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Ian Biddle
G4S Ordnance Management Ltd.

Environmentally Responsible SAA Disposal

The need to dispose of small arms ammunition (SAA) for short-term stability and security concerns has traditionally outweighed the long-term need for environmentally responsible disposal. The author suggests the international community should change its procedures concerning SAA disposal and promote more environmentally friendly disposal methods.

by Ian Biddle [G4S Ordnance Management Ltd.]

An estimated 750,000 arms-related deaths occur every year.[1] According to Amnesty International, conflict and armed violence kills 1,500 people daily.[2]

In 2006, the Bonn International Center for Conversions estimated that "hundreds of thousands of tonnes of surplus ammunition inherited from the Cold War are thought to be held in Albania, Belarus, Bosnia-Herzegovina, Bulgaria, Kazakhstan, Russia, Ukraine and Uzbekistan. The relevant U.N. office in Southeastern Europe has estimated surplus stocks of ammunition from only ten countries in the region as follows" [see Table 1].[3]

Albania	140,000 tons
Belarus	1,000,000 tons
Bosnia-Herzegovina	32,000 tons
Bulgaria	153,000 tons
Croatia	40,000 tons
FRY Macedonia	10,000 tons
Moldova	20,000 tons
Romania	100,000 tons
Serbia and Montenegro	100,000 tons
Ukraine	2,000,000 tons

Table 1. Estimated surplus of ammunition stocks from 10 countries in Southeastern Europe.[3]
Table courtesy of the author/CISR.

Additionally, the recent upheavals in the Middle East and Africa have littered the respective regions with small arms ammunition (SAA).[4] Ammunition from these and other stockpiles leaked across international borders. Temporary munitions stockpiles established to support military operations, in which SAA is the longest lasting and most stable component, are often abandoned. Post-conflict, abandoned stockpiles are a principal source of ammunition for insurgents, terrorists and criminals, and SAA is a major destabilizing factor in post-conflict situations.[4] Reducing the availability of small arms, light weapons and SAA is a priority in all disarmament, demobilization and reintegration programs. According to an article by Oxfam International, "Ammunition supplies have an impact on the ability of combatants to engage in hostilities. A shortage of bullets can reduce or even stop fighting altogether … "[3]

Disposing of Surplus SAA

Disposing of SAA is difficult in bulk. Expending ammunition through live fire is not viable if a stockpile consists of hundreds of thousands of rounds. Mechanical destruction requires the deformation of every cartridge. Burial is a popular form of caching SAA for later use, as it resists corrosion. Sea dumping is prohibited, as ammunition and explosives are considered hazardous industrial waste and fall under the remit of international treaties: the 1972 *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter*; the 1996 *Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* (amended 2006); and the 1998 *Convention for the Protection of the Marine Environment of the North-East Atlantic.*[5,6,7]

The only viable method of bulk destruction is incineration through open burning (OB), industrial incineration or incineration via mobile incinerator.

Open Burning

In the past, the requirement of disposing surplus SAA quickly to promote stability and security overrode the requirement to dispose of SAA in an environmentally responsible manner. OB can produce atmospheric and terrestrial heavy metal pollution from molten bullet cores, which inevitably seeps into the food chain.[8]

Transportable SAA disposal system, Afghanistan, 2013.
Photo courtesy of Kenn Underwood.

According to an evaluation in Canada of heavy metal contamination after OB in 2001, "… small arms bullets contain a 98% lead, 2% antimony alloy ... Tracer rounds contain strontium, molybdenum, and carbon tetrachloride ... The incineration of these toxic materials can understandably lead to adverse environmental impacts. If burning is not tightly controlled, temperatures may easily surpass 525°C, the point at which lead begins to vapourise. Unless a robust filtration apparatus is used to scrub such emissions, lead-contaminated particulates will be released into the environment."[8]

OB in a pit or a burning tank is easy to implement using materials and technology readily available in less-developed countries. As a common form of field disposal, OB is suitable for SAA quantities of a few thousand rounds at a time, lengthening the process when a stockpile weighs several tons.

A number of OB techniques can destroy ammunition natures safely and efficiently. These include open-pit burning using specially built burning boxes, either static or mobile. Readily available materials, such as disused 50-gallon oil drums, provide excellent containers to burn SAA.[9] Advantages include high production rates and very low costs. However, the container must cool for 24 hours before subsequent burns. The main disadvantage of OB procedures is ensuing air pollution.[10]

The theoretical incineration temperature is around 2,000 C (3,632 F), but this assumes perfect burning and complete stoichiometric conversion, and does not account for heat loss due to wind or other factors.[11]

In practice, OB produces a dense smoke plume consistent with incineration at a lower temperature and similar to plumes found in house fires at about 600 C (1,112 F) instead of the 800 C (1,472 F) required to eliminate volatile organic compounds, which are major health hazards. Using relatively small samples, experiments have been conducted under controlled conditions and quickly rising temperatures. Under field conditions, a gradual temperature rise occurs with incomplete and inefficient burning. This produces the characteristic plumes of dense dirty smoke. OB is also slow. After burning, time lapse must occur before the pit or tank can be reused, limiting the number of burns to one per day and driving up costs. This is often ignored when attention is focused on the cost of equipment rather than the cost of the total process. Although the use of SAA burning tanks is cheap to initiate, the length of time required to dispose of a stockpile means that labor costs quickly escalate. Thus, the entire exercise can be more expensive and polluting than if a more expensive but productive incinerator had been used.

Industrial Incineration

Industrial SAA incineration avoids the pollution problems associated with OB. A kiln is preheated to a specific temperature to achieve complete stoichiometric conversion of the propellant; emissions are filtered and scrubbed; and there is no heavy metal pollution. As a continuous process, this allows for higher disposal rates while reducing the time needed to dispose of large stockpiles.

Industrial incinerators also have significant inherent disadvantages:

- Ammunition must first be collected and brought to the kiln.
- Establishing and operating the kiln has high costs.

High capital and running costs render the demilitarization of small SAA amounts ineffective, as disposal costs can easily reach several thousand dollars. Target costs for disposing (US$800 per ton of SAA) can only be achieved using economies of scale, which dictate the collection of stockpiles to minimize logistic costs. Large stockpiles attract criminals and insurgents.[12]

The International Maritime Dangerous Goods Code has a complex process to classify goods for transportation. Munition classification is based on ammunition in the manufacturer's packaging. Ammunition recovered from the battlefield is frequently loose, making it very difficult to classify. As a result, shipping becomes a complicated, prolonged and expensive process.

Transportable Disposal Systems

Recently developed, self-contained, transportable incinerators can operate in remote areas where surplus SAA are often located, removing the risks associated with the consolidation of small stockpiles into large ones and eliminates the complications associated with transporting unclassified, dangerous goods. These systems are fitted with a comprehensive suite of pollution-control equipment, equivalent to that found in large static kilns. In addition, they generally have the same technology and scrap-processing systems found in large static facilities.

Recommendations and Conclusion

Africa and the Middle East have huge quantities of uncontrolled SAA, the availability of which is directly linked to the level of armed violence and insecurity. Hence, disposing of this surplus SAA is a priority. As environmental responsibility is a major international concern, ammunition disposal should strive to adopt best practices.

Although easy to establish, OB causes severe, long-lasting, heavy metal pollution. The only environmentally responsible way to destroy surplus SAA is to use an incinerator fitted with pollution-control equipment. However, the dispersion of SAA stockpiles, high costs and time demands preclude the establishment of fixed industrial incinerators. In contrast, quickly deployable, self-contained, transportable SAA disposal systems fitted with pollution-abatement systems are available and may provide a more ideal solution. Transportable SAA disposal systems limit pollution and eliminate the need for difficult transportation efforts and the collection of large stockpiles.

On security and humanitarian grounds, disposing of surplus SAA should continue as an international priority since there is a strong direct correlation between the availability of SAA in a conflict area and the amount of small arms violence and an inverse correlation between SAA and the level of stability in a post-conflict region. However, the benefits of prompt disposal must be balanced against the legacy of atmospheric and ground pollution caused by current OB methods. As new technology enables prompt local disposal without pollution, OB should no longer be the default disposal method. Instead, use of transportable incinerators fitted with pollution-control equipment should be mandated when international and national bodies award contracts to dispose of SAA.

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Ian Biddle is the ammunition technical manager for G4S Ordnance Management Ltd. He has 30 years of experience in ammunition manufacture, sale, transportation and disposal, both in and out of the British army. He has worked in Bosnia–Herzegovina, Egypt, Germany, Iraq, Republic of the Congo, Sierra Leone and Somaliland.

Ian Biddle
Ammunition Technical Manager
G4S Ordnance Management
Southside
105 Victoria St.
London SW1E 6QT / UK
Tel: +44 207 963 3100
Fax: +44 207 834 6371
Email: ian.biddle@uk.g4s.com
Website: http://g4s.com