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Industrial Demilitarization of Conventional Ammunition

States procure more conventional ammunition than they use. Despite other disposal initiatives, much of a nation's surplus ammunition stockpile eventually requires *demilitarization*—a process by which ammunition is safely dismantled or destroyed while, ideally, its valuable materials are recovered. This control measure is a component of conventional ammunition stockpile management and features prominently in the UN International Ammunition Technical Guidelines (IATG) (UNODA, 2011b).

In many countries, excess stockpiles of obsolete or unserviceable munitions have reached a level requiring demilitarization on an industrial scale, often in a race against time, because the ammunition tends to become unsafe with age. Since states rarely have the capacity to demilitarize the surplus ammunition stockpiles of their collective security forces, they often turn to the demilitarization industry.

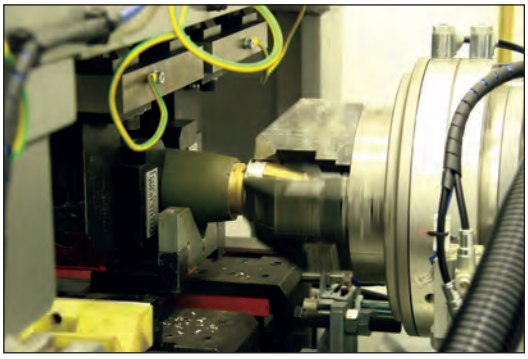
This *Research Note* provides an introductory snapshot of the ammunition demilitarization industry in Western and Central Europe as well as the United States, which account for the vast majority of industrial demilitarization activity worldwide. It summarizes the findings of the associated chapter from the *Small Arms Survey 2013: Everyday Dangers* (Gobinet, 2013a).

Actors, markets, and contracts

The demilitarization industry's main contractors are mostly based in Western Europe and the United States. A core group of approximately 30 major companies with proven operational capability occupy the international market. Many of them are former or active ammunition producers that have re-engineered their production lines for demilitarization. For instance, Nammo Buck GmbH in Germany was an ammunition factory before the reunification of East and West Germany, and has been involved in demilitarization since 1991 (Nammo, 2012, p. 2). Other companies focus exclusively on manufacturing and marketing demilitarization *equipment*. Industry contractors operate under private, government, or mixed ownership. Indeed, public–private partnerships are common.

The contractors demilitarize all types of ammunition under normal competitive tendering rules. National procurement and logistics agencies publish requests for proposals (RfPs), and often use regional organizations to issue them for large disposal programmes. The NATO Support Agency, for example, manages RfPs for the disposal of surplus ammunition holdings on behalf of NATO Ammunition Support Partnership and Partnership for Peace (PfP) countries, monitoring these contracts until completion. A well-documented PfP Trust Fund case study is Albania, where three successive projects significantly increased the country's indigenous demilitarization capacity (Gobinet, 2012, p. 39).

The contracts usually cover ammunition receipt; storage; internal movement; demilitarization processes; the processing of by-products, such as explosives and metals; and the disposal of all scrap materials. They can also include transportation costs from military storage to civilian demilitarization locations.



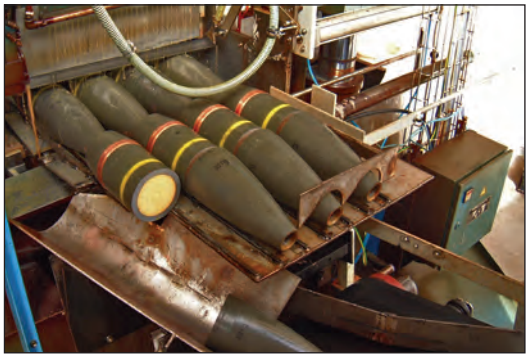


Photo (left): A projectile's nose fuse being removed remotely during the automated disassembly process, Kirikkale, Turkey, September 2007. © NATO Support Agency

Photo (right): The saw-cutting of high-explosive projectiles to expose their energetic content, after which the components travel on a conveyor belt to the next station to melt out the explosives, Lübben, Germany, 2012. © Spreewerk Lübben GmbH

Contract values vary largely according to ammunition types. Prices are usually expressed per *item* of ammunition. For a given ammunition family, demilitarization prices per item are always context specific. There is no generic unit cost basis for specific munitions types processed through specific demilitarization techniques, yet it is generally accepted that open competition is the most effective way to control pricing.

Recent estimates put the average cost of demilitarizing one tonne[1] of conventional ammunition in the United States and Western Europe at approximately USD 1,600 (RTO, 2010, p. 3-3), and costs are increasing. Demilitarization remains cheaper in Eastern Europe, where countries often receive external funding for this activity. In this context, (1) the economic level of the host nation, (2) local capacity, (3) the training levels of local staff, and (4) donor priorities factor into the demilitarization price and preclude easy comparative analysis. In 2012 TRZK estimated its demilitarization costs on behalf of the Serbian Ministry of Defence (MoD) at EUR 780 (USD 1,000) per tonne, and claimed that they would fall below EUR 500 (USD 650) per tonne following the upcoming installation of an explosive waste incinerator and new disassembly machines (TRZK, 2012).

The United States is the largest market for demilitarization services and will remain so for the foreseeable future. US figures from the 2010 Demilitarization Symposium in Tulsa indicate a demilitarization stockpile of 587,000 tons, with annual funding of approximately USD 146 million.[2] Large quantities of surplus munitions are disposed of each year, but a similar quantity is declared surplus. Cluster munitions, especially multiple-launch rocket system rockets, still represent an important segment of US demilitarization activity. In Western Europe, demilitarization stockpiles are generally growing at a much slower rate (NIAG, 2010, p. 82).

In Eastern European and Commonwealth of Independent States countries, industrial demilitarization remains a domestic activity largely inaccessible to open, international tender competition.

Table 1. **Summary of the ammunition demilitarization stages**

Process stage	Description
1. Transport	Compliance with dangerous goods or hazardous waste regulations that apply to the transportation of ammunition and explosives earmarked for demilitarization
2. Storage until demilitarization	Compliance with relevant quantity-distance standards
3. Manual unpacking and preparation	Sorting and unpacking
4. Pre-processing and disassembly	Separation of projectiles, propellants, and casings; exposure of energetic material prior to removal
5. Energetics removal	Physical removal of energetic materials from their housing or casing
6. Energetics disposal (primary destruction)	Decommissioning or destruction of energetic materials
7. Energetics disposal (secondary destruction)	Production of scrap material 'free from explosives'
8. Pollution control system	Compliance with regional or national environmental regulations covering noise, air, water, and land emissions, as well as waste management and recovery

Source: Gobinet (2013a, pp. 196–97)

Processes

Demilitarization is defined as 'the complete range of processes that render weapons, ammunition and explosives unfit for their originally intended purpose' (UNODA, 2011a, p. 8). The term applies equally to serviceable and unserviceable surplus material or equipment.

Many demilitarization techniques are available, categorized by the stage of the demilitarization process in which they are applied (Table 1). Not all of these steps are systematically required and some can be combined. Demilitarization is considered complete once all residues from the reverse engineering or destruction process have been destroyed or recycled.

Many contractors use a mix of open burning and open detonation (OB/OD) with other, more environmentally friendly methods that aim to recover valuable materials. The decision to choose any particular technique is based on cost, safety, environmental considerations, customer preference and timeframe, logistics, availability, the type and quantity of ammunition being destroyed, the physical or chemical condition of the ammunition, and the value of recovered material.

Contractors also modify technologies to be mobile or transportable so that they can be moved from stockpile to stockpile (Gobinet, 2013b).

Capabilities and capacities

In NATO countries, the technology exists to destroy the vast majority of ammunition types regardless of whether the ammunition is clearly labelled or stored in suitable conditions.

Equipment capacity is dependent on the type of ammunition processed. Capacity is an issue in the United States, where the amount of surplus ammunition grows faster than it is being demilitarized. In Europe, however, most NATO nations have underutilized industrial demilitarization capacity. It could be argued that these capabilities are rarely located where they are most needed; that is, in 'client' countries in Eastern Europe with significant surplus ammunition stockpiles, but no funds to address them (RTO, 2010, pp. 1-2, 4-1).

There is no standard unit of measurement for industrial demilitarization processing capacities (NIAG, 2010, p. 171). NATO and contractors typically use all-up weight and net explosive quantity, but will also express standard throughput rates in 'rounds of specified ammunition type' per time unit. Generally speaking, a company such as TRZK can process more than 3,000 tonnes of conventional ammunition per year (TRZK, 2012); Nammo Vingåkersverken in Sweden can reportedly handle 15,000–20,000 tonnes of conventional ammunition per year (NIAG, 2010, p. 71).

Warheads are transported to be detonated in controlled explosions in a dedicated facility 800 m below ground, Lökken Verk, Norway, 2012. © Nammo Demil Division

Regulations, transport, and general oversight

The IATG include a comprehensive section on ammunition demilitarization and destruction (UNODA, 2011b). Aside from these guidelines, there is currently no common international standard, legislation, or compliance mechanism that *specifically* addresses ammunition demilitarization by commercial contractors.

Transporting ammunition and managing cross-border cooperation represents both a costly logistical undertaking and a regulatory challenge. It is estimated that logistics can represent as much as 50 per cent of the total cost of some demilitarization contracts. Transport by rail and road must comply with (1) the European Agreement concerning the International Carriage of Dangerous Goods by Road and (2) the UN Recommendations on the Transport of Dangerous Goods, also known as the 'Orange Book' (UNECE, 2009; 2011b). In a number of former Warsaw Pact countries, whose massive ammunition stockpiles have not formally been tested or classified under the UN system, this represents a major hurdle to the demilitarization enterprise, because the ammunition cannot be transported legally across borders unless it is officially classified under the UN Globally Harmonized System of Classification and Labelling of Chemicals (UNECE, 2011a), which requires a range of expensive tests.

Industry oversight is necessary and equally complex. Industrial demilitarization implies the withdrawal of the weapons or ammunition from service and a transfer of responsibility—and eventually ownership—to the demilitarization industry. As a rule, demilitarization companies do not own the ammunition until they deliver a certificate of destruction.

Various national authorities and ministries oversee the activities of demilitarization contractors. Research shows that the activities of demilitarization firms are usually overseen by ministries of industry, trade, or the interior, which accredit and monitor them (Gobinet, 2012). While MoDs usually have oversight whenever munitions from national armed forces are concerned, their oversight of the private contractors operating in their respective countries is not systematic.

When appropriate risk management processes are applied, industrial demilitarization is not inherently risky. Yet the nature of the activities involved means that explosions can occur during processing or storage, even in NATO-standard facilities. When built according to strict quantity–distance standards, facilities confine all explosive damage to the workshop where an incident might occur. The buildings used to store or process munitions are self-contained, often partially buried, and designed to send any blast upward and not outward, to minimize damage. In countries where industrial demilitarization is less developed, involving contractors that do not meet relevant standards, there is greater potential for accidents. Poor MoD oversight over inexperienced private demilitarization companies may result in their developing, selling, or using non-functional or unsafe demilitarization equipment. The Survey has published case studies of such explosive accidents in Gerdëc, Albania (2008), and Midzhur, Bulgaria (2010) (Lazarevic, 2012; Gobinet, 2012, p. 91).

Environmental issues versus cost-effectiveness

Many munitions and propellants are harmful to the environment, so demilitarizing large quantities of ammunition requires the rigorous control and processing of toxic substances. The packaging material can also require handling and treatment to contain the heavy metals and persistent organic pollutants that were often used as preservatives in wooden ammunition packaging before it was banned. Some of the demilitarization processes themselves generate additional environmental hazards, such as air pollutants, pink water,[3] and other hazardous secondary materials.

All of these substances have been the subject of regional or national environmental regulation covering

noise, air, water, and land emissions, as well as waste management and recovery. Any demilitarization process must ensure that there is appropriate control of the materials at all stages, and particularly the final disposal of any hazardous waste stream. Yet strict adherence to these standards is not always possible, given countries' local demilitarization capacities and national legislation, which may be less demanding.

Environmental legislation has largely spurred the development of recovery, recycling, and reuse (R3) processes to reduce the reliance on OB/OD, which remains a common, yet controversial, practice, even when combined with industrial dismantling. R3 processes have become an important requirement in the demilitarization industry.

Yet the environmental compliance process, often involving multiple licensing requirements, has also made demilitarization systems more complex and expensive to develop and operate, thereby increasing the costs of demilitarization for cash-strapped client governments and prospective donor countries.

The current debates surrounding the environmental impact of OB/OD and the extent to which R3 revenues can offset overall demilitarization costs reflect the underlying struggle between environmental imperatives and the need for cost-effectiveness in industrial ammunition demilitarization. ■

Notes

1 Demilitarization figures can reflect short tons (US), tons (UK), or metric tonnes for either the gross weight of the ammunition, or the gross weight of the ammunition and packaging (which is referred to as tonnes all-up weight). For each figure, this *Research Note* reflects the unit of measurement used in the corresponding source.

2 Author correspondence with the US Army Defence Ammunition Center, 20 November 2012.

3 Pink water refers to waste water contaminated with explosives or their by-products.

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For more information about stockpile management and security, please visit: <http://www.smallarmssurvey.org/?pssm.html>

About the Small Arms Survey

The Small Arms Survey serves as the principal international source of public information on all aspects of small arms and armed violence, and as a resource centre for governments, policy-makers, researchers, and activists. The Small Arms Survey, a project of the Graduate Institute of International and Development Studies, Geneva, hosts the Geneva Declaration Secretariat. For more information, please visit: www.smallarmssurvey.org

About the Regional Approach to Stockpile Reduction (RASR) Initiative

The RASR Initiative addresses the threats posed by excess, unstable, and loosely secured stockpiles of conventional weapons and munitions. RASR encourages affected governments and partner organizations to develop a regional approach to stockpile management and destruction by building local capacity, sharing best practices, and synchronizing resources in order to maximize efficiency. Ultimately, RASR aims to prevent disastrous explosions or destabilizing diversions of conventional weapons and munitions. For more information, please visit www.rasrinitiative.org

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