



UNMAS/GICHD Mine Action Technology Workshop report

Background

In 2006, UNMAS and GICHD Co-Chaired a Technology Workshop for mine action technical staff from the field. The concluding comments endorsed the concept of the Workshop and recommended another to be held in 2008.

Invitations for the workshop were sent out in early July. The invitation was also posted on the GICHD webpage for online registration. The closing date for registrations was 8th of August 2008.

General

74 participants attended the Workshop together with a varying number of GICHD and UNMAS staff who sat in for specific presentations during the period 8-10 September 2008. This number was more than double the attendance in 2006 and included commercial operators, manufacturers and representatives from the R&D community as well as representatives from mine action programmes, operational partners and coordinating headquarter staff. 54 different organisations were represented and 33 different countries. Participants from commercial and manufacturing companies were limited to one per company.

The Workshop was opened by Ambassador Stephan Husy, Director of GICHD and Noel Mulliner, Technology Coordinator, UNMAS. The Agenda is attached together with a list of attendees.

The aim of the Workshop was to provide an opportunity for field based personnel to exchange ideas and share experiences, state requirements and to learn about what is new in the field of technology. At the same time, this time, there was the opportunity for the R&D community to see what was required and to brief on their involvement.

Following the workshop a questionnaire was completed by 58% of the participants. The result from this questionnaire is available from the GICHD upon request.

All presentations provided during the workshop are available on CD with the GICHD and can be provided upon request. All presentations together with video clips from the workshop are also available on the GICHD webpage.

Following is a summary of the presentations provided during Workshop.

Day 1. – Monday, 8 September 2008 – afternoon session

GICHD ongoing technology related projects

Speaker: Erik Tollefsen, GICHD

Summary of the presentation:

Erik Tollefsen gave an overview of GICHD activities in ongoing Mine and Technology projects.

Handheld magnets

Speaker: Arnold Scholderman (A.S.), TNO/ITEP

Summary of the presentation:

Hand-held Metal Detectors (MDs) are still the most used technology for Humanitarian Demining (HD) due to its various advantages (cheap, easy to use, long experience in the minefields,..)

It has one big drawback: false alarms

⇒ combined 2 technologies (MD + GPR) in order to reduce false alarms

Another option to reduce false alarm: handheld magnets. This tool is used before MDs in order to reduce the number of metal fragments (part of the false alarms).

Since ITEP works on the development of such a technology, A.S. shortly described

- The field trials ITEP carried out in Cambodia (with CMAC) and in Angola (with NPA – road clearance).
- The SOPs ITEP follows.

Discussion:

- *Mansoor El-Ezzi, Yemen national Mine Action Programme*, mentioned the difficulty to clean metal fragments if the magnet is not very close to the ground.
Arnold Scholderman explained the distance required depends on the type of magnets used. Three centimeters between the ground and the magnet should be close enough with all types of magnets. With some magnets, five centimeters are sufficient.
- *Kanith Roath, CMAC*, expressed the difficulty to use magnets in wet conditions. However, it remains an efficient tool in other conditions. The type of minefields has to be considered before using the magnets.
- *Noel Mulliner, UNMAS*, underlined the importance of choosing the right tool depending on the characteristics of the minefield.
- *Jonas Zachrisson, SRSA*, asked if mines can be picked up by a magnet.
Arnold Scholderman explained that the risk is non-existent with a handheld magnet.
- *Havard Bach, GICHD*, mentioned that magnets can also speed up the process while digging to find a mine.
- *Wilyam Lucar, MAC Peru*, outlined the problem faced in Peru due to the high number of mineralized rocks and asked for support to conduct an assessment
Harvard Bach answered it is really easy to use magnets. A support for a comprehensive assessment does not seem necessary. The main issue is to choose the right magnet. GICHD or UNMAS could help for the selection of the magnet

Another definition of technology has implication for technology development

Speaker: Maxwell Jones

Summary of the presentation:

Technology involves methods. The aim of technology is to improve methods. Humanitarian Demining sector cannot wait for new technologies. Therefore, its priority is to focus on new methodologies with existing tools/technologies.

- ⇒ Applied Behavior Analysis (ABA) seems to be the right process to improve the efficiency of a demining process
- ⇒ The ABA allows the optimization of important variables to improve overall system of a demining programme

Advantages of ABA

- It offers research designs that can be modified “on-the-fly” and in response to results obtained
- It can be applied while operations are being undertaken
- ABA Shows donors that improvements in the effectiveness and efficiency of operational methods are being sought

Discussion:

- *Noel Mulliner* asked how to know whether it is worth doing this kind of assessment.
Max Jones underlined the importance of detecting:
 - The component which can be improved in the overall programme (if any).
 - What should be measured to assess this component.

Thermal Detection Systems: Presentation of work carried out at Rome University

Speaker: Marco Balsi

Summary of the presentation:

The thermal detection measures the difference of temperature in the ground within a suspect mine-affected area. Since the ground over a buried mine is warmer (~ 1 degree), the thermal detection could represent a way to detect mine without facing frequent false alarms due to metal fragments. The system has already proved to be reliable and easy to use.

Disadvantages of the thermal detection:

- It is mainly focused on shallow buried mines, since the technology cannot detect mine buried deeper than 5 centimeters.
- Artificial heating requires much energy
- The system is expensive
- The system is complicated to use and to fix (high technology)

- ⇒ The research conducted by the team in Sapienza University (Roma) aims to :
 - reduce the cost and the energy's need
 - combine the technology with others (e.g. GPR)

Discussion:

- *A participant* asked if the research has identified difficulties to use the system with vegetation and rocks.
Marco Balsi answered that:
 - Even if no test has been conducted, they assume it will be necessary to free the ground from vegetation
 - Rocks also gives a signal, but less than mines
- *Daniel Eriksson, UNPD Irak*, mentioned the idea of implementing this technique for technical survey by using an infra camera to assess the presence of rocks, metal fragments, or mines.
Marco Balsi mentioned two drawbacks:
 - The metal fragments will be heated, but not always rocks.
 - The air between the camera and the ground will play the role of an isolator. The difference of temperature will be difficult to measure.
- *Daniel Eriksson* proposed the use of fire to heat an area.
Marco Balsi underlined the risk of mixing up everything. However, the research still takes this idea into account.

A CEN Workshop Agreement on soil characterization for metal detectors and GPR performance

Speaker: Yann Yvinec

Summary of the presentation:

Yann Yvinec presented the concept of the revised version of the *CEN Workshop Agreement CW14747*. This document contains guidelines on how to evaluate which type of MDs should be used with regards to the soil characterization.

The previous edition (2003) faced two major criticisms:

- It does not include guidelines on GPR
- Soil effect on metal detector performance is not sufficiently characterized

The new version consists of two parts:

- 1st part is the same as the previous document.
- 2nd part is focused on practical use, with more info on soil characterization for field users and how to at best test the MD with regards to the soil characterization. The document also gives specific info for scientists

Moreover, this new version includes GPRs. Yann Yvinec explained the document has still limitations - for instance it provides methods to evaluate if the detector can be used, but not if the detector can not be used.

Follow-up:

The new version will soon be freely available online: <http://www.mineactionstandards.org/guides/cwa.htm>

Field User Guide CWA 14747

Speaker: Dieter Guelle, Federal Office of defense Technology and procurement

Summary of the presentation:

1) *The Field User Guide CWA 14747*. It is a simpler tool than the *CEN Workshop Agreement*. It provides the field user with advice on how to carry out metal detector tests in field conditions. The Guide reduces the 30 tests of the CWA to the three following key tests: reliability, maximum detection depth and sensitivity profile.

2) User Guide Software:

After entering your data, the software will provide:

- The process to be followed to test
- Graphs giving POD & FAR for the sensor, for the operator and for the ground
- POD in relation to the target depth

The software, however, does not evaluate the result. It will be the management's responsibility.

Where to find T&E related info

Speaker: Franciska Borry, ITEP

Summary of the presentation:

Overview of the ITEP programme:

It is a network of national test/evaluation programmes. Its objective is to enhance the collaboration among national programme, gathering information from various sources.

The ITEP network provides:

- Test and Evaluation documents

- Best practice / standard-like test methodology documents
- Test facilities / test personnel and expertise

Franciska Borry outlined that the end of the programme is scheduled for 2010. She raised the concern of the succession of the programme.

BAM detection reliability trials software

This software helps to establish a trial lay-out to obtain statistically valid detector performance results.

Discussion:

- *Noel Mulliner* hopes that ITEP project will live after its 1st initial 10 years. To date, no financial solution has been found to make it survive.
- *Dieter Guelle* underlined the necessity to feed the software with very accurate data.

Concluding Remarks, wrap-up session

- *Noel Mulliner* outlined the importance of being more proactive in providing information on CEN test standards.
 - ⇒ GICHD could provide training workshop
- *Dieter Guelle* gave details on graphics giving consequence of certain types of soils on various types of machines.

Day 2. – Tuesday, 9 September – morning session

Technical Survey

Speaker: Havard Bach, GICHD

Traditional presentation of the GICHD concept of technical survey

Discussion:

- *Franciska Borry, ITEP*, asked if the concept of land release is cheaper. *BAH* replied positively.
- *Pablo Parra, Presidential Programme for MA Colombia*, asked if it is conceivable to use less reliable dogs for technical survey. *BAH* explained his preference to only use the reliable dog. Having two types of dogs could lead to the use of second quality dog for clearance.
- *Kanith Roath, CMAC*, mentioned the issue of relying on local people for technical survey. *BAH* explained that it is difficult to rely on them, since they do not always understand the issue of land release.

Colombia, present and future challenge for HD

Speaker: Pablo Parra, Presidential Programme for Mine Action in Colombia

Summary of the presentation:

Pablo Parra explained the scope of the problem in Colombia, describing the Colombian geography and the landmine issues in Colombia.

The mines laid by illegal groups since 2002 create the following difficulties:

- The minefields do not follow any patterns
- Suspect areas are growing on a daily basis

- Most of these landmines are improvised explosive devices (IEDs). It represents an even bigger challenge since IEDs are highly unstable and have always different makings (sometimes without any metal)

The other challenges faced by Colombia are the luxurious vegetation, the bad weather and the steep slopes.

Pablo Parra mentioned that a LIS will be undertaken at the end of 2008.

Discussion:

- *Alan MacDonald, UN MACA*, asked who will carry out the LIS.
Pablo Para answered that Colombia has not chosen the candidate yet.
- *Alan MacDonlad* warned *Pablo Para* about the risk of entering wrong data in conducting a LIS. He doubts the necessity of a LIS in Colombia
- *BAH* mentioned the importance of establishing criteria before starting the LIS
- *Dieter Guelle* mentioned that Colombia does not really face a landmine problem since the country has mainly to deal with IEDs. It will be very difficult to tackle the issue in the right way.

The benefits of using of discretionary detectors in ERW clearance in Laos

Speaker: Stephan Peter, UXO Lao

Summary of the presentation:

Stephan Peter mentioned the various detectors' types (Vallon VMXC 1, Ebinger, Minelab) used in Laos to detect UXO.

Then, he described the advantages to use the Vallon VMXC 1 in Lao (only in UXO clearance):

- The preparation is quicker
- It is an ergonomic tool
- It is very reliable
- It differentiates between ferrous and non-ferrous metal

Discussion:

- *Claudio Bruschini, Switzerland*, asked if UXO Lao often use magnometers
Stephan Peter answered they do not, since UXO Lao is just focused on farmers security. Therefore, they do not need to go deeper than 30 centimeters.
- *Dieter Guelle* asked if UXO Lao only investigates ferrous metal
Stephan Peter replied positively
- *Dieter Guelle* asked if UXO Lao is sure they have never missed anything?
Stephan Peter replied positively
- *Jurgen Braunstein, Vallon GmbH*, underlined that the VMXC 1 is not a mine detector. It is only designed to look for UXO.
- *Dieter Guelle* said that the VMXC 1 could also be used as mine detector if the survey has clearly defined the types of mines laid in an area.
- *Jurgen Braunstein, Vallon GmbH*, outlined the difficulty to use a magnetometer in ferrous soil. Mobile phones can be another interference.

Azerbaijan

a) Integrated mechanical, manual and MDDs operations in Azerbaijan

Speaker: Javid Mehraliyev, ANAMA

Summary of the presentation

Javid Mehraliyev described the process of land release followed by Azerbaijan authorities. He underlined the importance of the preliminary area survey which allows to categorize the suspected areas (A,B or C). Each

category will be released differently (by machines, deminers MDDs,..) depending on the probability of finding mines. This process of land release allows ANAMA to be much more efficient

Discussion

- *Noel Mulliner* outlined that the process used by ANAMA allows to release land while re-surveying.
- *Per Breivik, NPA* underlined that ANAMA programme is a good example, since ANAMA is focused on re-surveying which is much quicker and cheaper => big gain (cost + money)
- *BAH* explained that ANAMA has taken time to define a methodology, and this effort has accelerated the whole demining process.

b) Battle Area Clearance Operations in Azerbaijan

Speaker: Parviz Gidayev, ANAMA

Summary of the presentation

Presentation of the UXO clearance Project in Azerbaijan (Detection, clearance, destruction,..). The ANAMA and NATO/NAMSA Joint Saloglu Project has been carried out since 2005.

Discussion:

- *Amândio Albano Mavela, UNDP Angola*, asked for details on methods used to destroy items in order to avoid additional metal fragments contamination.
Parviz Gidayev answered ANAMA has a demolition site where they bring all the items.

Integrating technology into operations

Speaker: Mohammed Abu Dalou, NPA Jordan

Summary of the presentation:

Mohammed Abu Dalou outlined that, despite the improvement of technology, the biggest change in mine action concerns the methodology used to clear land.

Description of geographical profile of Jordan and its mine issue:

- Jordan wants to be mine free ASAP and play a role of leader in teaching other countries how to demine.
- Presentation of the mine contamination around the borders with Egypt, Israel and Syria.
- He mentioned the problems created by flash flood moving the landmines.
- He pointed out that Jordan is replacing the minefields on the borders by non-lethal way of marking the borders.

To reach the best efficiency, *Mohammed Abu Dalou* expressed his preference for small team well trained and well-equipped.

He finally described a development project to burn mine instead of blowing them up. He required the attendance's opinion on the potential environmental damage of such a process.

Discussion:

- Concerning the environmental issue of burning mines, *Noel Mulliner* pointed out it has to be balanced with the cost savings provided by this project. He also mentioned the idea of collecting TNT from landmines which will be used to destroy detected mines.
- *Per Breivik, NPA Norway*, asked why they do not blow the mines up instead of burning them.
Mohammed Abu Dalou explained that it is safer to burn them and it avoids the spread of metal fragments.
- *Steffen Peter, UXO Lao*, said that a few commercial companies burn UXO in Germany. He advised Mohammed Abu Dalou to ask them for information.
- *Erik Tollefsen* asked why there are cameras on the mini minewolf.
Mohammed Abu Dalou explained that the 3 cameras are used to avoid hitting anti tank mines while opening safe paths for deminers.

- *Marco Balsi*, asked why they do not use machines more widely, since the terrains seem free of obstacles.
Mohammed Abu Dalou answered Jordanian terrains have unfortunately obstacles. In addition, they judge necessary to double check behind machines, since they are not reliable enough.

Mechanical mine clearance in Cambodia

Speaker: Kanith Rotha, CMAC

Summary of the presentation:

Kanith Rotha gave an overview of the Cambodian mine contamination, the CMAC structures and its background. Then, he outlined the mechanical demining tools used in Cambodia and the challenges faced while using these machines (weather condition, damage created by anti-tank mines, etc). Finally, he described the test undertaken by CMAC on various mechanical demining equipments.

In conclusion, he said that, if machines are rightly integrated with platoons (deminers and dogs), the productivity as well as the rate of reliability will be increased.

Discussion:

- *Dieter Guelle*, asked if the damage on tillers is bigger than on flails after hitting a anti-tank mine.
Kanith Rotha confirmed that the damage was bigger on tillers.
- *Alan Macdonald*, *UN MACA*, mentioned UN MACA has used CEN Workshop Agreement in Afghanistan to test machines
- *Erik Tollefsen* asked how CMAC deals with the issue of bamboo.
Kanith Rotha answered CMAC uses machine with a big claw to grab the bamboo and remove it in a safe area. He added that the use of trails or flails with the presence of bamboo is a nightmare.

Day 2. Tuesday, 9 September 2008 - afternoon session

Technology presentation by CROMAC: “Technologies today and tomorrow”

Speaker: Nikola Pavkovic, Ivica Raguz, CROMAC

Summary of the presentation:

Nikola Pakvovic presented the CROMAC programme (facts and figures). He described the various technologies used in Croatia and mentioned CROMAC has never found a mine after the use of machines. He outlined the process followed by CROMAC to test their machines. He underlined that Croatian standards and law were established in accordance with both CEN Agreement and international standards. MDDs and deminers gears are also tested in accordance with IMAS.

He also listed the new technologies expected to be used in Croatia:

- Use of bees in HD
- Airborne general survey (1st result of this project will be released in January 2009)
- Japanese GPR and testing of ALIS

Follow-up:

He announced the organization by CROMAC of *The Sixth International Humanitarian Demining Symposium* (27 - 30 April 2009, in Sibenik, Croatia)

Discussion:

- *Noel Mulliner* mentioned the cost of the whole range of machines used in Croatia. The national programmes need to be well-funded to follow the Croatian example.

- *Kanith Rotha* outlined that the combination of GPR and MDs allows the deminers not to dig for nothing, since they can see the image of the suspected item. There is, however, a disadvantage: the final decision belongs to deminers => human factor could increase the risk of missing a mine.
- *Noel Mulliner* asked if ALIS has found any mines during the QA.
Nikola Pavkovic replied negatively
- *Dieter Guelle* added that 50% of the false alarms are avoided by using ALIS. But it is possible to miss a mine depending on the interpretation of the image by the deminers.
- *Noel Mulliner* summarized the current situation with regards to other dual sensor:
 - HSTAMIDS works very well, but is not readily available on the market
 - ALIS is still in development stage
 - Minehound, is the only dual sensor available on the market.
- *Bruce Elliott, NPA*, asked what CROMAC uses to check after the work of the machines.
Nikola Pavkovic said either deminers or dogs are used.
- *Dieter Guelle* outlined that the Croatian government funds 80 % of the Croatian mine action budget.
- *Claudio Bruschini*, Switzerland, asked for details on the airborne general survey
Nikola Pavkovic explained CROMAC does not find any mine. It is just used to define if an area has to be considered as suspected.
- *Kanith Rotha* asked if CROMAC only uses helicopter for airborne general survey
Nikola Pavkovic replied positively, but mentioned it is also possible with small airplane.

Break out session 1:

How can new technology realistically enhance the process of releasing land through technical survey?

The three groups presented the following ideas:

Survey

- It is crucial to define what kind of information the team wants to gather at each stage of the survey. In some context, where the problem is well defined, there is no need for any survey (e.g. Jordan).

Standards

- The importance of setting standards for the area to be cleared and of following the SOPs was pointed out. In addition, any new technology has to be correctly tested before being used in the field.

Use of machines

- The better survey tool you have (GPS, information database management software), the better will be the result of the survey
- Any technology has to be sustainable in the area where it is used – for instance with regards to the geography of the country or the skills of the staff)
- It is crucial to use the right tools to reduce area. If you use the right technology with the right methodology, it will improve the productivity.

Discussions:

- *Noel Mulliner* mentioned that the HD does not analyse and learn enough learn from what has been previously done. Guidelines to technical survey are produced in order to tackle this issue.
- *Erik Tollefsen* outlined that UAV is not so expensive if it is well conducted. It is important to well prepare the air recognition and to do it at the right time (spring and at beginning or end of the day)
- *Noel Mulliner* mentioned that although guidelines are useful, it is crucial to adapt them to the situation.
- *Bruce Elliott, NPA*, mentioned that deminers find sometimes innovative solutions which are not validated by national authorities
Erik Tollefsen explained that the support and monitoring of these individual initiatives represent a challenge for GICHD and UNMAS.
- *Noel Mulliner* pointed out that these initiatives have to be encouraged. A few IMAS have been used in a too strict way. This has to be taken into consideration while drafting the new IMAS.

Follow-up:

- Erik Tollefsen would like to discuss with CMAC about the way they use their machines

Day 3- Wednesday 10 September - morning session

Mechanical Equipment Testing – CWA 15044 and Beyond

Speaker: Geoff Coley, DRC

Summary of the presentation :

Why is it important to test demining machines?

Like any commercial product when a buyer makes a rational choice there is a need for information that will contribute in making a choice. Basic data and performance claims are provided by the manufacturer. But you need performance verification to assess the credibility of information. This should be undertaken by an independent third party, without vested interests. An independent third party should test machines under standard situations as well as realistic conditions.

The CWA15044 can be key to this process. It is not : 1) a standard, 2) legally binding standard, 3) Complete or perfect **BUT** it is : 1) Best practice from users experiences. Drawbacks are : imperfect and focused too heavily on GPRs. Even if the CWA 15044 does not address all the factors important in evaluating a machine (purchase cost, maintenance, training, etc.) but it aims at wrapping up the questions of how well a machine deals with mines, and how well it survives the impact of detonating mines. Different testing stages : pre-test conditions, pre-test assessment, acceptance test. Drawbacks of the process : need to take machines somewhere to have realistic tests and that takes a long time. But it is useful for manufacturers, users and buyers. Before concluding, account of lessons learned for what concerns mine kill data presentation, standard soil conditions, mine target installation, Fireboard installation, Soil penetration data presentation. Finally, account of other mechanical experiments. 1) Mechanical rollers : don't bother 2) Flails pond mines? : no! Plunger not triggered. Only if you are lucky you can transmit information. 3) With hammers/ without hammers differences.

Discussions:

- Erik asked Geoff to say something about worm target and flail rigs.
Geoff Coley : Worm target : ideally you should use real mines. But in many parts of the world it doesn't work. The way this system works is that a signal is sent for half a second when triggered and then sends a series of repetitive numbers back. The numbers you don't hear of is where you might have a problem. As for flail rig, it is used to measure changes, how input variables select ability to dig. But so far there isn't a good system to improve it.
- Erik : Can you add more about the software to analyze results? (didn't capture the name of the software).
Geoff Coley : this software measures results. Penetration efficiency does not feature in the workshop agreement. But penetration is certainly one of the measures.
- Question: Who is driving the machines?
Geoff Coley: somebody who knows the machines, knows the performance.
- Question : Who coordinates the activities?
Geoff: Coley Digger test is part of ITEP activities. Though acceptance tests must be done somewhere else.
- *Kanith Roath*, Director of Training, Research & Development, CMAC: What size is the charge? What about maintenance?
Geoff : 1) what size charge ?According to CWA you should use a charge that represents an anti-tank mine. 7 kgms or 8 kgms. 7 kgms probably TNT or equivalent. 2) maintenance : so big, everywhere you go. In some environments : individual !
- *Fredrik Paulsson*, Operation Manager, Danish Demining Group : With the survivability test is the machine in motion?
Geoff Coley: It depends. It could be done either way. Also you could operate it with remote control.

- *Emanuela Elisa Cepolina, Research Assistant, University of Genoa* : What about using a company to measure soil problems ? Is that in the workshop agreement?
Geoff Coley : No. The idea of workshop agreement is to measure density. Either way in which you can find that out. As for the cone penetrometer : there is no relation between the cone penetrometer reading and density. In the CWA the cone penetrometer is used to measure moisture.

Stresses introduced in soil roads by mine rollers

Speaker: Peter Renwick, Design Engineering Consultant

Rollers are a means for proving roads that have been cleared. They are not to be used for clearing the road. When proofing a road pneumatic tyres pose some limits, since it is difficult to induce high stresses on the road. Tests have showed how solid tyres or steel wheel appear to be better at overcoming the effects of “bridging”. Solid tyres are less able to adapt to lateral contours. Adding studs to a solid wheel is likely to disrupt the crust of the road but the rolling resistance increases. The problem then is that excessive wheel slip of the towing vehicle can detonate mine. So the question is has rolling a future? How can it be best carried out?

Discussions :

- *Emanuela Elisa Cepolina:* Which material did you use for the analysis of the soil?
Peter Renwick: The material is not meaningful since I changed it. Comparative stress, instead, is meaningful. Comparing stresses between one treatment and another one.
- *Ted Higgings, Director, Land Mine Detection Research Centre* : What about scarify road surface? Have you tried anything like that?
Peter Renwick: You need something that punches the soil. For example the propel machine is useful. You need similar machines where you have got extra work. The scope is to get the roller to do the breaking work on the surface.
Noel Mulliner : Rollers might come back as a method of helping communities when the land is cleared.
- *Al Charruthers, Consultant, GICHD* : Do you know whether the heavy detonation trailer in Angola worked?
Peter Renwick: I don't know.

Break out Session 2 : What is the way ahead in technology development?

Group 3:

Manual demining .Most of the time investigating false signals. Imaging devices need to be designed to save time. Magnets (like yesterday) not available commercially. Need to find a cheap way of getting away of false signals. Problems of mechanical demining : some kind of system, self-incorporated. Basic. Get away. Important to reduce time on follow up on mechanical assets. Machines, useful on flat lands, etc. Not very useful in jungle. Industry, instead of companies producing demining machines. But perhaps is time to develop together machines in jungle. Future in demining : a lot in the mechanical field.

Road clearance : Sudan for example. All kind of systems. Technology been used not working properly.

Disposals : using explosive for mines. But maybe, need to develop (esp. UXO) cheaper destructors.

Group 2 :

Detector for explosives : are they feasible, reliable, cost effective? Detect explosive : reliable, cheap, detectable system.

Land release : less costly detector used for land release purposes. Faster and acceptable risks. Improvised explosives, improvised mines. How can we best detect those? Other aspect : break down of mines over time. How does it affect off gassing of explosives. Maybe those mines ineffective over time? Research in term of heating of mine.

Mechanical machines. Can we integrate detection and clearance operation into one machine? Maybe put magnets in machine as well as roller to smooth the surface. Keep it simple and low cost.

Engineering : Need for simple machines.

Reducing Development – field time : How do we get good ideas to the field? Sustainable.

Robots : Cost-effectives, techniques and procedures, time savings. Also in removal perspective.

Environmental effects. Explosive produce gasses : what are the environmental effects? How does it affect the land release? Greed disposal techniques.

Social economic aspects :When deminers go in : turn-over of land in period of time. More land faster. Yet, micro-economic aspects : how do we develop local economies? Optimizing human involvement : employing people. Developing, economic development plan. Opportunity to get benefits from action.

Group 1

Wish list :

- 1) No robots to replace humans (UAV may be useful for technical service, or other kind of robots might be useful like cameras, etc.)
- 2) Necessary to empower local people while using technology
- 3) Some kind of technology able to eliminate fragments
- 4) Machines that could work at night.
- 5) Portable equipment to help digging
- 6) Increase the detection depth
- 7) Design specific machines for anti-tank mine clearance, neutralizing explosives

Noel Mulliner :

- There seems to be a trend in looking for faster and cheaper solutions. At the same time you always want to involve local environment and social development. Hence the dichotomy : if you do it high-tech you take it away from local people.
- As for the issue of mines break down over age, a lot of mines deteriorate after a few years but not all!
- IEDs : We strain away from typical mine action when we talk about improvised explosives. IEDs is a police security issue.

Day 3 – Wednesday, 10 September - afternoon session

How to protect yourself against malaria?

Speaker: Dr. A Brosman, Medical Office, WHO

Malaria : very high risk in rural remote areas. Number of death every day 3'000. Africa, South Sahara : highest risk. General statistics : more than 109 countries are affected. Only 7 countries in the world were not reported. The picture not same everywhere. Children more immune. Travellers, women highest risk. In particular along the Thai/ Cambodian border. In other countries malaria is a problem for isolated communities. Evolution over years : shrinking. Malaria eradication programme. Malaria map : reduced. Some people said: result of economic development. Malaria was eliminated in many countries : vectors that do not transmit very well malaria. In most malaria countries : very efficient malaria vectors. What makes the elimination very difficult today: very powerful vectors. Some parasites : incubation of weeks- 1 month. So what can we do against malaria? Use preventive methods. Vaccine still not ready for at least another 5-10 years. New technological improvements needed. Explanation of medicines to be used in prophylaxis (how many for how long, which ones, side effects). But malaria can still appear even if you've treated it. Explanation of malaria symptoms. Also brief account of Malaria Diagnosis Tests.

Discussions:

- *Noel Mulliner:* Are people immune from malaria?
Doctor Brosman : Immune is a person born in an area exposed to inoculation every year in many years. In most cases they die. But when they survive, less immune, like a flue. Immunity from malaria is one of those myths that we should forget.

- *Noel Mulliner* : For how long you could take prophylaxis for ? Many of our staff are in field for much longer than 3 months, can people take prophylaxis for 2 years or so ?
Dr Brosman : So far we have data on toleration for 12 months. 2-3 years : we don't have data that it can be taken without effect. Women can have candidosis. Another side effect is that you can get dermatitis when exposed to sun light. Either sun screen. Or prophylaxis seasonally. Sometimes you have a second peak. It's possible to target prophylaxis for a period of high risk. For us best : Mefloquin. Most tolerated by majority of persons. For people with psychiatric problems and convulsions not tolerated. If person starts to have dreams, insomnia, depression, etc. These are signs to take an alternative. Mefloquin used for 3-5 years, without problems.
- *Noel Mulliner*: if you take a prophylaxis and miss doses, some people say that the mosquito develops an immunity against that prophylaxis. Is that true?
Dr Brosman. : Not true, you are not making parasites resistant. Person can still take prophylaxis, perhaps lower protection.
- *Question* : How about switching from a medicine to another or 2 at same time?
Doctor : For specific drugs you should be careful of period of overlaps but more risks of side effects because there would not be protective efficacy. For instance, if you are using Mefloquin you shouldn't go quickly to a Quinin treatment. It's ok to switch one to the other. With Mefloquin, more side effects in African areas. You should switch 3 weeks before you go.

WADS from Angola to Skallingen

Speaker: Rune Persson, DunChurch Aid

WADS scan very large areas quickly. System used in Angola and Skallingen (last minefield in Denmark). The focus of WADS is to develop new tools to serve more quickly. WADS were created for the detection of metallic mines for roads verification system. The idea was to develop a system that can scan roads very quickly. With this system you can see where the mines are. The philosophy behind WADS is to produce very flexible systems that are easy to repair.

Ebinger UPEX 740M : Deep search for large metal mines.

Data processing problem : Lot of metal from the ground that we don't want to create a map of. So system, that when you encounter small fragments : small signal. When big metals : long signal. No human interaction.

In Angola : The radar scanned up to 8 metres. 8 kms of road per day. Very efficient. Useful also in accidented roads.

In Skallingen : Largest industrialized clearance. System able to detect small mines, at 1.5 meters. Need to make system different in order to detect threats under 80 cms.

Challenges at Skallingen : changes to the system because of large degree of sand. Road to the minefield difficult. Mechanical equipment : needed to find at a depth under 80 cm to distinguish fragments from non metal contents. Operating at around 4-5 Kms per hour. Small signals from top soil fragments. Driving over a big area.

Needs assessment : Develop new types of technologies. Investigating a robust system to act quickly. Need to systematize data. Make sure that when we make a survey we get all right information. Technological priority list. Environmentally friendly in our programme. Sustainable energy supply.

Account of new strategic partnership between private companies, Universities and DanChurchAid

Discussions :

- What's the resolution of the image you need?
Rune Persson : It depends on the system we need different type of resolution. Something adjustable in resolution.
- How were you marking to the third GPS?
Rune Persson : We produce a map using GIS. Big map of the whole area you put it into GIS you can see all the area. So you can go investigate.
- *Noel Mullilner* : Error areas and WAD system to prove roads, why did you not use rollers and opted for this system. Would rollers be useful as well?

Rune Persson : Rollers not effective to a depth that is required. WAD quality control tool. In Skallingen, used as clearance tool. But this tool useful when you have metal mines.

- Can you change size?

Rune Persson: we can use different sizes of the detector. It depends on the task.

- If you use deep search locator, could it be useful?

Rune Persson: Yes

- *Erik* : You take analogue system, digitalize and bring it into computer and enhance readings. Data in and out that has been processed. Lots of different configurations. American demining programme : Magic Carpet. Discussion of application of system. Easier to use manual deminers. What about sand and soils : can you comment on that?

Rune Persson : We had problems with salt. In dry areas not a problem. When water entered, reduction in detection. That's why down to 80 cm.

Erik : Similar system to this are definitely the way to go.

- When you move along the road, how many movements from the wire?

Rune Persson : It's really slow. Very little movement. You can't see. Little noise but doesn't interfere.

Erik : System in Angola. Common history.

Noel Mulliner : mentioned the US humanitarian demining device to find minimum metal mines in roads using the NITEK GPR- It has been used in south Africa, with impressive results. It will be tested in Afghanistan by HALO. Problem : if it works, the manufacturer must see the advantage of production against a relatively few orders.

Workshop evaluation

- *Peter Ranneck* : I appreciated the good to mix of different people.
- *Noel Mulliner*: Encourage more sharing of information.
- *Claudio Bruschini, Independent Scientific Consultant, CBR Scientific Consulting*: Could make sense to have short 1-2 pgs. layers for any new item? Focus only on what is really new.
- *Noel Mulliner*: It is important first of all to select what's really new.
- *Al Carruthers, Consultant, GICHD* : What about donors engagement in these kinds of meetings?
Noel Mulliner: Mine action funded a lot by donors. If donors paying for demining then they should get the best outcome possible, so they should sit in meetings on improving technology. Struggle to engage donors. How can we re-engage donors - difficult question.
- It might help secure funding if you involve international organisation together with universities – like suggested the DanChurchAid presentation.
- *Nikola Pavkovic, Director, CROMAC-CTDT ltd.* : Speaking about donors, Croatia shows that is interested in scientific programme. If country interested, additional money, more financing. Collect more donors to fund one programme.
- Comment : Design workshops only for donors and people from field with new ideas and present. Create occasions to present technologies to donors .
- *Rune Persson* : very important in developing technologies, field implementation.
- Remark: Donors activities in south east Europe always including university.