authority                                 |
| CMAC   | Cambodian Mine Action Centre                                    |
| CROMAC | Croatian Mine Action Centre                                     |
| DDAS   | Database of Demining Accidents                                  |
| EOD    | explosive ordnance disposal                                     |
| IMAS   | International Mine Action Standards                             |
| IMSMA  | Information Management System for Mine Action                   |
| IND    | National Demining Institute (Mozambique)                        |
| ISO    | International Standardization Organization                      |
| LIS    | Landmine Impact Survey  |
| MAG    | Mines Advisory Group  |
| NGO    | non-governmental organisation                                   |
| NPA    | Norwegian People's Aid  |
| PPE    | personal protective equipment                                   |
| QA     | quality assurance   |
| QC     | quality control   |
| SME    | Subject Matter Expert   |
| SOP    | standing operating procedure                                    |
| UNDP   | United Nations Development Programme                            |
| UXO    | unexploded ordnance   |









Geneva International Centre for  
Humanitarian Demining  
Centre International de  
Démunage Humanitaire - Genève

**Geneva International Centre for Humanitarian Demining**

7bis, avenue de la Paix

P.O. Box 1300

CH - 1211 Geneva 1

Switzerland

Tel. (41 22) 906 16 60, Fax (41 22) 906 16 90

[www.gichd.ch](http://www.gichd.ch)