we will be concentrating on in the second half of the year include seeking to understand the importance of providing information that is as broad and detailed as possible, giving examples from the field to explain the reality of clearance and risk education work, and explaining the strengths of the clearance community.

Conclusion

The next meeting of the GGE on ERW is 17-24 November 2003. Shortly after, there will be a meeting of States Parties to the CCW on 27-28 November, to consider the next step on this issue. While it is unclear what the States Parties will decide, there are two probable outcomes: an agreement to create a legally binding protocol or a non-legally binding "statement of best practice" for ERW. Discussions on ERW continue, possibly because the States Parties cannot decide on the legal status of the proposal or due to the demands in any paper being unacceptable to some States Parties. Perhaps the greatest danger is a legally binding document that has been too weakened to achieve agreement that it does little if anything to alleviate the acknowledged humanitarian impact of ERW.

References

1. The full official role of the CCW is: 'The Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects.'
3. Ellis, op. cit.
4. Should a legally binding protocol be adopted it would become the fifth protocol to the CCW. For details of the other four protocols, see Ellis, op. cit.
5. Full details of the Draft Proposal and other papers presented to the meeting can be found on the UN Department of Disarmament Affairs website on the CCW at http:// disarmament.un.org/ccw/index.html.

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The GICHD will continue to play an active role in negotiations. Two recently published reports on information requirements and warnings and risk education were written to try to provide delegates to the meetings with a better understanding of the issues involved. The Centre's mandate is to provide technical advice to the States Parties involved in the discussions. Areas

ITEP Work Plan, continued from page 97

Service (UNMAS) and Geneva International Centre for Humanitarian Demining (GICHD). ITEP participants are encouraged to contact the IETF on the work plan and, together with other stakeholders, to identify user needs in order to update and adapt the R&D projects accordingly. The ITEP Work Plan is available through the IETF website (http://www.itep.ws/). It is also being facilitated by UNMAS and GICHD.

ITEP recognises the fact that a considerable amount of T&E has been and is being conducted by many other organisations in the field of humanitarian demining. The hopes and expectations are that members of the demining community will consult the Work Plan, identify relevant T&E activities, request more information and possibly actively collaborate in them.

All graphics courtesy of the author.

NOTES FROM THE FIELD

Logistics-Explosives-Safety

Logistics-Explosives-Safety

Cost, safety, and compliance with international regulations are among the most important factors with respect to shipping explosives. The following article gives detailed insight into the transport and storage of explosives necessary for destroying mines and UXO.

by Rolf Oechslin, RUAG Munitions and Jürgen Schneider, Dyno Nobel

Introduction

The humanitarian disaster caused by landmines and UXO listed throughout more than 60 countries has created an active and growing response from the international community that could eventually lead to the elimination of the use of landmines. As mines can be very dangerous or impossible to render safe, they often must be destroyed in situ. Quality demolition products are essential for the safety of the mine clearance experts. Delivering materials for the demining teams can be solved with reasonable economic resources and within a relatively short time; however, problems associated with explosives must be solved first. For example:

• Can explosives be transported safely?
• Can explosives be transported to the site and stored safely?

If it is possible to get explosives from neighbouring countries:

• Can explosives be delivered from other countries?
• What type of explosives should be delivered?

Many traditional safety precautions and procedures for destroying mines and UXO are still being used. The following section includes a short discussion on the difficulties of transporting explosives and a proposal for simplifying procedures for handling or rendering safe mines and UXO that can easily be delivered.

Transport of Explosives

To understand the transport of explosives, a few things must be clear. First, explosives are classified as dangerous goods. The dangerous goods covered by the heading of a class are defined on the basis of their properties. The assignment of Class 1 explosive substances and articles has been assigned to a division and a compatibility group. The division is based on the results of the tests described in UN regulations. Listed below are the various divisions and compatibility groups into which Class 1 explosive substances and articles are subdivided.

Class 1: Explosive Substances and Articles

Division numbers give information on how the explosives can be transported. Explosives typical for demining can be put into one of the following divisions:

• Division 1.1: Substances and articles that have a mass explosion hazard (a mass explosion is an explosion that affects almost the entire load instantaneously).
• Division 1.4: Substances and articles that present only a slight risk of explosion in the event of ignition or initiation during carriage. The effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire shall not cause an instantaneous explosion of the entire contents of the package.

Compatibility Groups

Compatibility groups inform you about how to store a container and how it can be transported as well. Definitions of compatibility groups of substances and articles for demining are listed in Table 1 to the top right.

When stuffing a container with explosives, you are allowed to have normal goods in the container as well, but under no circumstances can it contain other dangerous goods. Table 2 shows what is possible to mix when stuffing a container.

By putting division number and compatibility group together, it is possible to store and transport the explosives by sea or air in accordance with International Maritime Organization (IMO) regulations (by ship) or in accordance with the International Air Transport Association (IATA) Dangerous Goods Regulation (transporting by air) as in Table 3.

Table 3 is rather theoretical and can be difficult to understand. All explosives will be listed as Class 1. In addition, they will have a division number, a compatibility number, a UN number and a proper shipping name. Typical explosives for demining can be seen at Table 4.

Compatibility Group

Definition of Compatibility Group

A Article containing a primary explosive substance and not having two or more effective protective components. Some articles, such as detonators for blasting, demolition tools for demolition and cap-type primers, are included, even though they do not contain primary explosives.

B Security, detonating explosive substances or black powder or article containing a secondary detonating explosive substance. In each case, without means of initiation and without a propelling charge, or an article containing a primary explosive substance and having two or more effective protective features.

C Substances or articles so packed or designed that any hazardous effects arising from accidental functioning are confined within the package unless the package has been degraded by fire, in which case all blast or projection effects are limited to the extent that they do not significantly hinder or prevent fire-fighting or other emergency response efforts in the immediate vicinity of the package.

Table 1: Classification of compatibility groups.
Table 2: Blasting of explosives when stuffing, (by comparison groups)

<table>
<thead>
<tr>
<th>R</th>
<th>B</th>
<th>D</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Possible</td>
<td>Forbidden</td>
<td>Possible</td>
</tr>
<tr>
<td>D</td>
<td>Possible</td>
<td>Forbidden</td>
<td>Possible</td>
</tr>
<tr>
<td>S</td>
<td>Possible</td>
<td>Possible</td>
<td>Possible</td>
</tr>
</tbody>
</table>

Table 3: Transportation of explosives.

<table>
<thead>
<tr>
<th>By ship</th>
<th>Passenger and Cargo Aircraft</th>
<th>Cargo Aircraft only</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4 B</td>
<td>Possible</td>
<td>Forbidden</td>
</tr>
<tr>
<td>1.4 B</td>
<td>Possible</td>
<td>Forbidden</td>
</tr>
<tr>
<td>1.4 D</td>
<td>Possible</td>
<td>Possible</td>
</tr>
<tr>
<td>1.4 S</td>
<td>Possible</td>
<td>Possible</td>
</tr>
</tbody>
</table>

Table 4: Classification of typical explosives for demining.

<table>
<thead>
<tr>
<th>Classification</th>
<th>UN Number</th>
<th>Proper Shipping Name/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 D</td>
<td>UN No. 0084</td>
<td>Explosives, blasting, Type D (e.g., PIAT, Cat or similar high explosives)</td>
</tr>
<tr>
<td>1.1 D</td>
<td>UN No. 0027</td>
<td>Black powder granular, or in meal</td>
</tr>
<tr>
<td>1.1 D</td>
<td>UN No. 0059</td>
<td>Charges, shaped, without detonator</td>
</tr>
<tr>
<td>1.1 D</td>
<td>UN No. 0063</td>
<td>Charges, shaped, with detonator</td>
</tr>
<tr>
<td>1.4 S</td>
<td>UN No. 0015</td>
<td>Fuse, safety</td>
</tr>
<tr>
<td>1.1 B</td>
<td>UN No. 0029</td>
<td>Detonators, non-electric, for blasting (e.g., blasting cap to be clipped on a safety fuse)</td>
</tr>
<tr>
<td>1.1 D</td>
<td>UN No. 0020</td>
<td>Detonators, electric, for blasting</td>
</tr>
<tr>
<td>1.4 S</td>
<td>UN No. 0055</td>
<td>Detonators, electric, for blasting</td>
</tr>
<tr>
<td>1.4 S</td>
<td>UN No. 0056</td>
<td>Detonators, electric, for blasting</td>
</tr>
<tr>
<td>1.1 B</td>
<td>UN No. 0060</td>
<td>Detonator, assemblies, non-electric, for blasting</td>
</tr>
<tr>
<td>1.1 D</td>
<td>UN No. 0060</td>
<td>Detonator, assemblies, non-electric, for blasting</td>
</tr>
<tr>
<td>1.4 S</td>
<td>UN No. 0041</td>
<td>Charges, shaped, without detonator</td>
</tr>
</tbody>
</table>

Storage of Explosives

Many regulations for storage of explosives exist. If explosives are classified 1.1 D and 1.1 B, there are very heavy restrictions on storage of these explosives because of the potentially fatal consequences for the surrounding area if the explosives were to go off. Storage of explosives 1.4 S are not subject to heavy restrictions but are subject to fire regulations because if the storage caught on fire, the material would burn out without going into detonation, or in the worst case, only a very limited quantity of fragment will come out without causing serious harm to the firemen.

Explosives for Demining

Procedures for use of explosives for demining and destruction of UXO have traditionally been made by the armed forces. Reliable procedures have been developed. Explosives to be used are normally:

- Explosives (Classified 1.1 D, e.g., PE4 or similar)
- Detonating cord (Classified 1.1 D, e.g., 10 g/m) approx. 1,000-10,000 m
- Electric detonators (Classified 1.4 S) approx. 6-11,000 p.c.

The mines will not be touched and the shaped charges are more than sufficient for ignition of UXO as well.

Conclusion

When taking into consideration the problems in transportation and secure storage of explosives classified 1.1 D and 1.1 B, it should be highly recommended to demand use of shaped charges and electric detonators classified 1.4 S. The prices for the shaped charges classified 1.4 S are higher than for explosives 1.1 D, but this is not of interest. The most important thing is the price when fired on the demining site—what the cost has been for transportation of high explosives compared to the shaped charges, what the cost has been for storage and what the price is for improved safety for the shaped charges compared to high explosives. If the vendor includes all of those factors in the cost, the shaped charges will be competitive to high explosives.

The price for electric detonators classified 1.4 S is slightly higher compared to ordinary packed electric detonators, and adding the cost of transporting the electric detonators classified 1.4 S becomes much cheaper than the ordinary packed electric detonators. Giving up the detonating cord, the explosives 1.1 D, safety fuse and detonators for the safety fuse and demanding shaped charges and electric detonators 1.4 S, it will be easier to have the necessary explosives in a short time and with the highest possible safety for the users and during transport and storage.*

*All graphs courtesy of the authors.

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Endnotes


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Typical tender for explosives for demining is:

- Explosives (Classified 1.1 D, e.g. PE4 or similar) approximately 1-5 tons
- Detonating cord (Classified 1.1 D, e.g. 10 g/m) approx. 6,000-10,000 m
- Electric detonators (Classified 1.4 S) approx. 1-5,000 m
- Safety fuse (Classified 1.1 D) approx. 500-1,000 m
- Non-electric detonators for blasting (Classified 1.4 S, detonator to be crimped on a safety fuse) approx. 500-1,000 m

The explosives shall be delivered as soon as possible.

A tender for explosives is very informative and for a limited project. Transportation must be by ship as explosives, detonating cords and non-electric detonators for blasting are classified 1.1 D and 1.1 B, and the goods must be stowed in two containers. One of the containers will have explosives and the detonating cord (approximately six tons in total or 10 pallets). The second container will have the electric detonators, the safety fuse and the non-electric detonators (approximately 600 kg on one pallet). The only reason for having two containers is because of the non-electric detonators for blasting. These detonators have an extremely low value as well, but must be stowed separately from the explosives.

Findings of a ship that will carry explosives becomes more and more difficult because the liners and insurance companies classify them as high-risk goods. Also, the liner will have restrictions as to which vessels they can take in (a lot of harbours have very heavy restrictions as to what type of goods a ship must carry). When planning such a tender, a lot of money can be saved, but the tender must be changed to one of the following two following alternatives.

**Alternative 1**

- Explosives (Classified 1.1 D, e.g. PE4 or similar) approx. 1-5 tons
- Detonating cord (Classified 1.1 D, e.g. 10 g/m) approx. 1,000-10,000 m
- Electric detonators (Classified 1.4 S) approx. 6,000-10,000 m
- Safety fuse (Classified 1.1 D) approx. 1,000-10,000 m
- Non-electric detonators for blasting (Classified 1.4 S, detonator to be crimped on a safety fuse) approx. 500-1,000 m

The explosives must be forwarded by ship, but only one container is needed. The deminer can do the same job as what the first tender asked for.

**Alternative 2**

- Charges, shaped (Classified 1.4 S) approx. 6,000-10,000 m
- Electric detonators (Classified 1.4 S) approx. 6,000-10,000 m
- Passenger or cargo aircraft can ship the goods. Extremely quick delivery is possible and you only pay the freight cost for the goods that you transport by aircraft. The deminer can do the same job as what the first tender asked for.

### Storage of Explosives

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- Explosives (Classified 1.1 D, e.g. PE4 or similar)
- Detonating cord (Classified 1.1 D, e.g. 10 g/m)
- Electric detonators (Classified 1.1 B)
- Safety fuse (Classified 1.4 S)
- Non-electric detonators for blasting (Classified 1.1 B, detonator to be crimped on a safety fuse)

When blasting mines, the explosives are normally used as a small bulk charge of 100-200 g placed on the mine or even better, on the side of the mine without touching the mine. When blasting UXOs, the explosives are used in bulk charge of 200-500 g placed on a shell or a minor explosive charage is placed in the firing chamber of the UXO. From time to time to conserve explosives, improvised shaped charge containers are used, and the demining teams fill the mine with neat charges and the shape of the charge is to have the necessary explosives in a short time and with the highest possible safety for the users and during transport and storage.

### EUDEM2: Overview and Early Findings

*All graphs courtesy of the authors.

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**Endnotes**

4. Louskold, G. (1997) "Innovation Char-

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