

Unplanned Explosions at Munitions Sites

Considerable attention has been paid to the threats posed by small arms and light weapons proliferation and misuse, but far less is known about the dangers inherent in poorly stored or mishandled munitions.¹ A single unplanned explosion at a munitions site can claim dozens of lives, injure hundreds of people, and displace thousands.² The damage

to infrastructure can be extensive, covering many square kilometres. In addition, the loss of economic activity can exceed tens of millions of dollars and have long-term ramifications for livelihoods and the environment.³

Unplanned explosions at munitions sites (UEMS) are a global problem. Since 1979 more than 500 incidents of this nature have been

Table 1 Number of reported UEMS by region, sub-region, and country, 1979-2013

Geographical distribution		Number of reported UEMS		Number of incidents by reporting country
Region	Sub-region (number of UN member states)	Number of countries reporting UEMS	Number of incidents	
Africa	Eastern Africa (18)	8	25	Ethiopia (2); Kenya (1); Mozambique (10); Somalia (1); South Sudan (5); Tanzania (4); Zambia (1); Zimbabwe (1)
	Middle Africa (9)	4	19	Angola (5); Cameroon (1); Republic of Congo (5); Democratic Republic of the Congo (8)
	Northern Africa (6)	3	13	Egypt (3); Libya (8); Sudan (2)
	Southern Africa (5)	2	2	Namibia (1); South Africa (1)
	Western Africa (16)	6	13	Côte d'Ivoire (3); Guinea (2); Guinea-Bissau (3); Mali (1); Nigeria (3); Sierra Leone (1)
Americas	Caribbean (13)	3	3	Cuba (1); Dominican Republic (1); Trinidad and Tobago (1)
	Central America (8)	5	8	El Salvador (2); Guatemala (1); Honduras (1); Mexico (2); Nicaragua (2)
	Northern America (2)	2	20	Canada (1); United States (19)
	South America (12)	9	23	Argentina (1); Brazil (5); Chile (1); Colombia (3); Ecuador (7); Guyana (1); Paraguay (1); Peru (2); Venezuela (2)
Asia	Central Asia (5)	4	8	Kazakhstan (5); Tajikistan (1); Turkmenistan (1); Uzbekistan (1)
	Eastern Asia (4)	2	18	China ^a (15); North Korea (3)
	South-Eastern Asia (11)	8	32	Cambodia (4); Indonesia (2); Laos (1); Malaysia (1); Philippines (5); Singapore (1); Thailand (11); Vietnam (7)
	Southern Asia (9)	6	86	Afghanistan (28); India (23); Iran (10); Nepal (1); Pakistan (13); Sri Lanka (11)
	Western Asia (17)	13	76	Armenia (1); Azerbaijan (4); Cyprus (1); Georgia (3); Iraq (19); Israel (1); Kuwait (2); Lebanon (10); Saudi Arabia (1); Syria (7); Turkey (11); Yemen (15); Palestinian Territories ^b (1)
Europe	Eastern Europe (10)	8	91	Belarus (1); Bulgaria (9); Czech Republic (2); Hungary (1); Poland (1); Russian Federation (66); Slovakia (1); Ukraine (10)
	Northern Europe (10)	4	5	Denmark (1); Finland (2); Sweden (1); United Kingdom (1)
	Southern Europe (14)	8	46	Albania (24); Bosnia and Herzegovina (2); Croatia (3); Greece (2); Italy (2); Montenegro (2); Serbia (10); Slovenia (1)
	Western Europe (9)	4	18	Belgium (2); France (9); Germany (5); Switzerland (2)
Oceania	Australia and New Zealand (2)	1	1	Australia (1)
	Melanesia (4)	0	0	None reported
	Micronesia (5)	0	0	None reported
	Polynesia (3)	0	0	None reported
Total		100	507	

Notes:

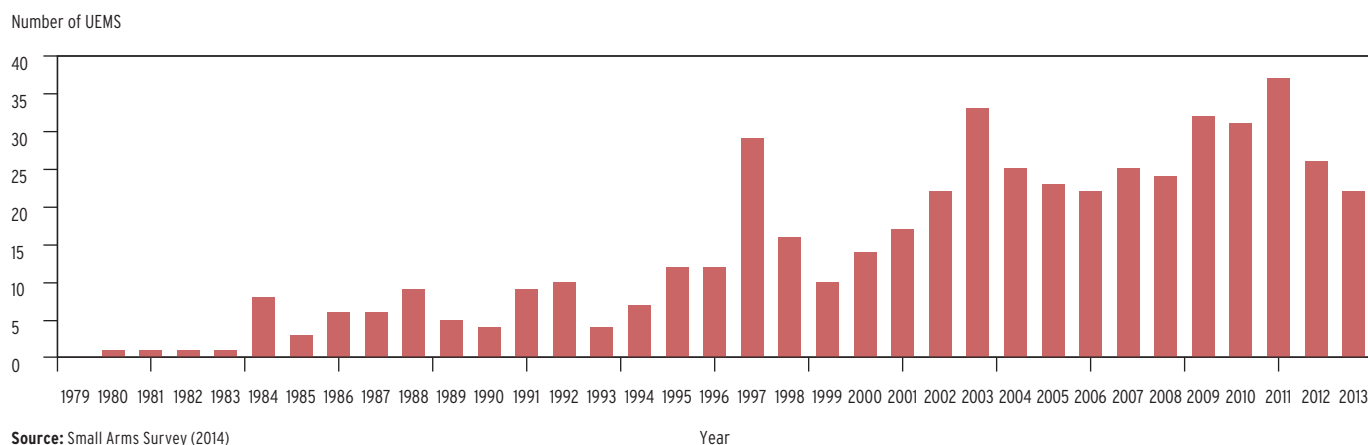
Regions and sub-regions (22 in total) are defined with reference to UNSD (2013). They include all 193 UN member states and the two UN permanent observer states.

a. Including eight incidents recorded in Taiwan. In 1971 the UN recognized Taiwan to be a province of China.

b. The Palestinian Territories was granted UN Observer status in 2012.

Source: Small Arms Survey (2014)

Figure 1 Number of recorded UEMS by year, 1979–2013



Source: Small Arms Survey (2014)

reported in more than half of UN member states on every continent except Antarctica (see Table 1). The Small Arms Survey UEMS Database (2014)⁴ reveals that UEMS have occurred regularly, with an average of two per month for the past ten years (see Figure 1). It is unclear whether the problem is getting worse or reporting of incidents is improving. What is clear is that the rate of explosions is not decreasing, despite efforts to address their causes.⁵

There are numerous causes of UEMS. Most concern handling errors and inappropriate working practices.⁶ Inferior infrastructure and failure to prevent external security or environmental threats are also major factors in UEMS and contribute to related security challenges. Other frequent causes include negligence in monitoring the condition of ammunition, leading to its unchecked deterioration.⁷ That said, no cause is yet recorded for one-quarter of reported explosions (see Table 2).

States that exhibit strong political will to tackle UEMS—often with international assistance—can prevent unplanned explosions or mitigate their effects. Several regional organizations have developed best-practice guidelines for physical security and stockpile management (PSSM).⁸ Ad hoc coalitions of the willing—such as the nine countries in South-east Europe that comprise the Regional Approach to Stockpile Reduction (RASR) Initiative—underscore the importance states

Table 2 Reported causes of UEMS, 1979–2013

Root cause	Primary cause	Number of events	Proportion of all causes	Proportion of known causes
1. Ammunition deterioration	1.1 Auto-initiation(auto-catalysation)	28	5.5%	7.3%
	1.2 Mechanical deterioration	4	0.8%	1.0%
	1.3 Chemical deterioration	3	0.6%	0.8%
	1.4 Suspected	19	3.7%	5.0%
2. Inappropriate storage systems and infrastructure	2.1 Falling objects	1	0.2%	0.3%
	2.2 Internal fire ^a	45	8.9%	11.8%
	2.3 Suspected	31	6.1%	8.1%
3. Handling errors and inappropriate working practices	3.1 Mechanical damage (caused by shock initiation)	48	9.5%	12.6%
	3.2 Inappropriate working practices	13	2.6%	3.4%
	3.3 Tampering	1	0.2%	0.3%
	3.4 During demilitarization/explosive ordnance disposal	38	7.5%	10.0%
	3.5 Suspected	14	2.8%	3.7%
4. Failure to prevent external influences and events	4.1 Extreme weather	34	6.7%	8.9%
	4.2 External fire	29	5.7%	7.6%
	4.3 Other	5	1.0%	1.3%
	4.4 Suspected	12	2.4%	3.1%
5. Poor security	5.1 Criminal/deliberate act	56	11.0%	14.7%
6. Cause currently undetermined or unrecorded		126	24.9%	
Total		507	100.0%	100.0%

Notes:

The percentages given in the last two columns do not total exactly 100 due to rounding.

a. Many of these fires may have originated as auto-ignitions of propellant.

Sources: Small Arms Survey (2014)



A fire at Maracay, Venezuela, on 30 January 2011 reportedly caused the explosion of a Venezuelan army artillery-munitions depot that killed one person and forced the evacuation of 10,000 residents from surrounding areas. © REUTERS/Gerard Aponte

attribute to PSSM.⁹ International donors working bilaterally, with UN bodies and agencies, through sub-regional organizations, and in conjunction with NGOs and private companies have assisted dozens of governments in the safe destruction of surplus stocks of munitions and in securing remaining materiel in safe conditions.¹⁰

Some solutions are expensive to implement and may require external assistance, but many can be undertaken unilaterally and with a modest investment. Some sites may need to be closed and their ordnance moved to another location at great cost. New sites incorporating quantity–distance principles and security features may need to be constructed from scratch. Nevertheless, without necessarily striving to achieve state-of-the-art storage

standards, a number of pragmatic measures can address the immediate risk of unplanned explosions. As depicted in the RASR PSSM Best-practice cards (for examples, see below),¹¹ states can achieve positive results on their own through some inexpensive and effective first steps. These include installing proper doors and locks at storage facilities, using adequate fences and barriers, posting signs to warn and inform those approaching or entering storage facilities, organizing the stockpile into stacks, and ensuring that aisles are free of obstructions. ■

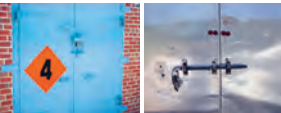



Notes

- 1 In this Research Note—as is common practice—the term ‘munitions’ refers to military weapons, ammunition, and equip-

ment; however, the term can also be used to refer solely to complete rounds of ammunition.

- 2 The death toll has at times been much higher. In January 2002, for example, a series of explosions at a military depot on the outskirts of Lagos, Nigeria—sub-Saharan Africa’s most populous city—resulted in more than 1,100 deaths, with many people drowning in nearby canals when fleeing the fires and explosions (MSIAC, 2002). See also USDoS (2010) and IFRC (2010).
- 3 Following an explosion in Paraćin, Serbia, in 2006 a main access road was reportedly blocked for 32 hours and an estimated EUR 15 million (USD 19 million) worth of trade was lost (Parliamentary Forum, 2008). The Serbian army subsequently removed more than 130,000 pieces of unexploded ordnance from an 8-km² perimeter around the contaminated area (Jovanović, 2011).
- 4 Small Arms Survey (2014) builds on the listing of incidents compiled by Adrian

Examples of RASR PSSM Best-practice cards

<p>2 DOORS 2</p>  <ul style="list-style-type: none"> • Door made of steel (or 4.5 cm wood with 12 gauge steel plate) • Frame anchored to building at 8 places • Hinges welded to prevent pin removal • Marked with UN Fire Division symbol • Doors open OUTWARDS - cannot be rammed • Light gauge handles break off easily - cannot be used to pull off door <p>IATG 09.10</p>	<p>4 CONTRABAND NOTICES 4</p>  <ul style="list-style-type: none"> • List forbidden items (cell phones, flame-producing items, etc.) • Identify restricted areas <p>IATG 06.10 Annex C</p>	<p>5 FENCES AND BARRIERS 5</p>  <ul style="list-style-type: none"> Class 1 - Minimum Deterrence Class 2 - Deterrent to Opportunist Class 3 - Deter and Delay Resourceful Intruder Class 4 - Maximum Deterrence and Delay • Zones clear of vegetation: 4 m inside; 10 m outside <p>IATG 09.10</p>	<p>6 LOCKS 6</p>  <ul style="list-style-type: none"> • Must protect against manual manipulation (hammers, bars, etc.) for at least 15 minutes • Must protect against powered tools (drills, saws, etc.) for at least 5 minutes <p>IATG 09.10</p>
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Source: RASR (2015)

- Wilkinson (2011) and George Zahaczewsky (2011).
- 5 Private facilities are also at risk. Small Arms Survey (2014) seeks to distinguish facilities that are wholly national or private enterprises from those that are state owned but privately operated.
 - 6 Poorly managed state stockpiles also facilitate corruption due to deficient record keeping and theft by criminals and non-state armed groups.
 - 7 Only trained experts can conduct routine physical surveillance and chemical testing throughout the life cycle of propellants, primers, and explosive components.
 - 8 See, for example, NATO (2010), OSCE (2008), RECSA (2005), and SEESAC (2007). See also the UN International Small Arms Controls Standards (CASA, n.d.) and the UN Office for Disarmament Affairs' International Ammunition Technical Guidelines (UNODA, n.d.; King, 2011, p. 4).
 - 9 For more information on the US-funded RASR Initiative involving Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Former Yugoslav Republic of Macedonia, Montenegro, Romania, Serbia, and Slovenia, see RASR (n.d.).
 - 10 For example, Berman and Reina (2014, pp. 68–104) identify and profile 37 such actors. Importantly, best practices and best intentions sometimes meet unexpected challenges when they are implemented; see, for example, King (2011).
 - 11 See RASR (2015).

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For more information about unplanned explosions at munitions sites, please visit: <www.smallarmssurvey.org/?uems.html>

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Authors: Eric G. Berman, David Gertiser, Pierre Gobinet, and Pilar Reina

Design and layout: Rick Jones (rick@studioexile.com)

Contact details

Small Arms Survey
Graduate Institute of International and Development Studies
47 Avenue Blanc, 1202 Geneva
Switzerland

t +41 22 908 5777 **f** +41 22 732 2738



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