Unplanned Explosions at Munitions Sites (UEMS): Accident Reporting and Lessons Learned

“Generic Preventive Measures”
in support of the convention on Certain Conventional Weapons (CCM) – Protocol V

Pilar Reina - Small Arms Survey
Small Arms Survey

- Provides reliable and impartial policy-relevant analysis on small arms and armed violence

- Receives support primarily from governments:
  - Australia
  - Belgium
  - Canada
  - Denmark
  - Finland
  - Germany
  - Netherlands
  - Norway
  - Sweden
  - Switzerland
  - United Kingdom
  - United States

- Benefits from network with UN and civil society
PSSM resources RASR Initiative
(www.rasrinitiative.org)

Meeting of Experts for CCW Protocol V. Geneva, 10 April 2013
Today’s Presentation:

- Historical examination of UEMS in UN Member States
- Examination of Cause(s) of accidents
- Case Study - Examples of Lessons Learned
- Accident Reporting and Investigation
- Conclusion

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Historical examination of UEMS: Global

Number of Recorded UEMS by Year, 1987 - 2012

Source: Small Arms Survey UEMS Database (2013)

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Historical examination of UEMS and Casualties: Global

Number of UEMS and (approx) casualties by years, 1987 - 2012

- No. Of UEMS
- No.of Casualties

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Historical examination of UEMS: Regional

Number of UEMS recorded by world regions, 1987-2012

- Asia: 43%
- Oceania: 1%
- Africa: 14%
- Americas: 10%
- Europe: 33%

Source: Small Arms Survey UEMS Database (2013)
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# Causes of accidents

## Table 1 Classification of recorded causes of UEMS

<table>
<thead>
<tr>
<th>1. Sub-standard storage</th>
<th>2. Defects in storage area or processing site</th>
<th>3. Handling errors and poor working practices</th>
<th>4. Poor security conditions/External events</th>
<th>5. Cause currently undetermined</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1. Auto catalysis</td>
<td>2.1. Falling objects</td>
<td>3.1. Handling/Negligence</td>
<td>4.1. Extreme weather</td>
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</tr>
<tr>
<td>1.2. Mechanical deterioration</td>
<td>2.2. Internal fires</td>
<td>3.1.1. Rough handling (including transport within depot)</td>
<td>4.1.1. Lightning</td>
<td></td>
</tr>
<tr>
<td>1.2.1. Sensitization typically due to corrosion</td>
<td>2.2.1. Electrical fault</td>
<td>3.1.2. Dropped munitions</td>
<td>4.1.2. High temperature</td>
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<tr>
<td>1.2.2. Exudation (e.g. white phosphorus and nitro-based chemicals)</td>
<td>2.2.2. Incompatible structural material</td>
<td>3.1.3. Contamination/smoking</td>
<td>4.1.3. Cold temperature (and subsequent thaws)</td>
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<tr>
<td>1.3. Chemical deterioration</td>
<td>2.2.3. Hot surfaces</td>
<td>3.1.4. Hot work (e.g. welding)</td>
<td>4.1.4. Humidity</td>
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<td>1.3.1. Formation of sensitive compounds (e.g. copper azide)</td>
<td>2.2.3. Hot surfaces</td>
<td>3.1.5. Storage of incompatible materials</td>
<td>4.2. External fire</td>
<td></td>
</tr>
<tr>
<td>1.3.2. Depletion of propellant stabilizer</td>
<td>2.x. Suspected</td>
<td>3.1.6. Horseplay</td>
<td>4.2.1. Vegetation fire</td>
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<td>1.x. Suspected</td>
<td></td>
<td>3.1.7. Tampering</td>
<td>4.2.2. Vehicle fire</td>
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<tr>
<td></td>
<td></td>
<td>3.2. During Demilitarization/Explosive Ordnance Disposal</td>
<td>4.2.3. Building fire</td>
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<tr>
<td></td>
<td></td>
<td>3.2.1. Inadvertent initiation of UXO</td>
<td>4.2.4. External body</td>
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<tr>
<td></td>
<td></td>
<td>3.2.2. Inappropriate disposal</td>
<td>4.3. Criminal/Deliberate</td>
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<td></td>
<td></td>
<td>3.x. Suspected</td>
<td>4.4. Other</td>
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<td></td>
<td></td>
<td></td>
<td>4.x. Suspected</td>
<td></td>
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</tbody>
</table>

Source: Small Arms Survey, 2013
Examination of recorded causes of accidents.

Recorded UEMS in UN Member States by Immediate Cause, 1987 - 2012

1. Sub-standard storage 24%
2. Defects in storage area or processing site 9%
3. Handling errors and poor working practices 24%
4. Poor security conditions/External events 27%
5. Cause currently undetermined 16%

Source: Small Arms Survey, 2013
Today’s Presentation:

■ Historical examination of UEMS in UN Member States

■ Examination of Cause(s) of accidents

■ Case Study - Examples of Lessons Learned

■ Accident Reporting and Investigation

■ Conclusion
Case Study: Albania 2008

Location: Gërdec
Time details: 15.03.2008 at 0430 PM
Casualties: 326. Fat (26); Inj (300+)
Content: More than 10 tons of propellant, 100-3,000 tons of ordnance items
Owner: Privately run ammunition depot
Causes: 3. Handling errors/poor working practices
Consequences:
- Blast effect: 5 km radius
- Evacuation: 4,000
- Estimated costs: 50+ Mill EUR
- Political: Three prosecuted
Lessons Learned: Albania

1. Greater oversight over demilitarisation activities;

2. Need to strengthen technical expertise;

3. Need to develop an emergency response plan;

4. Possibilities for international technical assistance.
Today’s Presentation:

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Accident Reporting and Investigation allow:

- Preserving information electronically and the lessons learnt from them;
- Monitoring of safety and identifying areas that require special attention;
- Assisting accident investigations;
- Trends analysis and risk assessment.
# Accident Reporting Template

1. **Time details**  
   Date (yy/mm/dd):  
   Hour (hh/mm):  

2. **Location details**  
   Location (grid Coordinates):  

3. **Casualties**  
   Fatalities:  
   □ Yes  
   □ No  
   □ Unknown  
   No. of Civilian:  
   or/and military:  
   Injured:  
   □ Yes  
   □ No  
   □ Unknown  
   No. of Civilian:  
   or/and military:  

4. **Depot ownership**  
   State security forces:  
   □ Police  
   □ Armed Forces  
   □ Other (specify):  
   Private:  
   □ Civilian  
   □ Security companies (PSCs)  
   □ Other (specify):  
   Semi-private (specify):  
   Armed groups (specify):  
   Other:  

5. **Type of storage**  
   Permanent:  
   □ Yes  
   □ No  
   □ Unknown  
   Volume (tonnes):  
   Temporary:  
   □ Yes  
   □ No  
   □ Unknown  
   Type of material (no. of items):  

6. **Depot contents**  
   More details:  

7. **Causas (See reverse Table 1 on Reported causes of UMES)**  
   Immediate Cause:  
   Primary Cause:  
   Sub-Cause:  
   Context:  

8. **Socio-economic impact**  
   Displaced people:  
   □ Yes (number):  
   □ No  
   □ Unknown  
   Infrastructure damage:  
   □ Yes  
   □ No  
   □ Unknown  
   More details:  

9. **Additional information**  
   Blast effect (Radius):  
   Immediate response (Govt. and IO/NGOs):  
   Follow up measures (Govt.):  
   Political impact:  

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Accident Reporting Template

Definition: Unplanned Explosions at Munitions Sites (UEMS) include accidents resulting in the explosion of abandoned, damaged, improperly stored, or properly stored stockpiles of munitions and explosives. For our purposes, munitions sites comprise storage areas (including those temporarily maintained during demilitarization or explosive ordnance disposal) and processing sites, whether temporary or permanent. Ammunition manufacturing facilities (ordinance factories) are not included, but accidents during ammunition processing operations within munitions sites have been included where known.

1. An accident is defined as ‘an undesired event, which results in harm’ (UNODA, 2011, paragraph 3.5, p.2). ‘Harm’ is defined as ‘physical injury or damage to the health of people, or damage to property or the environment’ (UNODA, 2011, paragraph 3.120, p. 14).
2. An explosion is defined as ‘a sudden release of energy producing a blast effect with the possible projection of fragments. The term explosion encompasses fast combustion, deflagration and detonation’ (UNODA, 2011, paragraph 3.95, p.11).
3. Abandoned Explosive Ordnance (AXO) is defined as ‘explosive ordnance that has not been used during an armed conflict, that has been left behind or dumped by a party to an armed conflict, and which is no longer under control of the party that left it behind or dumped it. Abandoned explosive ordnance may or may not have been primed, fused, armed or otherwise prepared for use’ (UNODA, 2011, paragraph 3.1, p.1).
4. Damaged munitions refer to the physical or chemical deterioration of ammunition and explosives.
5. Munitions are considered improperly stored when storage does not generally follow accepted international norms or guidance, or existing national legislation and controls.
6. Munitions are used in this definition—and in common usage—to refer to weapons, ammunition, explosives and components. A number of armed forces and ammunition specialists, however, use the term munitions to refer solely to complete rounds of ammunition (cf. Ammunition) (Bewan and Wilkinson, 2008, p. xxvi). Ammunition: A complete device (e.g. missle, shell, mine, demolition device, etc.) charged with explosives, propellants, pyrotechnics; initiating composition; or nuclear, biological, or chemical material for use in connection with offence, defence, or training, or non-operational purposes, including those parts of weapons systems containing explosives (cf. Munitions) (Bewan and Wilkinson, 2008, p. xix).
7. An Explosive Storage Area (ESA) is defined as ‘an area used for the storage of explosives and within which authorized ammunition or missile preparation, inspection and rectification operations may also be carried out’ (UNODA, 2011, paragraph 3.108, p. 12).
8. An ammunition process [site] is defined as ‘a building or area that contains or is intended to contain one or more of the following activities: maintenance, preparation, inspection, breakdown, renovation, test or repair of ammunition and explosives’ (UNODA, 2011, paragraph 3.12, p.2).

Table 1: Reported causes of UEMS (x. Immediate Cause; x:x. Primary cause; xxx: Sub-cause)

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Conclusion

1. Big step forward to understand the scale and dimension of the problem;

2. Valuable resource to improve safety of ammunition storage;

3. Need for more systematic reporting and investigation of UEMS and accidents throughout the ammunition lifecycle;
Unplanned Explosions at Munitions Sites

Posted 1 June 2012

Unplanned explosions at munitions sites (UEMS) are a global problem. Since 1998, incidents of this nature have been reported in every region, in more than a third of UN member states (see Table 1). They have occurred regularly, with an average of three every two months for the ten-year period 1998—2007. According to the forthcoming Small Arms Survey UEMS database, the rate has increased in recent years to more than one every two weeks. During 2008, the number of explosions increased to 3.8 per month (see Table 2)—the highest rate recorded in a calendar year. Whether the problem is getting worse or reporting of incidents is improving (see the Figure below), the number of explosions is not decreasing despite efforts to address their causes.

The database remains very much a work-in-progress. Since this page’s previous update, it has grown to comprehensively cover the three-month period up to 30 April 2012. This report includes 567 UEMS incidents and over 1,600 casualties. Around 14,000 people are reported as having been injured in UEMS-related response efforts in 2012.

Questions?

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