

Special Report

Capabilities and Capacities: A Survey of South-east Europe's Demilitarization Infrastructure

Pierre Gobinet



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April 2012

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RASR
The Regional Approach
to Stockpile Reduction



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About the RASR Initiative

The Regional Approach to Stockpile Reduction (RASR) is a long-term, coordinated, regional approach to address the threats posed by excess, unstable, loosely secured, or otherwise at-risk stockpiles of conventional weapons and munitions.

RASR encourages affected governments and relevant organizations to develop a proactive, coordinated, regional approach to securing and destroying small arms and light weapons by building local capacity, sharing best practices and lessons learned, and synchronizing resources in order to maximize their efficiency.

The ultimate aim of the RASR initiative is to prevent disastrous explosions or destabilizing diversions of conventional weapons and munitions.

For more information, visit www.rasrinitiative.org
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Abbreviations and acronyms

AAF	Albanian Armed Forces
AASTP	Allied Ammunition Storage and Transport Publications
ADF	Ammunition disposal facility
AF BiH	Armed Forces of Bosnia and Herzegovina
ARM	Army of the Republic of Macedonia
ATA	Ammunition Technical Assessment
AUW	All-up weight
BAF	Bulgarian Armed Forces
BAM	Bosnian mark
BGN	Bulgarian lev
BiH	Bosnia and Herzegovina
CAF	Croatian Armed Forces
EAF	Entity Armed Forces
EOD	Explosive ordnance disposal
EU	European Union
EUCOM	US European Command
EUFOR	European Union Force
EUR	Euro
EWG	Expert Working Group
EWI	Explosive waste incinerator
FFE	Free from explosives
GOF	Government Ordnance Factory
HE	High explosives
ITF	International Trust Fund (Enhancing Human Security)
JSC	Joint stock company
MANPADS	Man-portable air-defence system(s)
MKD	Macedonian denar
MoD	Ministry of Defence
MOFTER	Ministry of Foreign Trade and Economic Relations
MoI	Ministry of the Interior
MoND	Ministry of National Defence
MONDEM	Montenegro Demilitarization Programme

NAMSA	NATO Maintenance and Supply Agency
National Programme	National Programme for the Utilization/Recycling and Destruction of Surplus Ammunition on the Territory of the Republic of Bulgaria
NEQ	Net explosive quantity
NHQSa	NATO Headquarters Sarajevo
OB	Open burning
OD	Open detonation
OSCE	Organization for Security and Co-operation in Europe
PETN	Pentaerythritol tetranitrate
PfP	Partnership for Peace
PM/WRA	US Department of State, Bureau of Political-Military Affairs, Office of Weapons Removal and Abatement
PSSM	Physical security and stockpile management
R ₃	Recover, recycle, re-use
RACVIAC	Regional Arms Control Verification and Implementation Assistance Centre
RASR	Regional Approach to Stockpile Reduction
RDX	Cyclotrimethylene trinitramine
RPG	Rocket-propelled grenade
SAF	Slovenian Armed Forces
SDC	Static detonation chamber
SEE	South-east Europe/South-east European
SEESAC	South Eastern and Eastern Europe Clearinghouse for the Control of Small Arms and Light Weapons
SFOR	Stabilization Force in Bosnia and Herzegovina
TA	Technical Agreement
TNT	Trinitrotoluene
TRADS	Transportable ammunition destruction system
TRZK	Tehničko Remontni Zavod Kragujevac
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
US	United States
USD	US dollar
UXO	Unexploded ordnance
WP	White phosphorous

Introduction

The Small Arms Survey compiled this *Special Report* in support of the Regional Approach to Stockpile Reduction (RASR) Initiative. This initiative intends to contribute to South-east European (SEE) security by preventing disastrous explosions in weapon and ammunition stockpiles and addressing the destabilizing diversion of stockpiled conventional weapons and ammunition.

The *Special Report* is designed to provide regional physical security and stockpile management (PSSM) stakeholders with a clear, concise, and comparative overview of SEE capabilities and capacities for the demilitarization of surplus weapons and ammunition. It is a direct response to the First SEE RASR Workshop held on 5–7 May 2009 in Zagreb, Croatia, and hosted by the US government.

The Zagreb workshop included a wide range of PSSM stakeholders from the region. During the course of the meeting they identified five domains where the RASR Initiative could facilitate greater coordination among regional actors involved in conventional weapons reduction:

1. national and regional policy: highlighting impediments to regional stockpile reduction;
2. infrastructure: the need to develop and expand regional stockpile destruction centres further;
3. training, education, and capacity building: to build capacity and enhance regional confidence;
4. sharing of information and best practices: to facilitate the spread of proven stockpile reduction methods; and
5. standardization: to improve coordination and facilitate coordinated approaches to stockpile reduction (including the sharing of technical information).

Among other important topics, the regional PSSM stakeholders identified a number of critical issues that have hindered the development of a regional approach to stockpile reductions. These include the lack of awareness among and support from national policy-makers, the lack of donor coordination, and low levels of trust between governments. PSSM stakeholders also highlighted the scarcity of information about the size and content of stockpiles in each country in the region and suggested prioritizing high-profile ‘quick-win’ projects such as destruction events or stockpile security improvements. These events and improvements would aim to generate momentum and political will for further stockpile reduction efforts. Stakeholders recognized the need for information exchange, transparency in technical and policy mechanisms, and the standardization of ammunition classification, in addition to ammunition surveillance systems.¹ They also suggested a study to assess national capabilities in the region and how they could be consolidated so as to be more cost effective.

Responding to the concerns and aspirations of the Zagreb workshop’s stakeholders and addressing the RASR objective of increasing regional PSSM cooperation mechanisms, this *Special Report* reviews the disposal infrastructure of RASR-participating countries (as at November 2011). It presents each RASR country’s national demilitarization capabilities and capacities in a clear and comparable form, including within its scope past accomplishments; comparative annual small arms, light weapons, and ammunition demilitarization outputs; coordination with private industry actors; and the recurring capability gaps that regional countries are trying to address. The data contained in this publication has been compiled from the following sources:

- previously published small arms and light weapons assessments performed in the region by international PSSM and explosive ordnance disposal (EOD) experts;
- presentations given by the representatives of SEE Ministries of Defence (MoDs) and international organizations during various regional PSSM workshops;
- working group discussions during regional PSSM workshops; and
- Small Arms Survey PSSM questionnaires returned by eight MoDs to the RASR research team during the first quarter of 2011.²

To facilitate regional comparison, this *Special Report* presents a series of country case studies organized into thematic sections. Each case study presents a short historical narrative, followed by a general overview of open burning and open detonation (OB/OD) and industrial demilitarization capabilities, covering location, process, capacities, and existing commitments. The *Special Report* is targeted primarily at national civilian decision makers. In an effort to increase accessibility it voluntarily omits excessive technical details.

Despite efforts to ensure comparability between country case studies, however, cross-country comparison is complicated by the significant variation in the level of detail provided by national MoDs. Some states, for example, gave rather detailed accounts of their national state-owned demilitarization infrastructure. Others, in contrast, were able to provide information on the activity of private industry actors contracted to demilitarize ordnance on behalf of state security forces.

The respective MoDs in the countries featured in this publication have authorized all data to be disseminated. 🗨️

Demilitarization methods in RASR-participating countries

RASR-participating states use various methods to destroy excess and surplus ammunition, ranging from OB/OD techniques to highly sophisticated industrial processes. Adequate selection of the most appropriate destruction method will largely depend on the physical condition, nature, and size of the stockpile; available donor resources; and available national capacities.

Open burning and open detonation

OB/OD is a common destruction technique used in RASR-participating countries. In the short term OB/OD remains an economically practical option for countries with smaller (yet nonetheless potentially unstable) stockpiles.

According to practitioners and subcontractors interviewed by King and Diaz (2011, p. 40), the advantages of OB/OD outweigh its drawbacks (see Table 1), making it a much easier—and thus favoured—solution wherever government or donor funds are scarce.

The defence industry and industrial demilitarization

Much of the defence industry in South-east Europe (SEE) crumbled after the conflicts of the 1990s and the break-up of the former Yugoslavia. Many companies were largely left to fend for themselves by exporting their goods and signing commercial contracts with the military industries of neighbouring countries. Some of them managed to save a part of their workforce by retooling their lines for demilitarization tasks.

In SEE, successive donor-funded destruction programmes have—through training and the development of procedures, facilities, and equipment—helped to establish the infrastructure required to undertake industrial-scale

Table 1 Advantages and disadvantages of OB/OD

Advantages	Disadvantages
<ul style="list-style-type: none">• Cost savings (less time and capital expense per ton destroyed)• Efficient destruction of small explosive components resulting from the industrial demilitarization process• Quicker in some cases (depends on the scale of industrial demilitarization)• Can be performed by military personnel as part of training	<ul style="list-style-type: none">• Noise• Environmental impact• Waste• Fewer recoverable metals for recycling compared to industrial demilitarization• Low-order/incomplete detonations• Schedule delays due to low cloud cover or rain• Kick-outs (unexploded live munitions thrown from the detonation pit)• Range remediation needed at the end of OB/OD• Space requirements to avoid affecting the population with fragments of destroyed arms/munitions and soil debris• Less predictable due to low-order detonations and kick-outs of live rounds

Source: King and Diaz (2011, Table 1.2)

Table 2 Advantages and disadvantages of industrial demilitarization

Advantages	Disadvantages
<ul style="list-style-type: none">• More recyclable materials produced• Local employment• Less invasive in terms of noise, shock• Less impact on the environment• No weather delays to schedule• Allows re-use of removed components• Separates hazardous parts from inert parts for final disposition, disposal, or recycling	<ul style="list-style-type: none">• Slower in some cases (depending on the processes involved)• Increased risks: increased chances of accidents by mixing people, machinery, and explosives• Expensive: large capital and personnel expenses• Increased management requirements for components after disassembly• More storage requirements for disassembled components• More specialized training requirements for personnel

Source: King and Diaz (2011, Table 1.2)

demilitarization of the region's surplus ammunition stockpiles. These programmes have applied similar principles throughout the region, according to which demilitarization operations should:

- use indigenous capacity wherever possible (including existing production facilities);
- apply the principle of using the best available technology not entailing excessive cost;
- be environmentally benign and comply with European Union (EU) or national standards;
- maximize financial benefits from recycling materials recovered during the demilitarization process;
- use recovered explosives for commercial use only;
- avoid taking 'technical risks' and prioritize the use of commercial off-the-shelf technologies with a proven track record; and
- begin by destroying the 'simple' items to develop a track record and establish in the minds of potential donors that the project can be successful (SEESAC, 2007, p. 14; UNDP, 2009b, p. 11).

Industrial demilitarization processes were mostly developed in RASR countries that held large quantities of similar types of surplus items that needed to be destroyed. Economies of scale were deemed sufficient to allow domestic arms and ammunition manufacturers to convert and retool their assembly lines for industrial burning, melting, cutting, crushing, or disassembling techniques. This process initially strengthens the local industrial base and provides local employment opportunities (see Table 2). It can be sustainable when recovered metals and explosive materials are recycled and profits are reinvested into the enterprise. For this reason, the R₃ process (recover, recycle, re-use) is often advocated by large—and private—demilitarization companies processing large contracts with significant economies of scale. 📌

Main findings of the study

The following sections present the main findings from the country case studies in this *Special Report*. They reproduce the general structure of each of the nine successive case studies.

Demilitarization capacities

This *Special Report* covers demilitarization capacities and infrastructure. ‘Demilitarization’ is understood as

[t]he complete range of processes that render weapons, ammunition and explosives unfit for their originally intended purpose. ... Demilitarization not only involves the final destruction process, but also includes all the other transport, storage, accounting and pre-processing operations that are equally critical to achieving the final result (UNODA, 2011, p. 8).

‘Disposal’ is understood as a wider concept that includes the removal of ammunition and explosives from a stockpile through a variety of methods that may not necessarily involve destruction. Six traditional methods of disposal are used by armed forces around the world. These are: (1) sale; (2) gift; (3) increased use during training; (4) deep-sea dumping; (5) land fill; and (6) destruction or demilitarization (UNODA, 2011, pp. 9–10). Surplus sales are covered by previous RASR and Small Arms Survey publications (see Gobinet and Gramizzi, 2011; Gobinet, 2011).

Political priorities, financial constraints, and public opinion have shaped each RASR country’s demilitarization capabilities and capacities slightly differently. For some RASR-participating states a number of important decisions still need to be made in order to steer their demilitarization enterprise towards sustainability (NAMSA, 2009e, slide 13). Will they use government and donor funding to reduce their stockpile or to develop their industry base? Should they choose demilitarization technologies based on small or

large quantities of ordnance? Should they lean towards expedient or environmentally compliant demilitarization solutions? Should they prioritize their national demilitarization infrastructure or open market tenders to foreign (and often regional) contractors?

One of the goals of this *Special Report* is to highlight which country and which factories have available demilitarization capacity and which are fully committed. In some case studies, this was difficult to assess, for the following reasons:

- There is no common standard unit of measure for industrial demilitarization capacities. Furthermore, when detailing their ammunition demilitarization capacities, countries do not always specify whether their figures reflect tons (US), or metric tonnes, or gross weight (also known as tonnes all-up weight, or AUW) of ammunition. This makes comparison among different plants problematic (see Table 3). Logistic planning for demilitarization, for example, traditionally uses gross weight (or tonnes AUW³) as a reference, which includes the ammunition *and* its packaging. In addition, there are differences between US and UK tons.⁴ Unless otherwise stated, this *Special Report* assumes that RASR countries estimate their ammunition demilitarization capacities in gross weight tonnes per day, per month, or per year. In the case of OB/OD ranges, very few countries indicated explosive capacity limits (for instance, maximum net explosive quantity (NEQ) per demolition range per day). Also, small arms, light weapons, and ammunition are often counted as ‘pieces’ rather than measured by weight.
- In addition to industrial infrastructure, two other factors affect a country’s demilitarization capacity: the demilitarization plants’ storage capacity (independent from the country’s weapons and ammunition storage depots) and transport considerations. These two factors were not comprehensively reflected in the MoDs’ replies to the 2011 Small Arms Survey PSSM questionnaire and cannot be accurately assessed without on-site inspection.
- Some of the countries are recovering from the impact of unplanned explosions at munitions sites and are understandably dedicating a significant portion of their national demilitarization assets to the post-explosion clean-up and site remediation process.

Table 3 Annual national (state-owned and semi-private) demilitarization capacities (in tonnes of ammunition unless otherwise stated)

	Overall capacity	Industrial demilitarization capacity	OB/OD capacity	Free capacity
Albania	<ul style="list-style-type: none"> • 20,000 gross tonnes/year⁵ • 25,000 gross tonnes expected in 2011⁶ 	<ul style="list-style-type: none"> • Over 16,000 tonnes/year⁷ 	<ul style="list-style-type: none"> • 40 tonnes/day in 2009⁸ • 5,000 tonnes/year⁹ • Almost 7,000 tonnes/year (MoD destruction plan)¹⁰ 	<ul style="list-style-type: none"> • Gramsh (unspecified amount) for small arms and light weapons destruction¹¹
Bosnia and Herzegovina	<ul style="list-style-type: none"> • 3,500 tonnes¹² • 3,200 tonnes as at March 2010¹³ 	<ul style="list-style-type: none"> • 3,000 tonnes¹⁴ 	<ul style="list-style-type: none"> • 500 tonnes¹⁵ 	<ul style="list-style-type: none"> • Unknown
Bulgaria	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Unknown • TEREM-Kostenets: <ul style="list-style-type: none"> • 17 million rounds of small arms ammunition up to 12.7 mm • About 8 million rounds of 14.5 mm ammunition • Up to 2 million hand grenades • About 120,000 pieces of 100 mm artillery ammunition¹⁶ 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Unknown
Croatia	<ul style="list-style-type: none"> • Less than 2,000 tonnes/year¹⁷ 	<ul style="list-style-type: none"> • Approximately 1,000 tonnes/year¹⁸ • Small arms and light weapons demilitarization capacity is estimated at 500 pieces/day¹⁹ 	<ul style="list-style-type: none"> • 500 tonnes/year in 2011²⁰ • Around 4.5 tonnes/day or 1,000 tonnes/year in 2009²¹ 	<ul style="list-style-type: none"> • OB/OD capacity underused and could be increased²²
Macedonia	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • TA Krivolak/ Mushanci, capacity of 15 tonnes of TNT/ detonation²³ 	<ul style="list-style-type: none"> • TA Krivolak polygon²⁴ (available capacity unknown)²⁵
Montenegro	<ul style="list-style-type: none"> • Average of 300 tonnes of ammunition/year 2006–May 2011²⁶ • Average of 300 weapons/year 2006–May 2011²⁷ 	<ul style="list-style-type: none"> • Combined destruction capacity of Polix and Tara-Aerospace and Defence >1,500 tonnes/year²⁸ 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Polix, Tara-Aerospace and Defence, and Booster (available capacity unknown)²⁹
Romania	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Unknown

Serbia	<ul style="list-style-type: none"> • 4,000 tonnes of surplus ammunition destroyed annually since 2006³⁰ • 5,000 tonnes, with a possibility to increase to 8,000–10,000 tonnes/year³¹ 	<ul style="list-style-type: none"> • Approximately 4,000 tonnes/year, including 3,000 tonnes/year at TRZK³² 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • TRZK³³ underused; could double its capacity³⁴
Slovenia	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Unknown

State-owned plants vs. private contractors

Private companies and commercial interests play an increasing role in SEE's surplus demilitarization infrastructure.

Formerly state-owned demilitarization plants, with old technology and low production volumes, are increasingly being partially or fully privatized to increase their efficiency. RASR workshop discussions revealed the recurring opinion that creating new destruction facilities from scratch creates only short-term jobs and is not sustainable in the long run. However, promoting the use of already existing facilities and, more specifically, civil industry actors may be the way forward, instead of trying to implement a complex and potentially controversial regional solution. Stakeholders should turn to existing privatized companies instead. A textbook example in this field is Bulgaria, which has been systematically issuing commercial tenders to foreign and domestic demilitarization companies.

Industrial demilitarization involves the removal of the weapons or ammunition from service and a transfer of responsibility to the armaments industry. Contracts are usually awarded via competitive tenders. The extent of the 'competition' largely depends on (1) the type of ammunition to be destroyed and (2) the number of companies that possess the technology and destruction lines required to destroy the spectrum of ammunition earmarked by the tender, in accordance with the country's relevant regulations. The private sector seems to be able to provide more flexibility and to adapt its lines more easily—even, in some instances, designing and engineering its own lines to accommodate a contract for specific ordnance. This need

for flexibility may explain why few local contractors can compete for the tenders. If such companies do not exist within the country, then regional or international companies are allowed to bid.

Amid this increasing tendency to outsource demilitarization to semi-private or private companies, the MoDs' replies to the 2011 Small Arms Survey PSSM questionnaire reflect various approaches to and understandings of this trend. In several questionnaires, for instance, civilian (i.e. non-MoD) companies were often referred to as 'private', although many of them were still fully or partially state owned, but not operated by the MoD. Usually the questionnaires show that MoDs in general do not coordinate well with civilian demilitarization firms, even when the government is a majority shareholder. Fully private firms fall within the responsibility of another ministry (usually Trade, Interior, or Industry), which accredits and monitors them. The MoD does not coordinate them, but has occasional oversight of their work whenever it contracts them. Consequently, the MoD questionnaires provided very few details regarding the capabilities and capacities of civilian and fully private demilitarization facilities. Data presented in the 'Commercial industrial demilitarization plants' sections of this report was obtained via other sources. A number of selected private companies are mentioned in the case study sections, but the *Special Report* does not present a comprehensive catalogue of the private demilitarization industry actors in RASR-participating countries.

The potential remains for accidents while using private demilitarization companies that are not up to standard. First, private demilitarization companies are not systematically contracted and monitored by the relevant MoD.³⁵ In SEE, any lack of MoD control over inexperienced private demilitarization companies may encourage them to develop, sell, or use equipment that is dysfunctional or unsafe, and that has not been vetted by the international demilitarization community.³⁶ Secondly, private demilitarization companies are often producers themselves and production accidents can spread to storage areas or demilitarization lines. An example is the accident in Gorni Lom, Bulgaria, on 4 February 2010, which started out as a production accident that set 10 tonnes of ammonite on fire. The fire then spread to a nearby storage area that housed Greek anti-personnel mines earmarked for demilitarization.³⁷

Training and personnel

Technical training is considered integral to a country's demilitarization capacity. It involves training in ammunition stockpile management, ammunition safety, the industrial disposal and processing of explosives, EOD (levels I, II, III, and IV), and humanitarian demining.

In SEE, successive donor-funded destruction programmes have strengthened national and regional expertise through training and the development of procedures, facilities, and equipment. Albania, for instance, developed its national EOD capabilities significantly throughout the successive NATO Partnership for Peace (PfP) projects. Once Albania's surplus stockpile is regulated, the skills acquired by Albanian munitions experts to demilitarize their own surplus arsenals can be applied throughout SEE (Goodyear, 2010).

In their replies to the 2011 Small Arms Survey PSSM questionnaire a majority of MoDs emphasized a shortage of qualified technical staff experienced in best international demilitarization practices, as well as a recurring lack of specialized—and regionally standardized—technical training courses for indigenous staff. Linguistic hurdles must also be overcome. The staff are knowledgeable, but lack technical language skills. On the other hand, individuals who attend technical courses solely because of their language skills are not systematically assigned to the demilitarization work itself. Using full-time translators is not cost-efficient either.

The development of shared training syllabi and facilities also leads to certain difficulties. Training needs are very specific and cannot be provided solely by the commercial industry or the military: adequate training should be based on international standards and should integrate national legislation requirements. For this reason, the South Eastern and Eastern Europe Clearinghouse for the Control of Small Arms and Light Weapons (SEESAC), with the support of the United Nations Development Programme (UNDP) in Bosnia and Herzegovina (BiH), organizes regional training courses on stockpile management for members of the MoDs and Ministries of the Interior (MoIs) from the Western Balkans region. The three course modules, held at the Faculty of Mechanical Engineering of the University of Sarajevo, include training in the planning and managing of stockpile locations, inventory

management and accounting control procedures, and stockpile facilities and the transportation of small arms and light weapons and their associated ammunition. The course curriculum is in line with international standards and best practices in stockpile management, with a special emphasis on ensuring the safety and security of stockpiles, and the quality of stockpile procedures (SEESAC, 2011c).

Demilitarization challenges and capability gaps

The following sections consider technical capability gaps, and national and regional factors that restrict the demilitarization efforts in RASR-participating countries.

Technical challenges

Small Arms Survey PSSM questionnaires returned in 2011 by the MoDs reveal that SEE demilitarization experts face similar technical challenges. Most RASR participants were able to pinpoint specific technical gaps in their indigenous demilitarization capacities. Recurring items of concern are cluster ammunition, white phosphorus (WP) ammunition, mélange, fuel air explosives, and large ordnance such as deep-sea mines and torpedo warheads.

The existence of propellant master-sample facilities or of chemical laboratories able to test ammunition components was not always mentioned. This indicates either that some countries consider this to be a sensitive issue or that they may not realize the importance of systematic ammunition surveillance throughout the life cycle of a stockpile.

No single RASR-participating country is able to deal with the whole spectrum of surplus ammunition contained in its stockpiles. PSSM practitioners categorize ammunition, explosives, propellants, and pyrotechnic materials according to three levels of increasing demilitarization cost and difficulty, as shown in Table 4.

Risk and costs increase when the demilitarization process necessitates extra handling, manipulation, and the use of multiple technologies. Technical assessments of ammunition often note that, although ammunition types in

Table 4 Classification of generic ammunition types according to demilitarization requirements

Category	Description	Generic ammunition type
1	<ul style="list-style-type: none"> • Simple • Inexpensive (minimal processing required) 	<ul style="list-style-type: none"> • Small arms ammunition up to 14.5 mm • Fuses, igniters, and detonators (no boosters) • Bulk gun propellant • Bulk explosives (non-TNT based) • Some landmines
2A	<ul style="list-style-type: none"> • Difficult • More expensive (pre-processing before incineration) 	<ul style="list-style-type: none"> • Grenades • Fuses, igniters, and detonators (with boosters) • Detonating cord and linear charges • Cannon ammunition (20–40 mm) for large kilns only
2B	<ul style="list-style-type: none"> • Difficult • More expensive (TNT recovery) 	<ul style="list-style-type: none"> • Projectiles >60 mm (TNT-based fill) • Sea mines (TNT fill) • Aircraft bombs (TNT fill)
3	<ul style="list-style-type: none"> • Most difficult • Expensive 	<ul style="list-style-type: none"> • Liquid energetics • Flares • Projectiles (non-TNT fill recovery) • Rocket motors • Torpedoes • Cannon ammunition (20–40 mm) if only transportable ammunition destruction system incinerator is available

Source: UNDP (2009b, p. 11, Table 6)

TNT = trinitrotoluene

the category 3 represent only a small percentage of the surplus stockpile earmarked for destruction, ‘they have the potential to absorb a disproportionate fraction of technical and financial resources’ (SEESAC, 2007, p. 14; UNDP, 2009b, p. 11).

In SEE, most donor-funded destruction programmes begin by destroying the ‘simple’ items to develop a track record and reassure potential donors that the project can be a success (see ‘The defence industry and industrial demilitarization’, above), but simultaneously seek to maximize the financial benefit from recycling materials recovered during the demilitarization process. Consequently, it has been argued that many of the easiest and most profitable items to demilitarize have already been converted into scrap metal and sold, and that whatever remains is technically more difficult to destroy at a price that covers the cost of demilitarization. For instance, WP demilitarization

and disposal are clearly recurring issues. In their replies to the 2011 Small Arms Survey PSSM questionnaire a majority of MoDs underlined a lack of capacity and technology for the demilitarization of G-class,³⁸ H-class,³⁹ and cluster ammunition. The MoDs also highlighted the difficulty of processing the end products once WP ammunition has been demilitarized: the commercialization, export, transport, and packaging of the WP remain a problem. This could arguably cause a decline in donor interest as the cost per item for demilitarization rises. This may also explain the growing role that civil industry is taking on, with MoDs progressively seeking to outsource and ‘commercialize’ demilitarization.

To dispose of specific types of ordnance for a limited period of time, a number of commercial organizations can also provide self-contained mobile ammunition demilitarization plants. In their replies to the 2011 Small Arms Survey PSSM questionnaire SEE MoDs expressed varying interest in mobile ammunition plants. Yet according to the NATO Maintenance and Supply Agency (NAMSA, 2009a, p. B-3), a typical set-up of selected equipment is capable of demilitarizing 100 mm fixed artillery munitions at the rate of 60 rounds per hour. Theoretically, this reduces the cost of transporting the ammunition itself. It is also a way of circumventing the heavy investments that come with the creation of new permanent infrastructure. In the case of Albania, NAMSA did not recommend the use of mobile equipment for the Albania III project because the four-year time frame of the project was considered too short to amortize the operational costs of the unit (NAMSA, 2009a, pp. B-3–B-4). However, NAMSA (2009a, p. B-4) recommended that a business case be made for ‘the utilisation of mobile disassembly plants ... in the context of regional capacity’.

National challenges

The obstacles to demilitarization activities are largely monetary: governments in the region lack the funds to initiate and implement large infrastructure and destruction projects. Additional obstacles exist in the lack of national ownership of demilitarization programmes, the absence of public support for demilitarization campaigns, and the lack of government coordination among national demilitarization stakeholders.

Foreign donor financing and support fund only unique or intermittent PSSM activities if host governments do not commit to sustaining the effort and the continued use of the infrastructure. The best indicator of national ownership of demilitarization programmes is the amount of funds invested by the host governments directly into the demilitarization effort. For instance, NATO PFP Trust Fund projects require the country in question to contribute to the projects by providing essential resources and facilities, and by handling the logistics and transportation for weapons and munitions to the point of disposal (Courtney-Green, 2007, p. 4). This commitment can also be assessed by looking at the contracts and tenders the host government is issuing to the civil industry, if it has made the choice to outsource surplus demilitarization to private contractors.

Generally there is an absence of public support for demilitarization campaigns that rely exclusively on OB/OD, and public relations successes on behalf of the governments have been limited. There is increasing environmental awareness on the part of the population, and the levels of nuisance noise are not well tolerated. MoDs and private contractors must obtain permission from local authorities to use sites to destroy munitions and surplus military materials through detonation. This does not stop the destruction process, but demolition campaigns are certainly slowed down by protests whenever the local population opposes the process. In order to speed up destruction, MoDs are tempted to exceed the maximum daily amount of unexploded ordnance (UXO) to be destroyed, which only exacerbates public protest (BCSP, 2011, p. 10). According to NAMSA (2009d, p. G-13), the only solution resides in MoDs' undertaking a 'proactive media campaign and local consultation stressing the need for OB/OD to dispose of some of the stockpile where there are no other options'.

Finally, the lack of cooperation between the RASR-participating countries' MoDs and MoIs certainly hampers coordination and information sharing. This *Special Report* focuses almost exclusively on MoD demilitarization capabilities,⁴⁰ yet in all RASR-participating countries, MoIs also regulate small arms, light weapons, and ammunition holdings.⁴¹ Responses to the 2011 Small Arms Survey PSSM questionnaire indicate that in many cases both ministries compartmentalize their respective destruction efforts, either

out of competition or simply because of a lack of liaison and coordination. Donor institutions support one or the other, but rarely both.

Regional challenges

States in SEE have disparate national capacities to destroy or demilitarize surplus weapons and ammunition. Relatively advanced capacity in some countries, however, suggests potential benefits through bilateral or regional cooperation to dispose of surpluses.

The participants of the conference Towards a Sustainable Solution for Excess Weapons and Ammunition: Policy, Logistical and Financial Aspects of Excess Weapons and Ammunition Disposal, organized from 30 May to 1 June 2011 in Pula, Croatia, by the Regional Arms Control Verification and Implementation Assistance Centre, ITF, and the MoD of the Republic of Croatia, noted that

SEE countries have developed their own disposal capacities that can be offered to other countries that have insufficient know-how and capacities. The MOD of the Republic of Serbia has already offered its facilities to be developed into a regional center for the demilitarization of White Phosphorus Ammunition and Cluster Ammunition, while Croatia has offered to develop its facilities for Demilitarization of Cluster Ammunition in Cooperation with Norwegian People's Aid (RACVIAC, 2011).

Although this *Special Report* wishes to make a clear case for increased cooperation to deal with the regional problem of surplus, it is necessary to explain why, despite individual and spontaneous 'offers', closer cooperation is not yet a reality in much of the SEE region. The ideal of a regional demilitarization centre is an oversimplification of several issues and is not universally approved by regional demilitarization practitioners.

Several issues related to national and regional policy and programmes hinder a regional approach to stockpile reduction.

Transportation

A regional perspective must take into account the risks, costs, and constraints of the transportation of weapons and ammunition.

Logistics represent about 50 per cent of the costs of such an endeavour and these need to be optimized to bring demilitarization costs down.⁴² The most efficient means of transporting ammunition and explosives is usually by rail. The quality of a country's rail infrastructure and its regional network will have an impact on its demilitarization potential (Greene, Holt, and Wilkinson, 2005, p. 22).⁴³ The movement of explosives by road is generally considered more complex. Both rail and road transport are governed by comprehensive directives and regulations such as (1) the European Agreement concerning the International Carriage of Dangerous Goods by Road (UNECE, 2009); (2) the UN Recommendations on the Transport of Dangerous Goods – Model Regulations (13th revised edition) (UN, 2003); and (3) the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (UNEP, 1989). Where practicable, air and sea transport can also be considered.

Arranging for import/export permits and associated documentation, planning for emergency procedures, and taking out insurance policies for the weapons and ammunition being transported represent significant hurdles. Much of the surplus ammunition in SEE stockpiles was manufactured in the former USSR, China, Romania, and Yugoslavia. Consequently, it does not have the UN serial numbers required for transportation under international guidelines and cannot be easily moved for demilitarization (Threat Resolution Ltd, 2004, p. 4-2). In addition to transport regulations, there are national statutes preventing the cross-border transportation of weapons and ammunition. Some countries, such as Bulgaria, cannot export weapons and ammunition for demilitarization purposes, and are therefore required to destroy their surpluses in-country (Bulgaria, 2011b, p. 6).

Most SEE MoDs cannot by themselves tackle all these financial, legal, and logistical hurdles. A number of civil industry actors have integrated these constraints as part of their business contracts and undertake trans-border shipments of weapons and ammunition on a regular basis.

Who pays? National pride and the quest for potential income

So far, the quantities of stockpiled ammunition and explosive materials in each RASR country have created enough economies of scale to justify the existence of national demilitarization capacities.

Most countries support the concept of a regional demilitarization facility, but have competing interests. States that invested in their national demilitarization infrastructure will not want to ship their ordnance to a neighbouring state and lose a potential source of activity, employment, and income in the process (Greene, Holt, and Wilkinson, 2005, p. 22).

Regional collaboration in PSSM issues is currently limited to countries with historical and cultural ties. For instance, the Montenegrin authorities collaborate with the Serbian facility in Kragujevac to test the chemical composition of selected ammunition samples for instability.⁴⁴ But the traditionally low levels of trust among regional governments do not facilitate burden sharing when the time comes to fund a regional plant.

Lack of coordination between international donors and organizations

The lack of donor coordination was not explicitly mentioned in the MoDs' replies to the 2011 Small Arms Survey PSSM questionnaire. Yet RASR workshop discussions revealed that SEE countries often submit a request for assistance to several organizations and donor countries working in the region, without foreseeing the potential consequences of duplication. This has reportedly led to gaps and overlaps in terms of both human and financial resources in bilateral and multilateral PSSM projects (Kryvonos and Kytömäki, 2010, p. 52).

International organizations have created platforms, such as the RASR Initiative, to de-conflict and coordinate their arms control activities. For instance, the Expert Working Group (EWG) was established in BiH in February 2006 to assist the BiH MoD and Armed Forces of Bosnia and Herzegovina (AF BiH) with the disposal of surplus weapons and ammunition, and with the improvement of storage facilities. It comprises representatives from the European Union Force (EUFOR), NATO Headquarters Sarajevo (NHQSa), the UNDP office in Sarajevo, and the Organization for Security

and Co-operation in Europe (OSCE) Mission to Bosnia and Herzegovina (EWG, 2010b, slide 4).

The increasing integration of humanitarian mine action and small arms and light weapons PSSM agendas and policies by international organizations under the umbrella of explosive remnants of war or 'conventional weapons destruction' (Adams, 2010) may also contribute to streamlining and standardizing donor support in the region. 📄

Albania

Background

The following sections consider the role that the Albanian small arms and light weapons industry has played in setting up the country's national demilitarization apparatus and highlight the country's past demilitarization accomplishments.

Small arms and light weapons industry

Albania owes much of its current demilitarization apparatus to its former small arms and light weapons industry.

In the mid-1990s production capacity and employee numbers dropped. Small arms and light weapons have not been manufactured on a large scale in Albanian military factories since then (Saferworld, 2005, pp. 69–70). The Albanian MoD has only recently procured a small quantity of ammunition for training and operational requirements (Albania, 2011e, p. 2).

The demilitarization of ammunition takes place in three former military weapons and ammunition production facilities, which retooled their production lines to meet the demands of industrial demilitarization. The facilities remain government owned and controlled.

- ULP Mjekës, near Elbasan, is a state-owned enterprise that started producing explosives, propellants, and various types of mine in 1965 with support from Russia and China⁴⁵ and, since 1982, under licence from Bofors (Sweden). The original site consisted of six factories and 11 former production lines for high explosives (HE) and propellants (NAMSA, 2009g, p. D-2; Saferworld, 2005, p. 69).
- KM Poliçan was founded in 1962 as a munitions plant for the Albanian Armed Forces (AAF), producing 7.62 x 39 mm calibre ammunition, 82 mm mortar bombs, grenades, and anti-personnel mines. Large-scale production

ceased around the early 1990s. In 2005 the company still produced 7.62 x 39 mm blank ammunition for the MoD. It continues to market small arms ammunition, including 9 mm handgun ammunition for the Albanian police (NAMSA, 2009b, p. E-2; Saferworld, 2005, pp. 69–70).⁴⁶

- UM Gramsh, which is also a state-owned company, manufactured infantry small arms and light weapons from 1965 until 2000. It reportedly had the capacity to produce 26,000 automatic rifles per year in the 1970s. Some 400 machines for steel fabrication remain in the factory in various states of repair (NAMSA, 2009h, p. F-2; Saferworld, 2005, p. 69).

Past accomplishments

NATO's first demilitarization programme in Albania destroyed 1.6 million anti-personnel mines in a EUR 0.85 million (USD 0.91 million) project during 2002 (Courtney-Green, 2007, pp. 1–2). The first NATO Pfp Trust Fund project was led by Canada and implemented by NAMSA. It strengthened Albania's demilitarization capacity at ULP Mjekës and KM Poliçan (NIAG, 2010, p. 46; NAMSA, 2010b, slide 5).

NATO's second project in Albania destroyed 8,700 tonnes of small arms and light weapons ammunition in a EUR 6.4 million (USD 7.8 million), five-year project.⁴⁷ The investment significantly improved the existing factories' demilitarization capacity. ULP Mjekës, for instance, received an air extraction system to remove TNT dust from the working environment, a TNT crushing machine, and a high-capacity explosive waste incinerator (EWI) capable of destroying 2.5 million 7.62 mm cartridges per week (Courtney-Green, 2007, pp. 1, 5).⁴⁸ The project ended in October 2007 after having destroyed 105 million 7.62, 12.7, and 14.5 mm cartridges; 2 million hand grenades; and 130,000 mortar rounds. It further strengthened Albania's indigenous demilitarization capacity (NIAG, 2010, p. 46; NAMSA, 2010b, slide 5).

In 2008 the Albanian government established its National Action Plan to coordinate the disposal of approximately 100,000 tonnes of various types of ordnance that had been designated surplus (see Gobinet, 2011, pp. 32–44). In 2009, owing to political pressure following the Gërdec catastrophe, Albanian prime minister Sali Berisha ambitiously announced the demilitarization of all

hazardous ordnance by 2013. The Albanian government and the US Department of State's Office of Weapons Removal and Abatement (PM/WRA) jointly funded a feasibility study to assess a possible NAMSA project that would build on the success of the earlier Albanian projects (NAMSA, 2009c, p. i).

As at September 2009 the AAF had declared more than 85,000 tonnes of ammunition surplus. Most of the stockpile was categorized into generic types of ammunition, allowing for the development of industrial processes with long production runs (Gobinet, 2011, pp. 32–35). Supported by a USD 10 million pledge from the United States for the period 2010–14 (Albania, 2011b, slide 10), NATO opened a NAMSA office in Tirana in September 2010 and signed a memorandum of understanding with the Government of Albania in January 2011. Other international agencies, principally the OSCE, UNDP, and the US military, provided specific elements of support under the coordination of a demilitarization committee, chaired by a deputy minister of defence.⁴⁹

These initiatives largely explain why Albania's demilitarization capacity increased significantly in the ten years prior to 2011. The Albanian MoD's disposal efforts have been increasingly quantified, reported on, and documented:

- Between 2000 and April 2004 the country's three plants and several private contractors destroyed a reported 22,815 tonnes of ammunition (see Table 5).
- In 2004 and 2005 Albania was reportedly in the process of destroying around 300–400 tonnes of ammunition per month (Saferworld, 2005, p. 76).
- It reportedly destroyed 74,000 tonnes of ammunition between 2003 and 2008 (Albania, 2011b, slide 2).
- It reportedly destroyed between 6,350 and 6,540 tonnes in 2009 alone (Albania, 2011b, slides 2, 15).
- It reportedly demilitarized 20,653 tonnes of ammunition in 2010, at times destroying more than 2,300 tonnes in a single month (Albania, 2011b, slides 11, 13).

By mid-2011 Albania, with the support of the international community, had established 8 separate industrial demilitarization lines in the 3 facilities and

was running 9 OD ranges that could handle around 2,000 tonnes of ammunition per month.⁵⁰ According to NAMSA (2011b, slide 6), the MoD would destroy 25,000 tonnes during 2011.

Table 5 Albania: ammunition destroyed and used, 2000–April 2004 (tonnes)

Location	2000	2001	2002	2003	Jan.–April 2004	Total
KM Poliçan Military Facility	400	2,300	2,085	4,600	853.8	10,238.8
UM Gramsh Military Facility				804	169.3	973.3
ULP Mjekës Military Facility		2,186	688	35	307.0	3,216.0
Albanian EOD Group	63	468	671	2,837	2,436.0	6,475.0
EOD Solutions Ltd			894	2	34.0	930.0
National Demilitarization Centre				352		352.0
Spent rounds	200	180	150	100		630.0
Total	663	5,134	4,488	8,730	3,800.1	22,815.1

Source: Saferworld (2005, Table 25)

Current demilitarization capacities

The combined capacities for industrial dismantling and OB/OD allow the destruction of more than 20,000 gross tonnes of ammunition annually. This maximum capacity is currently devoted to the objective of destroying all MoD surplus ammunition by 2013, with the exception of Gramsh (Albania, 2011e, p. 6). MoD officials also provided a figure of 80–90 tonnes per day, but this appears overly optimistic (Albania, 2011a, slide 11).

According to the 2011 Small Arms Survey PSSM questionnaire, the MoD planned to dispose of approximately 76 per cent of total surplus ammunition through industrial demilitarization in Mjekës, Poliçan, and Gramsh and 24 per cent via OB/OD (Albania, 2011e, p. 4). The 2010–13 destruction plan foresees a slightly different ratio (67 and 33 per cent, respectively):

Table 6 Albania: quantities of excess ammunition and explosives earmarked for industrial demilitarization and OB/OD by the 2010–13 destruction plan

Type of ammunition	Quantity (tonnes)	Industrial demilitarization	Open detonation
Excess ammunition	72,170	52,380	19,790
Additional ammunition and explosives	6,030	—	6,030
Total	78,200	52,380	25,820

Source: Albania (n.d.b, Table 3/1)

The actual split between industrial disposal and range disposal depends on a number of factors, principally:

- the technical difficulty of safely dismantling ammunition;
- the economic value of recovered materials offset by the cost of processing; and
- the availability of resources at the factory or ranges at the time of demilitarization. The Military Logistic Brigade manages and coordinates resources, providing personnel and transport to take the ammunition from various storehouses located throughout Albania to the disposal location.⁵¹

Projected figures provided by NAMSA for 2011–13 also show that industrial demilitarization is the predominant method chosen to destroy the 69,715 tonnes of ammunition surplus declared in May 2011. Table 7 indicates that a reported 7 per cent—4,562 tonnes—of surplus ammunition have been earmarked for export from 2011 to 2013.

As Table 8 indicates, the Albanian MoD planned to dispose of 25,000 tonnes of ammunition in 2011 (NAMSA, 2011b, slide 6).

Open burning and open detonation

Albania conducts OB/OD at demolition ranges of ammunition that is assessed as dangerous or is not recommended for disassembly for technical reasons (Albania, n.d.b, p. 3). OB/OD is also considered for small quantities of ammunition (less than 50 tonnes) that do not justify the creation of a new demilitarization line (Albania, n.d.b, p. 11).

Table 7 Albania: excess ammunition and explosives earmarked for disposal by industrial demilitarization, OB/OD, or sales, 2011–13

Factories/ranges	Total (tonnes)	Planning		
		2011	2012	2013
ULP Mjekës	26,321	8,154	8,767	9,400
KM Poliçan	22,769	6,642	7,332	8,795
UM Gramsh	1,628	900	728	—
Total (factories)	50,718	15,696	16,827	18,195
OB/OD range	14,378	8,000	6,378	—
Export	4,562	2,000	1,562	1,000
Total	69,658	25,696	24,767	19,195

Source: NAMSA (2011b, slide 4)

Table 8 Albanian MoD ammunition demilitarization plan for 2011

Ammunition destruction	Planned 2011 (tonnes)
Anti-tank bakelite mines demilitarization line	805
120 mm mortar rounds demilitarization line	3,191
Incineration of cartridges 12.7–14.5 mm	2,400
122 mm projectiles demilitarization line	1,632
Total to be destroyed by Mjekës factory	8,028
82 mm mortar rounds demilitarization line	3,193
Hand grenades demilitarization lines	1,440
7.62 mm cartridges demilitarization line	2,700
Total to be destroyed by Poliçan factory	7,333
Total to be destroyed by Gramsh factory: 37 mm anti-aircraft rounds demilitarization line	900
Total factories	16,261
By OB/OD ranges	8,750
Total yearly plan 2011	25,011

Source: NAMSA (2011b, slide 6)

From 2003 to 2005, 850 tonnes of ammunition were destroyed by OB/OD under international assistance—primarily by the United Kingdom and United States (NAMSA, 2009d, pp. G-3–G-4). OB/OD of munitions was suspended in 2007 due to previous accidents on ranges (Goodyear, 2010). In 2008 the Government of Albania designated⁵² eight open ranges.⁵³ Table 9 lists these ranges and their respective capacities.

Table 9 Demolition capacities of Albanian OB/OD ranges (ammunition gross weight in tonnes/day with maximum NEQ per each demolition range/day)

Range		Distance to nearest house (km)	Distance to nearest road (km)	Capacity and explosive limit (kg)
Large capacity	‘Livadhet e Hamzit’, Pukë	12.32	7.8	10 tonnes, or NEQ 431
	‘Fushë Roshaj’, Voskopojë, Korçë	1.2	4.4	10 tonnes, or NEQ 431
	‘Shën Noi Madh’, Bizë	12.32	2.0	8 tonnes, or NEQ 113.5
Medium capacity	‘Trajlarit, Këlcyrë’, Përmet	1.2	0.77	NEQ 90.8
	‘Zgarë’, Librazhd	6.0	1.2	4 tonnes, or NEQ 68.1
Small capacity	‘Jubë-Sukth’, Durrës	N/A	N/A	6 tonnes, or NEQ 30
	‘Shëmrisë’, Gramsh	4.5	0.7	NEQ 30
	‘Përroit i Bigasit’, Skrapar	4.5	1.2	4 tonnes, or NEQ 12.3

Source: Albania (n.d.b, p. 13); NAMSA (2009d, Table 4)

Albanian authorities approved three additional ranges, including a second range at Bizë, operated by the US contractor Armor Group with international (US) assistance (NAMSA, 2009d, p. G-2). Jubë is used to support Gërdec-related operations and is restricted in its use during the summer tourist season due to noise and, in the winter, flooding (NAMSA, 2009d, p. G-3).

In its reply to the 2011 Small Arms Survey PSSM questionnaire the Albanian MoD states that destruction by OB/OD is carried out in 12 open sites specifically designated by Albanian law for this purpose. Demilitarization

facilities utilize three of these sites (unspecified) to burn propellant obtained during the industrial dismantling of ammunition (Albania, 2011e, p. 5). According to NAMSA (2011b, slide 8; 2009d, G-7), the MoD has licensed 11 OB/OD sites and has the capacity to use any one of these depending on local weather conditions, noise limits, or logistical capacity.

NAMSA's 2009 proposal recommended that OB/OD be used to dispose of up to 23,410 tonnes, with a minimum of 8,523 tonnes (NAMSA, 2009d, p. G-5).⁵⁴ The MoD's destruction plan earmarked between 25,820 and 26,820 tonnes (according to Albania, n.d.b, Table 21) for OB/OD; see Table 10.

The MoD manages OB/OD activity using primarily AAF resources, but NAMSA supports aspects of OB/OD by providing environmental risk assessments and other technical support. According to the NAMSA proposal, the overall OB/OD capacity was 40 tonnes per day in 2009; the objective for subsequent years was to achieve 3,500–5,000 tonnes per year among the various ranges. The proposal added that 'it is likely that more than 5,000 tonnes per annum will be achieved reducing the overall time still further' (NAMSA, 2009d, p. G-9). The Albanian destruction plan foresees an OB/OD destruction capacity of almost 7,000 tonnes per year (Albania, n.d.b, Graph 3).

As with most OD operations, nuisance noise and vibration can become a sensitive issue with the local population. The MoD took active steps to select the most appropriate locations and carried out a largely successful public information campaign to explain why the temporary disturbance was necessary in terms of the national interest. International support was provided to train the EOD operators to (1) apply NATO procedures at the ranges, (2) assist Albania in understanding the environmental impact of the OB/OD activity, and (3) consider what remediation activity was required to close the ranges and return the land to the local population. US European Command (EUCOM) has provided a series of military assistance courses to raise the standard of training in ammunition and UXO within the AAF (see 'Training and personnel', below). This assistance, which includes introducing NATO procedures to the OB/OD ranges, will continue until 2013.⁵⁵



Open-pit demolition, Bizë, September 2009. © NAMSA

Table 10 MoD breakdown of excess ammunition and explosives earmarked for disposal by OB/OD, Albanian Action Plan 2010–13*

Name of ammunition	Excess		Detonation
	Pieces	Tonnes	Tonnes
Defensive and offensive hand grenades	6,167,485	5,425.3	5,425.3
Anti-tank hand grenades	78,075	132.7	132.7
RPG-2 and RPG-7 rockets**	91,164	335.3	335.3
Special projectiles 60, 82, 107 mm for mortar	19,594	116.1	116.1
Projectile 20–45 mm special (Turkish)	39,415	30.7	30.7
Recoilless rifle ammunition (75, 82, 107 mm)	126,554	2,033.0	2,033.0
Shell with special projectile 122, 130, 152 mm	1,128	66.3	66.3
Total		9,556.7	9,556.7
Engineering ammunition		11,651.3	11,651.3
Total in tonnes		19,790.7	19,790.7
Projectiles collected at Gërdec and stored at Murras depot			2,030.0
Explosives that come out of demilitarization			3,000.0
Propellant charge of projectiles 122–152 mm			1,000.0
Total			25,820.5

* Figures given as provided by the MoD; columns may not total correctly. ** RPG = rocket-propelled grenade.

Source: Albania (n.d.b, Table 18)

National industrial demilitarization plants

The original December 2009 NAMSA Albania III project proposal aimed to provide the infrastructure, capacity, and capability improvements to demilitarize a minimum of 52,000 tonnes of ammunition by industrial processes over four years. The Mjekës factory was intended to become a permanent facility equipped to international safety and efficiency standards. Poliçan, Gramsh, and the OB/OD programme were developed as temporary facilities with no plans beyond the end of 2013 (NAMSA, 2010a, slides 5, 6, 10; see Table 11).

Table 11 Albania: upgrades and developments for the Mjekës, Poliçan, and Gramsh factories as planned in the 2009 NAMSA proposal

	Mjekës	Poliçan	Gramsh
Capacity improvement	<ul style="list-style-type: none"> • Modification to explosive waste incinerator • Reinforcement of current mortar production line • Strengthening of site logistics 	<ul style="list-style-type: none"> • Reinforcement of current mortar production line 	<ul style="list-style-type: none"> • Minor modification of current medium-calibre production line
Capability development	<ul style="list-style-type: none"> • Opening of a large-calibre production line • Opening of two 7.62 mm debulleting lines • Installation of a static incinerator 	<ul style="list-style-type: none"> • Opening of a second mortar production line • Improvement of site logistics 	<ul style="list-style-type: none"> • Improvement of site logistics
Infrastructure improvement	<ul style="list-style-type: none"> • Modification of two process buildings • Refurbishment of four process buildings • Refurbishment of four ammunition stores 	<ul style="list-style-type: none"> • Modification of two process buildings • Refurbishment of two process buildings • Refurbishment of road infrastructure 	<ul style="list-style-type: none"> • Minor modification of process buildings

Source: NAMSA (2010a, slides 14, 15, 16; 2009c, Table 2)

Small arms and light weapons ammunition (7.62–14.5 mm rounds), estimated by the Action Plan at 16,931.64 tonnes in 2009 (see Table 12), was intended to be incinerated using the rotary kiln (EWI) installed at ULP Mjekës and through a transportable lower-capacity furnace provided by the US contractor Armor Group at KM Poliçan (Albania, n.d.b, p. 3):

Table 12 Albania: plan for incineration of small arms and light weapons ammunition, 2010–13

Ammunition	Quantity (tonnes)	KM Poliçan		ULP Mjekës	Total (tonnes)
		2010–11	2011–13	2010–13	
7.62–12.7 mm rounds	7,011	3,600	3,411	—	7,011
12.7–14.5 mm rounds	9,920	—	—	9,920	9,920
Total		3,600	3,411	9,920	16,931

Source: Albania (n.d.b, Table 4)

The Action Plan also called for medium-calibre ammunition (20–160 mm) to be disassembled industrially at the military factories at Poliçan, Mjekës, and Gramsh. According to the Action Plan, industrial demilitarization consists of:

- a) separating all ammunition components;
- b) removing the explosives, propellant charges, and pyrotechnic elements from the other elements of ammunition (metallic, plastic, etc.);
- c) destroying (OB) the propellants, explosives with no recycling values, and pyrotechnic elements;
- d) demilitarizing the ammunition components (making them unsuitable for use for military purposes); and
- e) packaging and storing the explosives residue that might have a recycling value for civil industry or the local market (Albania, n.d.b, p. 5).

Overall, ULP Mjekës was meant to bear almost 60 per cent of the industrial demilitarization load; see Table 13.⁵⁶

The NAMSA Albania III proposal was originally projected to cost EUR 35.8 million (USD 49 million) over a four-year period. Albania had been a PfP nation during previous projects. After Albania joined NATO on 1 April 2009 potential donors took a different view and the Trust Fund did not attract the required level of funding. During 2010 the project was reduced in scope to a four-year, EUR 10.6 million project focused on the Mjekës industrial facility, funded through a single PM/WRA grant of USD 2 million per year over five years.⁵⁷

Despite this setback, the three plants' eight demilitarization lines (as at 2010) will work at full capacity until late 2013 (see Table 14). The Gramsh

facility reportedly has additional capacity (unspecified) for small arms and light weapons destruction (Albania, 2011e, p. 6).

Table 13 Albania: industrial demilitarization repartition according to initial destruction plan, 2010–13

Types of munitions	ULP Mjekës	KM Poliçan	UM Gramsh	Total (tonnes)
Rounds 7.62–14.5 mm	9,920	7,011	—	16,931
Rounds 20–160 mm	21,417	12,082	1,950	35,449
Total	31,337	19,093	1,950	52,380

Source: Albania (2011b, slide 6)

Table 14 Albania: schedule of industrial demilitarization lines, 2010–13 (tonnes)

Factory	Lines	Munitions	2010												2011												2012–2013
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10–12			
KM Poliçan	Line 1	82 mm (TNT)	3,000						1,330																		
	Line 2	82 mm (Kineze)							Equipment used at line 2						10,751												
	Line 3	7.62 mm	3,600						3,411																		
ULP Mjekës	Line 1	160 mm	229 + 1,217																								
		120 mm							11,244																		
	Line 2	75–152 mm							7,127																		
	Line 3	12.7–14.5 mm							9,920																		
	Line 4	Anti-tank landmines							2,212																		
UM Gramsh	Line 1	20–45 mm	924						1,950																		
EOD															25,820												

Source: Albania (2010, slide 9)

ULP Mjekës

NAMSA's Albania III project focuses on operations at the state-owned ULP Mjekës facility near Elbasan, leaving the Poliçan, Gramsh, and range disposal activities to the Albanian MoD.⁵⁸

From 2001 to 2008 two NATO PFP Trust Fund projects renovated and developed the factory's infrastructure and installed new equipment (NAMSA,

2009g, p. D-3)—notably an industrial-scale EWI for small arms ammunition and fuses.⁵⁹ In 2008 and 2009 the Mjekës factory purchased two bandsaws and started demilitarizing 160 mm mortar ammunition under a combination of self-funding for the infrastructure and equipment, and national funding for operational costs. In 2010, in coordination with NAMSA and the MoD, the Government of Denmark, through the OSCE, donated four more bandsaws to Mjekës to expand the demilitarization capacity for large-calibre ammunition (Goodyear, 2010).

As Table 15 indicates, the original Albania III proposal earmarked 31,090 tonnes of ammunition for destruction at the plant.⁶⁰

Table 15 Albania: ammunition earmarked for demilitarization at ULP Mjekës by the 2009 NAMSA proposal

	Designation	Quantity	Tonnage
Small arms ammunition	Cartridge 7.62 mm ball	238,243,000	6,063.00
	Cartridge 7.62 mm armour-piercing incendiary, incendiary, and tracer	34,944,000	947.00
	Cartridge 12.7 mm	25,062,430	4,135.30
	Cartridge 14.5 mm	9,433,875	2,140.25
	Trophy	1,482,622	45.07
	Sub-total (tonnes)		
Mortar	120 mm mortar	479,441	11,027.14
	160 mm mortar	21,364	1,217.75
	Sub-total (tonnes)		
Large-calibre ammunition	75 mm	196,007	3,136.11
	122 mm	41,656	1,672.23
	130 mm	15,040	614.64
	152 mm	1,412	91.80
	Sub-total (tonnes)		
Total			31,090.29

Source: NAMSA (2009g, Table 2)

In January 2011 NAMSA signed a contract with ULP Mjekës to develop and run an additional demilitarization line for ‘large-calibre’ ammunition and to run the existing lines. The contract established fixed rates for the demilitari-



Industrial bandsaws used for the disposal of 82 mm, 120 mm, and 160 mm mortars. © NAMSA

zation of specified types of munitions (NAMSA, 2011, slides 14–15). It also allowed for site-wide improvements in infrastructure to enable the factory to operate safely at a significantly increased overall capacity. As at May 2011, ULP Mjekës operated four demilitarization lines (Albania, 2011a, slide 11):

Line 1 is tasked to demilitarize 1,217 tonnes of 160 mm mortar ammunition and 11,027 tonnes of 120 mm mortar ammunition between 2010 and 2013. Its annual demilitarization capacity is approximately 3,200 tonnes (one shift) (Albania, n.d.b, p. 6).

Line 2 processes 75–152 mm artillery projectiles at approximately 2,400 tonnes per year (one shift) (Albania, n.d.b, p. 6). Table 16 lists mortar and large-calibre ammunition demilitarization rates at ULP Mjekës, as estimated in NAMSA’s original 2009 proposal.

Line 3 uses the EWI. A rotary kiln incinerates 12.7–14.5 mm rounds⁶¹ during the first shift, and the furnace is used to burn the fuses and ignition cartridges of 160 and 120 mm mortar ammunition. The EWI’s annual demilitarization

capacity is approximately 2,400 tonnes (Albania, n.d.b, p. 7). The metal scrap is recovered, certified free from explosives (FFE), and sold.⁶² Gases and particulates produced by the incinerator are scrubbed by the pollution control system to control emissions released into the atmosphere (NAMSA, 2009a, p. B-1).

Table 16 Albania: estimated mortar and large-calibre ammunition demilitarization rates at ULP Mjekës

Calibre (mm)		Total quantity	Item weight (kg)	Total weight (tonnes)	Demilitarization rate (items/hour)
Mortars	120	479,441	23.00	11,027.14	56
	160	21,364	57.00	1,217.75	34
Large-calibre	75	196,007	16.00	3,136.11	69
	122	41,656	40.14	1,672.23	35
	130	15,040	40.87	614.64	31
	152	1,412	65.01	91.80	25

Source: NAMSA (2009g, Table 4)

Table 17 Albania: ULP Mjekës EWI demilitarization rates for small arms ammunition estimated in NAMSA's original 2009 proposal

Item	Total quantity	Item weight (kg)	Total weight (tonnes)	Demilitarization rate (items/hour)
7.62 mm ⁶³	34,944,000	0.03	947.00	10,200
12.7 mm	25,062,430	0.17	4,135.30	3,000
14.5 mm	9,433,875	0.23	2,140.25	2,200
Trophy	1,482,622	0.03	—	2,200
Fuses	754,920	—	—	200
Certification FFE	754,920	—	—	400

Source: NAMSA (2009g, Table 3)

Line 4 processes bakelite anti-tank mines (Albania, n.d.b, p. 8), with an annual demilitarization capacity of approximately 70,000 mines or 980 tonnes. The TNT-based filling is recovered for potential sale to the civilian blasting industry.⁶⁴

NAMSA (2009g, p. D-16) originally estimated the total cost of the Mjekës component of the Albania III project at EUR 14 million (USD 19.2 million) over four years. As at September 2011 the only contributor to date remained

the US PM/WRA grants of USD 4 million. NAMSA anticipates that a further grant of USD 2 million will be made on 1 August 2012. PM/WRA has indicated that a total of USD 10 million in five annual grants will be provided, but this cannot be guaranteed. This would equate to approximately EUR 7.8 million at current exchange rates (January 2012). As at September 2011 the overall project was reportedly underfunded by EUR 3.09 million (USD 4.13 million). The scope of the NATO-funded work may reduce if no other donors are found, with the Albanian MoD having to fund the remaining costs (NAMSA, 2011a, p. 4).

Plans for the introduction of new capital equipment such as a EUR 1 million (USD 1.3 million) static incinerator and automated demilitarization lines were put on hold, and the project focused on the development of low-cost—albeit personnel-intensive—solutions. Despite intensive fundraising activity by NATO and Albania during 2011, no significant additional sources of funding were secured and NAMSA had to scale back monthly spending on demilitarization at Mjekës, which resulted in the funding of only two lines from 1 November 2011. The other lines continued to operate, but under direct MoD funding, which consequently reduced investment elsewhere in the military modernization programme.⁶⁵

Despite the challenges in securing funding, the Mjekës facility improved significantly over the period. As at late 2011 it is regarded as a high-capacity plant processing a variety of ammunition in a safe and environmentally responsible way. The factory recovers commercially valuable materials, but is unable to sell them directly, because the Government of Albania regards them as state-owned assets. The MoD has set up a process to sell the excess material from all sources, including the material recovered under previous demilitarization projects and during the ongoing project. The MoD is also considering proposals to rework the components from disassembled ammunition for use in the production of cartridges for the civilian market. Notably, for some types of ammunition returns from sale of the metals (2011) exceed the costs of processing. For transparency reasons, the MoD holds central records of all material recovered and runs separate auctions to sell the material, with the funds being returned to a central MoD budget.⁶⁶

By 30 September 2011 the MoD reported that it had achieved the following demilitarization rates:⁶⁷

- 1,694 tonnes demilitarized in the three months between July and September 2011;
- 4,439 tonnes demilitarized since the project started in January 2011; and
- 3.67 million separate items of mines, mortars, shell, and small arms ammunition delivered since January 2011.

ULP Mjekës will be fully committed until late 2013.

KM Poliçan

The state-owned Poliçan munitions factory near Berat in southern Albania did not receive direct capital investment from the NAMSA project. Only one of the five zones (zone C) is suitable for ammunition processing; the others are too close to public buildings in the town of Poliçan (NAMSA, 2009b, p. E-2). In 2009 and 2010 the Department of State (PM/WRA) contracted Armor Group to supervise demilitarization operations at Poliçan. In March 2009 Armor Group (subcontracted to Sterling International for direct supervision at the factory) awarded a first contract to Poliçan to establish a demilitarization line for 82 mm mortars (NAMSA, 2009b, p. E-4). The OSCE donated several bandsaws to the plant in late November 2009 and 2010 to establish a second mortar line and improve efficiency on the first.⁶⁸

NAMSA's 2009 proposal had initially earmarked almost 19,000 tonnes of ammunition for destruction at KM Poliçan (see Table 18). The MoD action plan foresaw an additional 3,000 tonnes (Albania, n.d.b, p. 9).

Table 18 Albania: ammunition proposed for demilitarization at KM Poliçan by the 2009 NAMSA proposal

	Designation	Quantity	Tonnage
Small arms	14.5 mm	13,846,154	3,600
Mortars	82 mm mortar	2,775,110	13,875
	60 mm mortar	618,829	1,299
Total			18,774

Source: NAMSA (2009b, Table 2)

KM Poliçan has three lines, all fully funded by the MoD (Albania, 2011a, slide 11).

Line 1 processes 82 mm mortar ammunition with TNT fillers with an annual capacity of approximately 2,700 tonnes (Albania, n.d.b, p. 9). The demilitarization rate was estimated in 2009 at 225 pieces of 82 mm mortars per hour, with the aim of increasing capacity from 9 to 12 tonnes per day (225 per hour to 300 per hour) (NAMSA, 2009b, p. E-5; see Table 19).

Table 19 Albania: forecast mortar demilitarization rates at KM Poliçan from January 2010

Calibre (mm)		Total quantity	Item weight (kg)	Total weight (tonnes)	Demilitarization rate (items/hour)
Mortars	60	618,829	2.1	1,299.54	300
	82	2,775,110	5.0	13,875.55	300

Source: NAMSA (2009b, Table 3)

Equipment includes a tail-dismantling unit with a reported capacity of 1,200 rounds per week and four autoclaves with an explosives melting capacity of 28 projectiles per autoclave batch (NIAG, 2010, p. 46).

Line 2 is dedicated to the demilitarization of small arms and light weapons ammunition of 7.62–14.5 mm calibre cartridges. The plant formerly used the transportable ammunition destruction system (TRADS), leased from the British contractor EOD Solutions and funded by PM/WRA, to incinerate the rounds. The TRADS provides a claimed incineration capacity of 2,700 tonnes per year (Albania, n.d.b, p. 10). The incinerator heats the cartridges until the gunpowder explodes, leaving the brass and melted lead for scrap. The incinerator, which started operations in January 2010, can burn between five and eight tons (5.54 and 7.26 metric tonnes) of cartridges per day (Goodyear, 2010). However, the TRADS design was susceptible to the build-up of dust from inert material in the propellant. This was particularly prevalent in some of the older Chinese-manufactured rounds, which caused a significantly reduced capacity due to maintenance downtime. The TRADS was released from Poliçan during late 2010 and is currently in use in another country. Poliçan is now using 13 locally designed dismantling machines to separate the bullets, cartridge cases, and propellant in 7.62 mm and 12.7 mm small arms ammunition.⁶⁹

Line 3 initially processed imported 82 mm mortar ammunition with mixed fillers with an annual capacity of approximately 3,200 tonnes (Albania, n.d.b, p. 10).⁷⁰

The total cost of the Poliçan component of the project was initially estimated at EUR 7,679 million (USD 10.5 million) over four years (NAMSA, 2009b, p. E-15).

UM Gramsh

Located approximately 30 km south of Elbasan, the UM Gramsh factory adapted its former production machinery for the disassembly and melting out of 57 mm, 85 mm, and 100 mm anti-aircraft and anti-tank ammunition (NAMSA, 2009h, pp. F-2–F-3). In November 2009 the machinery was replaced by a demilitarization line for 37 mm cannon rounds. The plant is, however, considered unsuitable for HE capacity munitions demilitarization and now processes only medium-calibre (23–45 mm) ammunition with small quantities of propellant and explosives (Albania, n.d.b, p. 8; 2011a, slide 11).⁷¹ The process does not use bandsaws, but involves semi-manually dismantling the 37 mm projectile from the fuse and cartridge case and melting out the explosives in the HE rounds (Goodyear, 2010).

The factory must maintain a very low production rate and explosive storage capacity because of its proximity to the local population (Goodyear, 2010). The maximum capacity at full production is 1,800 items (4 tonnes) per day (with one 8-hour shift), which represents an annual capacity of 475,000 items—approximately 900–970 tonnes (NAMSA, 2009h, p. F-6; Albania, n.d.b, p. 8).

NAMSA's 2009 proposal had initially earmarked 2,759 tonnes of ammunition for destruction at UM Gramsh (see Table 20).

The MoD action plan earmarked 2,875 tonnes of ammunition for UM Gramsh (Albania, n.d.b, p. 8). According to NAMSA, the plant is on course to deal with 2,400 tonnes of 37 mm cannon ammunition by the end of 2013.⁷²

The MoD contracts the plant for the total stock of 37 mm over 3 years at a cost of EUR 1.60 (USD 2.20) per HE round and EUR 1.20 (USD 1.60) per solid shot round. The total cost of the UM Gramsh component of the project was estimated at EUR 2,599 million over four years (NAMSA, 2009h, p. F-10).

Table 20 Albania: ammunition proposed for demilitarization at UM Gramsh by the 2009 NAMSA proposal

	Designation	Quantity	Tonnage
Medium-calibre	23 mm	291,531	97
	37 mm armour-piercing tracer	131,193	272
	37 mm HE	1,058,471	2,172
	30 mm	168,231	218
Total			2,759

Source: NAMSA (2009h, Table 1)

Commercial industrial demilitarization plants

Mjekës, Poliçan, and Gramsh have a special status determined by law, but remain state-run facilities (Albania, 2011e, p. 5). The plants offer and execute commercial demilitarization services, but are financed by the MoD. The process is supervised by special structures in the AAF (Albania, 2011e, p. 7) and by financial auditors from the local tax office.⁷³

For the Albania III project, NAMSA is the executing agent and conducts independent verification of all activities. NAMSA (2009c, pp. i, 12) conducts the following activities in this respect:

- It contracts companies through international competitive bidding to procure equipment such as the static incinerator and the EWI modifications, and to provide it to the factories fully installed.
- It negotiates fixed-price contracts (for each type, quantity, and rate of ordnance to be destroyed) directly with ULP Mjekës, KM Poliçan, and UM Gramsh for the demilitarization of the ammunition. The contracts cover receipt, storage, internal movement, demilitarization processes, the processing of by-products such as explosives and metals, and, with the agreement of the MoD, the disposal of scrap materials.

RASR workshop discussions seemed to point out that until recently, local Albanian contractors, often lacking technical expertise, carried out ammunition demilitarization contracts without MoD supervision. The MoD has

reasserted its control over demilitarization activities by supervising the demilitarization work conducted by factories. The government-owned factories are required to design and propose a technology line that they will use to destroy certain types of munitions and to develop an entire set of standard operating procedures, starting from the moment factory personnel offload ammunition from the trucks to the time they store them at the factory's warehouse and throughout the whole demilitarization process. The technology line and project are reviewed by the Defence Research Institute and then referred to the MoD and General Staff. The technical experts team inspects the line and checks everything at the factories, focusing on safety, security, and auditing. The project starts only after the chief of defence has approved it and the MoD has issued an order to transfer ammunition to factories or ranges and destroy it. According to the MoD, weekly and monthly reports are provided by factories, the armed forces, and all stakeholders involved in this process. All efforts are directed and managed by the Demilitarization Board on which sit the deputy minister of defence, the commanders of the major forces (army, navy, air force), directors at the MoD and members of the General Staff, the directors of the factories, and ammunition experts from supporting organizations such as NAMSA.⁷⁴

Training and personnel

In 1998 NATO's Ammunition Storage and Disposal Implementation Team, working under PfP auspices, recommended improvements to the training of the AAF in EOD procedures. The EOD Ammunition Support Training Team (1999–2002), the second NATO PfP team sent to Albania, trained the nucleus of the AAF's new EOD team (Saferworld, 2005, p. 75). However, many trained ammunition experts have lost their positions in the ongoing reforms of the defence apparatus, often moving on to the private sector. The AAF lost precious expertise in the process (Albania, 2011e, p.8).

The AAF bears the brunt of the Albania III project's OB/OD programme. Accordingly, the MoD reorganized and strengthened its military EOD capability during 2009. The AAF's EOD units also received training from the US Defense Threat Reduction Agency and US Navy EOD experts. US EUCOM

and the Netherlands provided EOD safety and personal protective equipment to train EOD operators (NAMSA, 2009d; Goodyear, 2010). Members of the AAF's EOD units now undergo basic and periodic training according to a five-year training plan with US EUCOM (Albania, 2011e, p. 7). Thirty-three personnel received training for Level 1 EOD in 2010 (Albania, 2010, slide 21).

For industrial demilitarization, each plant trains its own personnel according to the tasks they will be assigned in the destruction process. Personnel are reportedly evaluated after training and awarded certificates (Albania, 2011e, p. 7). In addition, the Albania III project foresees that whenever NAMSA procures equipment from commercial or government entities in Europe and the United States, equipment supply contracts will include the provision of training to the Albanian operators of the equipment (NAMSA, 2009c, p. 12).

The government does not allocate a specific budget for training. Each plant finances its own training needs, while the United States covers the expenses for the training of AAF EOD personnel (Albania, 2011e, p. 8). The MoD does not express a need for any sort of additional EOD training/courses.

Demilitarization challenges and capability gaps

The following sections consider the technical capability gaps, and the national and regional factors that restrict Albania's national demilitarization efforts.

Technical

The Albanian MoD reports a number of capability gaps and requirements (Albania, 2011a, slide 25; 2011e, p. 7).

A selected 15,000 tonnes of small arms and light weapons ammunition (no further details provided) are described as expensive and slow to destroy. The procurement of additional disassembling equipment such as pulling-apart machines would accelerate the process. The destruction of fuses is also problematic. They are unpacked, some are considered hazardous to transport, and they are difficult to destroy through OD. A separate burning furnace would facilitate their destruction. They are being processed through

the EWI, but there is a significant backlog of fuses and some of the larger ones are slow to process in the EWI.⁷⁵ Artillery shell fuses are also unpacked and some are considered dangerous to transport. Mobile equipment could be used to destroy them at the depots where they are stored.

Finally, the MoD reports insufficient capacity to destroy WP and cluster munitions or surface-to-surface and surface-to-air missiles.⁷⁶

National and regional

The Albanian MoD has not considered using another demilitarization facility in the region. The size and condition of the Albanian stockpiles have made in-country disposal the only option (Albania, 2011e, p. 5).

The MoD, with the financial support of the OSCE and UNDP, has shipped hazardous chemicals abroad for treatment.⁷⁷ In 2008–09, for instance, 34 tonnes of mélange were shipped to Sweden for disposal and in 2009–10, 120 tonnes of dichloroethane were shipped to Belgium (Albania, 2011e, p. 6; OSCE, 2010a).

As mentioned above, the MoD previously used the TRADS portable incinerator, leased from the British contractor EOD Solutions and funded by PM/WRA. This did not work out to be cost effective in practice (see comments on the TRADS in the Poliçan section, above) and the contractor left Albania in late 2010.⁷⁸ According to the MoD, mobile plants can be used to destroy small numbers of detonators or other items and in situations where transportation poses risk. For greater amounts or larger-calibre ammunition, the MoD states that it prefers static equipment that provides added safety and more capacity (Albania, 2011e, p. 7). NAMSA did not recommend mobile plants for the Albania III project, partly because the investment would not have been amortized over a short time frame (four years, in this case), and partly because such an investment could not be framed in the context of regional capacity (NAMSA, 2009a, p. B-3).

In January 2011 the director of ULP Mjekës announced that the plant could eventually dismantle old ammunition from across the region (mentioning Croatia, Greece, and Serbia as examples) (SETimes.com, 2011). The declaration may signal Albania's willingness to take up a regional role in the demilitarization of surplus ammunition. According to the MoD, this is technically

possible, but transportation and supervision issues would need to be addressed through prior political agreements (Albania, 2011e, p. 5). However, ULP Mjekës is currently working at full capacity on Albanian stocks and will do so at least until 2013. Technically, Mjekës could provide a regional facility for demilitarization, but legislative, procedural, and commercial issues would have to be resolved, and there is doubt as to whether Albanian law would allow these factories to be used by international customers. 📌

Bosnia and Herzegovina

Background

BiH is the only RASR-participating country not to have responded to the Small Arms Survey PSSM questionnaire. The figures presented in this section are therefore either based on previous reporting by the country or have been supplied by other stakeholders, including NATO and the EWG (the latter consists of representatives from a number of organizations involved in arms control activities in BiH).

The following sections consider the role that BiH's small arms and light weapons industry has played in setting up the country's national demilitarization apparatus and highlight the country's past demilitarization accomplishments.

Small arms and light weapons industry

BiH inherited a significant portion of the former Yugoslavia's military production capacities. The Republika Srpska possessed the bulk of the defence manufacturing apparatus with at least 17 companies in 2004, including ORAO in Bijeljina, Kosmos in Banja Luka, and TRZ in Bratunac. The Federation of Bosnia and Herzegovina possessed at least nine major production facilities:

1. UNIS GINEX in Goražde;
2. BNT Machine and Hydraulic Plant in Novi Travnik;
3. TRZ in Hadžići;
4. UNIS IGMAN in Konjic;
5. ZRAK in Sarajevo;
6. UNIS PROMEX in Sarajevo;
7. UNIS BINAS in Bugojno;
8. UNIS PRETIS in Vogošća; and
9. PS VITEZIT in Vitez (CSS, 2003, pp. 52–55; Paes, Risser, and Pietz, 2004, pp. 28–30; Kauer, 2006, Table 8).

The BiH military industry crumbled after the conflicts of the 1990s and the break-up of the former Yugoslavia. According to open sources, the defence sector was a USD 825 million-a-year industry in 1986. The figure dropped to BAM 45 million (USD 31.5 million) in 2009. Over the same period, defence industry employment reportedly fell from 40,000 employees to fewer than 3,000. A few companies, such as UNIS IGMAN in Konjic, have managed to maintain a successful market presence by exporting their range of products (Ramadanovic, 2010).

BiH's current demilitarization capacity was largely built using these defence factories' manufacturing equipment, which was retooled and adapted to demilitarization. Most of the sites were originally government owned and already incorporated safety distances for explosive storehouses. The use of existing facilities reduced reconstruction costs and local, qualified personnel already manned many of the plants (Threat Resolution Ltd, 2004, p. 4-3). Nevertheless, the existing sites were created using former Yugoslav national regulations, which often do not meet NATO safety distance criteria—the traditional use of NATO Allied Ammunition Storage and Transport Publications (AASTP-1) tables and effect equations is therefore not possible (UNDP, 2009a, p. 17).

The companies usually maintain some form of production activity in parallel to their demilitarization contracts. In 1998 Jane's described UNIS PRETIS as 'one of the biggest factories for producing artillery ammunition in this part of Europe' (*Jane's Defence Weekly*, 1998). UNIS PRETIS produced various calibres of mortar shell, artillery ammunition, and rocket (90, 122, 128, and 262 mm), including cluster warheads and aerial bombs. The factory still produces ordnance, although the safety distances to the local factories and houses are such that in normal circumstances neither the production nor the demilitarization of ammunition would be allowed under current NATO and UN regulations. As at 2009 the factory operated within the local regulations and with an explosives licence from the Ministry of Foreign Trade and Economic Relations (MOFTER) (UNDP, 2009a, p. 35).

UNIS BINAS produced fuses and primers for anti-aircraft ammunition, mortar shells, and artillery shells. In addition to being the former Yugoslavia's exclusive manufacturer of landmines (anti-personnel and anti-tank), the

plant also produced hand grenades, anti-tank grenades, and engineering explosive charges.⁷⁹ As at 2009 the facility still manufactured military fuses and 40 mm projected grenades (UNDP, 2009a, p. 49).

PS VITEZIT produced industrial explosives, fuels, and rocket propellants (double based and composite), and still produced civilian blasting explosives in 2009 (UNDP, 2009a, pp. 63–64).

Civilian factories have also performed demilitarization tasks. In 2004, for instance, the Mittal Steel Zenica factory assisted the Stabilization Force in Bosnia and Herzegovina (SFOR) with the melting of small arms and light weapons collected during Operation Harvest, turning them into molten steel to be recycled into other products (Paes, Risser, and Pietz, 2004, p. 53). In 2006 it was still reportedly destroying weapons, along with the Jelsingrad steel factory in Banja Luka (SEESAC, 2006d, p. 28).

Past accomplishments

UNDP, NATO, EUFOR,⁸⁰ the OSCE, and the US Embassy have provided financial, technical, training, and policy support to the Bosnian government's arms control and demilitarization initiatives.

Representatives from EUFOR, NHQSa, the UNDP office in Sarajevo, and the OSCE Mission to Bosnia and Herzegovina established the EWG in February 2006. Its tasks are:

- to provide Bosnian authorities with the expert advice and recommendations in the area of arms control and stockpile management;
- to assist the BiH MoD and AF BiH with the disposal of surplus weapons and ammunition and the improvement of storage facilities; and
- to coordinate the activities of international organizations in arms control issues (EWG, 2010b, slide 4).

Despite receiving international assistance, Bosnia's ammunition demilitarization capacity has been under-used for the past five years at least. As at March 2010 BiH's demilitarization capacity was approximately 3,200 tonnes per year (EWG, 2010a, slide 7). Available figures, such as the ones portrayed in Tables 21 and 22, show that BiH has not used its ammunition demilitarization capacity to the full in the past few years.

Table 21 Results of ammunition disposal by destruction in BiH, 1 January–31 December 2009

Location	Tonnes disposed of and % of disposal capacity utilized	
GOF-18/TROM (Doboj)	706.0	58%
UNIS PRETIS (Vogošća)	0	0%
UNIS BINAS (Bugojno)	0	0%
Demolition range (Manjača)	148.4	49.5%
Demolition range (Glamoč)	303.1	101%
Total	1,157.5	

Source: EWG (2010a, slide 8)

Table 22 Results of ammunition disposal by destruction in BiH, 2007–10 (tonnes)

Location	2007	2008	2009	2010
GOF-18/TROM (Doboj)	1,096	773	706.0	761.5
UNIS PRETIS (Vogošća)	495	591	0	506.05
UNIS BINAS (Bugojno)	45	180	0	22.2
Demolition range (Manjača)	321	277	148.4	0
Demolition range (Glamoč)	205	150	303.1	295.7
Total	2,162	1,971	1,157.5	1,585.45

Source: Statistics provided by UNDP BiH in February 2011

In May 2011 the BiH MoD declared that BiH disposed of 10,831 tonnes of surplus ammunition, mines, and explosives between January 2006 and March 2011: the country donated 31 tonnes, sold 2,152 tonnes, and destroyed 8,648 tonnes (BiH, 2011a, slide 2). The BiH MoD provided similar figures at the Pula conference shortly after, including a breakdown of the amount of ammunition destroyed. In this case, it is stated that BiH destroyed a total of 8,456 tonnes between 2006 and 2010 through either OB/OD or industrial demilitarization (BiH, 2011c, slide 22). According to NHQSa, BiH destroyed a little over 8,700 tonnes between January 2006 and May 2011 through either OB/OD or industrial demilitarization (see Table 23).

Table 23 BiH: ammunition and explosive ordnance destruction by demilitarization and detonation, 1 January 2006–10 May 2011 (gross weight in tonnes)

Disposal method/ location	2006	2007	2008	2009	2010	2011	Total
Industrial demilitarization							
GOF-18/TROM (Doboj)	1,040	974	974	695	838.3	253	4,774.3
UNIS PRETIS (Vogošća)	437	784	160	0	506.0	0	1,887.0
UNIS BINAS (Bugojno)	52	46	180	0	0	0	278.0
UNIS IGMAN (Konjic)	42	0	0	0	0	0	42.0
Sub-total	1,571	1,804	1,314	695	1,344.4	253	6,981.3
OB/OD							
‘Manjača’ (Banja Luka)	96	0	358	145	0	0	599.0
‘Gladna Brda’ (Glamoč)	188	218	142	284	296.4	0	1,128.4
Sub-total	284	218	500	429	296.4	0	1,727.4
Total	1,855	2,022	1,814	1,124	1,640.8	253	8,708.7

Source: NATO (2011, slide 23)

Current demilitarization capacities

BiH’s current ammunition demilitarization capacity is estimated at 3,500 tonnes per year. This roughly breaks down into 500 tonnes through OB/OD and 3,000 tonnes through industrial demilitarization and dismantling (BiH, 2011a, slide 3) (see Table 24).

Given the figures mentioned in the previous section, it is clear that between 2006 and 2010 BiH did not use its full demilitarization capacity (EWG, 2010b, slide 11), reporting the destruction of a maximum of 2,000 tonnes of ammunition per year at most. It is unlikely that the country will have used its full demilitarization capacity in 2011 (NATO, 2011, slide 23).

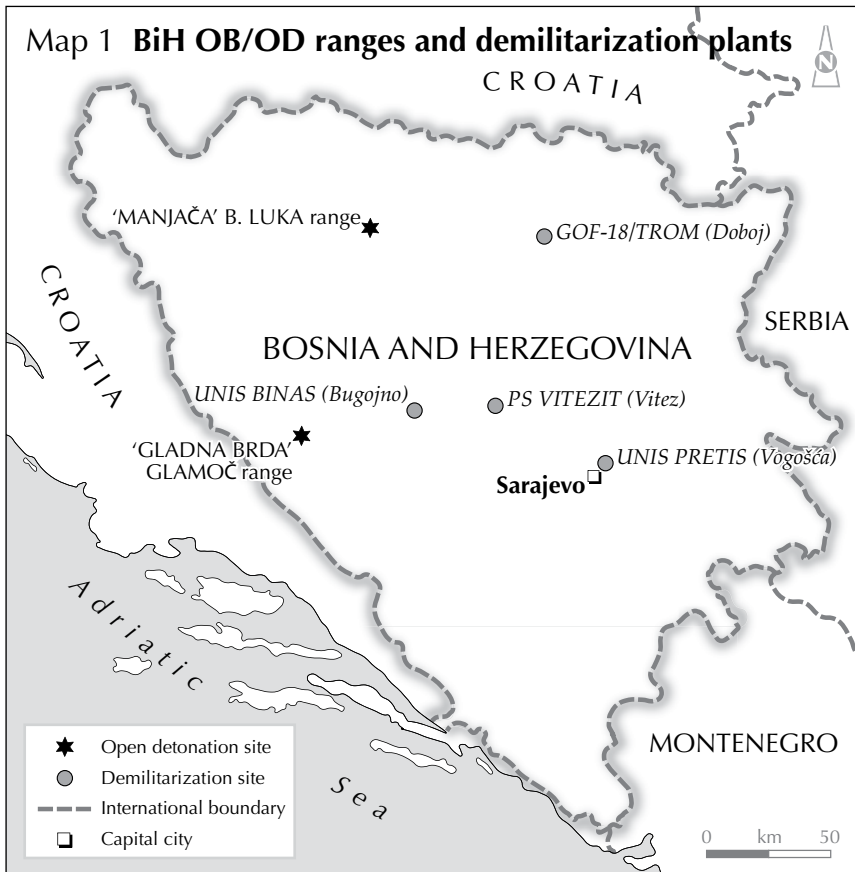
In 2011 BiH planned to destroy 1,500 tonnes of ammunition, including 1,000 tonnes by demilitarization at GOF-18/TROM at Doboj and 500 tonnes

Table 24 AF BiH disposal site capacity

Destruction site	Capacity (tonnes)
GOF-18/TROM (Doboj)	1,200
'GLADNA BRDA' Glamoč range	400
'MANJAČA' Banja Luka range	200
UNIS PRETIS (Vogošća)	1,200
UNIS BINAS (Bugojno)	200
PS VITEZIT (Vitez)	300
Total	3,500

Source: NATO (2011, slide 21)

Map 1 BiH OB/OD ranges and demilitarization plants



Source: NATO (2011, slide 21)

by OB/OD at the Glamoč and Manjača ranges (NATO, 2011, slide 25). NATO confirms that there is a 'slow pace [of] destruction of the unsafe ammunition [that] pose[s] a real threat of self-ignition and accidental explosion' (NATO, 2011, slide 8). If all functioning BiH defence industry factories were to be engaged in the demolition of 20,000 metric tonnes of surplus BiH MoD ammunition, it would take an estimated ten years to destroy BiH's surplus ammunition stockpile (Kauer, 2006, p. 97; EWG, 2010a, slide 14).

According to the EWG (2010a, slide 9), demilitarization capacities at the UNIS PRETIS and GOF-18/TROM plants could potentially be doubled to 2,400 tonnes a year, which could bring national demilitarization capacity to almost 6,000 tonnes and enable the demilitarization of BiH's surplus ammunition stockpile in a little more than three years (20,000/6,000). Despite this, the AF BiH MoD reports a lack of industrial ammunition-destruction capacity (BiH, 2011c, slide 34).

No reported figures are available for annual small arms and light weapons demilitarization capacity, but according to the EWG, BiH has the technical capacity to destroy its surplus small arms and light weapons (estimated at 95,697 pieces in March 2010) within three months if there is the political will and given a BiH Presidency decision. In 2010 UNDP reportedly had the necessary funds to finance this destruction completely (EWG, 2010a, slides 3, 14). In 2010 a total of 30,081 surplus M16 A1 rifles were destroyed in the weapons storage site at Visoko (NATO, 2011, slide 24).

Open burning and open detonation

In 2004 a reported 16 OB/OD demolition areas were in use by SFOR and the Entity Armed Forces (EAF). OB/OD activities faced considerable opposition from the civilian population, which complained about noise and environmental pollution around the destruction polygons (Threat Resolution Ltd, 2004, p. 3-2; CSS, 2003, p. 54).

OB/OD was carried out intermittently at the 'Kalinovik' and 'Veliki Ribnica' ranges (Kauer, 2006, p. 97; SEESAC, 2006d, p. 28). A significant amount of propellant (approximately 200 tonnes) was also destroyed by OB in the UNIS PRETIS range.⁸¹

OB/OD activity now seems centred on three main open detonation facilities with limited capacity (approximately 300 tonnes each annually), including the Kalinovik and Glamoč ranges, and the Manjača range in Banja Luka (EWG, 2010a, slides 7, 9).

National industrial demilitarization plants

One AF BiH facility and three commercial facilities currently carry out industrial demilitarization.

The 2004 Small Arms and Light Weapons Ammunition Demilitarization Feasibility Study team recommended the construction of an indigenous ammunition disposal facility (ADF) capable of handling large quantities of ammunition (up to 5,000 tonnes AUW per annum) (Threat Resolution Ltd, 2004, p. 4).

The study earmarked the Government Ordnance Factory (GOF) at UNIS PRETIS as the most appropriate site. According to the study, the ideal technology for BiH was an EWI and appropriate pre-processing equipment. The team's additional recommendations included:

- introducing an effective ammunition surveillance system;
- upgrading the facility at Vitez to conduct propellant testing of the EAF stockpile;
- conducting ammunition management-training courses for EAF personnel;
- conducting a 100 per cent technical audit of the weapons and ammunition stockpile by a competent external organization;
- conducting a full environmental impact assessment on the proposed technical solution;
- incorporating a pollution control system to meet the European Directives on Emissions and lessen the environmental impact of current demilitarization techniques; and
- incorporating scrap metal processing to ensure that all scrap materials that leave the ADF will be FFE (Threat Resolution Ltd, 2004, pp. 3-5, 3-3, 3-4).

In the 2004 Small Arms and Light Weapons Ammunition Demilitarization Feasibility Study, GOF-18/TROM at Doboj in the Republika Srpska was dis-

counted due to the close proximity of civilian houses to demilitarization facilities (100 m) (Threat Resolution Ltd, 2004, p. 4-3). Despite the study's findings, EUFOR described the former VRS ammunition demilitarization centre TROM located in Doboј as '[o]ne of the best options for the AF BiH to get rid of unsafe and unstable ammunitions'. Because it was managed by the AF BiH and licensed by the MoD, the military unit's demilitarization costs were estimated to be about 50 per cent of the prices charged by comparable BiH competitors such as UNIS PRETIS (Kauer, 2006, p. 95).

GOF-18/TROM, Doboј

TROM is now the main facility for the demilitarization of ammunition by the AF BiH. As at May 2011 the GOF-18/TROM Doboј plant employed 44 people and represented 67 per cent of BiH's industrial demilitarization capacity (BiH, 2011c, slides 25, 40). It will be the only demilitarization facility in operation once all the current surplus stocks are disposed of. The plant includes a TRADS,⁸² an autoclave (TNT melting plant), an environmentally compliant EWI,⁸³ and a hydraulic machine. It is capable of dealing with the breakdown and recovery of TNT from TNT-filled projectiles and anti-tank mines. The facility uses the Manjača range for OB/OD (UNDP, 2009a, pp. 25-30; NATO, 2011, slide 22).

In 2006 the plant's annual demilitarization capacity reportedly ranged from 1,000 to 1,500 metric tonnes (Kauer, 2006, p. 95). In 2009 GOF-18/TROM Doboј's total annual demilitarization capacity was calculated at 2,000 tonnes, including 800 tonnes for small arms ammunition disposed of in an EWI and 1,200 tonnes for non-small arms ammunition (UNDP, 2009a, p. 10), which is almost twice the capacity (1,200 tonnes) reported by NATO in 2011 (NATO, 2011, slide 21). In 2010 the EWG estimated the plant's annual demilitarization/destruction capacity at 1,200 tonnes and reported that this capacity could be doubled pending upgrades to the plant's infrastructure (EWG, 2010a, slides 7, 9).

Commercial industrial demilitarization plants

MOFTER licenses commercial, semi-private factories (i.e. not fully private in the sense that the Bosnian government owns at least 51 per cent of the shares)

to carry out explosive storage and processing (UNDP, 2009a, p. 10). From 2006 to 2010, inclusive, they provided approximately 26 per cent of the country's demilitarization capacity (see Table 25).

Table 25 BiH: repartition of military vs. civilian demilitarization capacities, 2006–10 inclusive (tonnes)

Destruction method	Capacity	
	AF BiH	Civilian
Industrial demilitarization	4,521	2,207
OB/OD	1,727	—
Total	6,248	2,207

Source: BiH (2011c, slide 23)

UNIS PRETIS, Vogošća

The 2004 Small Arms and Light Weapons Ammunition Demilitarization Feasibility Study team concluded that UNIS PRETIS was the best site to promote as an ammunition disposal facility. The plant had not conducted demilitarization work, but its potential was assessed accordingly (see Table 26).

Table 26 BiH: advantages and disadvantages of the UNIS PRETIS Vogošća demilitarization site, 2004

Location	Advantages	Disadvantages
UNIS PRETIS Vogošća (Utilization of old ammunition-manufacturing complex)	<ul style="list-style-type: none"> Existing ammunition-manufacturing facility, largest pre-war capacity and largest site Government-owned site Adequate (almost unlimited) storage facilities Large semi-qualified labour pool available Operational foundry 	<ul style="list-style-type: none"> Some infrastructural damage to storage locations Basic level of physical security Close to only two current EAF storage locations Ammunition movement may be required on main roads around Sarajevo

Source: Threat Resolution Ltd (2004, p. 4-H-1)

UNDP's 2009 survey was more cautious, explaining that a nearby civilian factory complex limited the plant's explosive storage and processing capacity, and that overall it offered 'very [few] facilities to destroy or reverse engineer

the ammunition other than the autoclave system in use' (UNDP, 2009a, p. 35). The assessment concluded that the facility's main strength lay in dismantling missiles and large ordnance, and dealing with specific explosive fills (Tritonal), aluminized explosives, and propellants—one of BiH's main capability gaps. An assessment of the technical equipment concluded that most of the equipment needed overhauling or complete replacement and suggested the procurement of a high-pressure water-flushing system (UNDP, 2009a, pp. 35–42).

In 2009 UNIS PRETIS's total annual demilitarization capacity was calculated at 1,200 tonnes (UNDP, 2009a, p. 10). NATO (2011, slide 21) confirmed this in 2011. In 2010 the EWG (2010a, slides 7, 9) estimated the plant's annual demilitarization/destruction capacity at 1,200 tonnes and reported that this capacity could be doubled pending upgrades to the plant's infrastructure.

Capacity figures are thus similar to the GOF-18/TROM Doboј plant. Yet, as at May 2011 the PRETIS Vogošća plant (51 per cent owned by the government of the Federation of BiH and 49 per cent private shares)⁸⁴ represented only 28 per cent of BiH's industrial demilitarization capacity (BiH, 2011c, slide 25).

PS VITEZIT, Vitez

In 2004 the Small Arms and Light Weapons Ammunition Demilitarization Feasibility Study assessed the Vitez plant, which is also known as GOF-26. Table 27 presents the relevant findings of the study.

Table 27 BiH: advantages and disadvantages of the PS VITEZIT Vitez demilitarization plant, 2004

Location	Advantages	Disadvantages
PS VITEZIT Vitez (Utilization of old explosives-manufacturing complex)	<ul style="list-style-type: none"> • Existing explosives-manufacturing facility • Government-owned site • Adequate storage facilities • Large semi-qualified labour pool available • Relatively accessible • Ongoing demilitarization activity co-located with TNT-recycling facility (mortar bombs only) • Reasonable infrastructure • Propellant-testing facility • Central to all EAF sites 	<ul style="list-style-type: none"> • Poor physical security

Source: Threat Resolution Ltd (2004, p. 4-H-1)

Five years after the feasibility study, UNDP (2009a, p. 64) concluded that the facility was ‘the largest and the most workable of the sites visited due to its construction and layout’. Despite the 250 tonnes of propellant stored in the facility that required immediate destruction, the facility presented good potential for the destruction of rocket motors, air-dropped munitions, large missile warheads, and other high-capacity ordnance through autoclaving (UNDP, 2009a, pp. 63–67).

The plant (100 per cent owned by the government of the Federation of BiH)⁸⁵ currently has a reported annual demilitarization capacity of 300 tonnes (EWG, 2010a, slide 9; NATO, 2011, slide 21). The environmental emission limits imposed are 250 kg of propellant per burning site (OB) per day (UNDP, 2009a, p. 65).

UNIS BINAS, Bugojno

Although it had almost identical facilities to Vitez, UNIS BINAS was discounted in the 2004 Small Arms and Light Weapons Ammunition Demilitarization Feasibility Study because it had only half the storage capacity and no propellant testing facility (Threat Resolution Ltd, 2004, p. 4-3). Table 28 presents the relevant findings of the study.

Table 28 BiH: advantages and disadvantages of the UNIS BINAS Bugojno demilitarization site, 2004

Location	Advantages	Disadvantages
UNIS BINAS Bugojno (Utilization of old explosives-manufacturing complex)	<ul style="list-style-type: none"> • Existing explosives-manufacturing facility • Government-owned site • Adequate but limited storage facilities • Relatively accessible • Ongoing demilitarization activity reported by director (hand grenades and anti-tank mines only) • Reasonable infrastructure • Central to all EAF sites 	<ul style="list-style-type: none"> • Poor physical security • Smallest site

Source: Threat Resolution Ltd (2004, p. 4-H-1)

The facility has its own demolition area, in addition to an autoclave (reportedly deactivated). UNDP's 2009 assessment advised that the plant be used for the dismantling and subsequent disposal of cluster munitions, and that it was well equipped to deal with the fuses currently held in other locations in BiH (UNDP, 2009a, pp. 49–52).

The plant (51 per cent owned by the Government of the Federation of BiH and 49 per cent private shares)⁸⁶ has a reported annual demilitarization capacity of 200 tonnes (EWG, 2010a, slide 7; NATO, 2011, slide 21).

According to statistics provided by UNDP in February 2011,⁸⁷ the UNIS BINAS site destroyed mainly KB 1 cluster sub-munitions (50,000 pieces) in 2007, 2008, and 2010. It also recently destroyed M75 hand grenades using the controlled burning process.⁸⁸

Training and personnel

UNDP's 2009 Ammunition Disposal Capacities Survey in Bosnia and Herzegovina generally praised the competency and savoir faire of demilitarization plant employees. Personnel from GOF-18/TROM Doboje, who attended a basic ammunition course in the United Kingdom, are 'highly experienced and work well as a team' (UNDP, 2009a, p. 30). Personnel at UNIS PRETIS 'display a high level of technical knowledge' (UNDP, 2009a, p. 40). PS VITEZIT has 'many trained individuals who are long term employees, experienced in working with explosives and propellants' (UNDP, 2009a, p. 65).

However, within AF BiH, technical knowledge and experience tend to disappear with the restructuring of the armed forces, which thwarts continuity training and capacity building in general. The MoD and international organizations have each highlighted the recurring need for training AF BiH personnel in different roles, including ammunition technical officers, ammunition technicians, and ammunition handlers (BiH, 2011c, slide 41; EWG, 2010b, slide 13).

Aside from the mechanical engineering faculty, BiH has no indigenous training capacity and relies on EUFOR training programmes. Currently, EUFOR arranges training at all technical levels, but this takes three to five years. Language skills are also an issue—those who know the technical terms are often not the ones doing the fieldwork, and using interpreters

drives the demilitarization costs up. There is also a need for training AF BiH specialists in the destruction of certain types of ammunition (see Table 29). Dobož specialists, for instance, could be trained in the demilitarization of shaped charge ammunition at the Tehničko Remontni Zavod Kragujevac (TRZK) facility in Serbia (EWG, 2010a, slide 16).

Demilitarization challenges and capability gaps

The following sections consider the technical capability gaps, and the national and regional factors that restrict BiH's national demilitarization efforts.

Technical

UNDP's 2009 Ammunition Disposal Capacities Survey in BiH highlighted that OB/OD was the only disposal method available to destroy:

- explosive fillings containing aluminium;
- free-flight rockets and guided weapons;
- cannon ammunition under 57 mm calibre;
- cluster munitions;
- propellant;
- fuses;
- intermediate explosives and non-standard fills;
- high-capacity rockets and missiles; and
- WP ammunition (UNDP, 2009a, pp. 7–9).

The EWG reported similar limitations on ammunition disposal. Table 29 specifies the ammunition types and number of items that BiH was unable to process as at November 2010. RASR workshop discussions stressed that BiH does not have an indigenous demilitarization capacity to process cluster and WP ammunition, and surface-to-surface and surface-to-air missiles (EWG, 2010a, slide 7). Such capacities may, however, exist in the commercial industry. For instance, the company UXB Balkans claims that its Dynasafe static detonation chamber (SDC) system has processed 50 calibre rounds up through 155 mm WP, including 'smoke, grenades, mortars, projectiles

of all sorts, fuzes, bulk propellant and explosive contaminated scrap' (UXB Balkans, n.d.) and therefore has the capacity to destroy WP and other special types of ammunition.⁸⁹ The company's claim was not verified on site. It must, however, be noted that SDCs are very expensive and do not permit great destruction capacity. Moreover, the destruction of WP requires an additional pollution-abatement system.⁹⁰

Table 29 Capability gaps in BiH surplus ammunition destruction (demilitarization and OB/OD) capacities, November 2010

Type of ammunition	Quantity	BiH capacity
Luna free-flight rockets (NATO FROG-7)	10	Only OB/OD; no trained personnel available in AF BiH
BL755 cluster bombs	321	No trained personnel available in AF BiH
Ground-launched weapons RFAB 275/4	24	No trained personnel available in AF BiH
Fuel air bombs FAB 275	34	No trained personnel available in AF BiH
WP ammunition	> 20,000	Only OB (but environmental pollution)
Shaped-charge ammunition	to be confirmed	No equipment or trained personnel in AF BiH
Kub surface-to-air missiles (NATO SAM-6)	89	Only OB/OD; no trained personnel available in AF BiH
Air-to-surface missiles (different type)	≈3,000	Only OB/OD; no trained personnel available in AF BiH
General		Lack of training capacity

Source: EWG (2010b, slide 12)

Finally, the BiH MoD currently lacks an indigenous propellant-testing capacity. MoD staff reportedly visited the Kragujevac Institute in Serbia to explore cooperation on this issue, but negotiations have been slow due to political and financial concerns.⁹¹

National

BiH did not respond to the 2011 Small Arms Survey PSSM questionnaire. It is therefore difficult to assess the extent of the Bosnian government's direct financial contribution to the demilitarization process. Workshop discussions

indicated that the country is entirely reliant on UNDP, NATO, EUFOR, the OSCE, and the US Embassy to provide financial, technical, training, and policy support to the Bosnian government's arms control and demilitarization initiatives.

BiH, however, does not use its full demilitarization capacity, despite international funding and support. Problems related to the development of a centralized government administration thwart BiH's willingness and ability to dedicate funds to PSSM efforts. The lack of political impetus shows that surplus disposal in BiH is more a political and diplomatic issue than a technical one. For things to happen, the three entity presidents need to reach consensus on minor quantities of surplus, yet they cannot seem to agree on what to do with even small quantities of ammunition. The issues of immovable property and the transfer of ownership impede implementation.⁹² Consequently, it is difficult to apply R3 processes because the ownership of scrap and energetic materials is unclear. The proceeds cannot be efficiently reinvested into demilitarization activities or storage infrastructure.

It remains to be seen whether the formation of a new government, formed almost 14 months after a general election held on 30 October 2010, will affect BiH's demilitarization agenda (Ramikovic, 2011).

Regional

The BiH MoD prefers to process conventional ammunition in-country, but regional or commercial solutions should be explored for WP, cluster munitions, air rockets, and other types of ammunition that cannot be demilitarized in BiH. BL755 ammunition, for instance, cannot be processed locally, yet no other country will allow it to be transported on its territory because it has been stored for so long.⁹³ During several RASR workshop discussions BiH MoD officials stated that it would make sense to use TRZK in Serbia as a regional facility. 📍

Bulgaria

Background

The following sections consider the role that the Bulgarian small arms and light weapons industry has played in setting up the country's national demilitarization apparatus and highlight the country's past demilitarization accomplishments.

Small arms and light weapons industry

The Bulgarian defence industry reached the peak of its activity in the late 1980s, with 130 companies and a total workforce of approximately 150,000 (Faltas and Chrobok, 2004, p. 100). Once specialized in the production, maintenance, and repair of small arms, light weapons, and ammunition, the Bulgarian defence industry declined as a result of the loss of its Warsaw Pact markets during the 1990s (Faltas and Chrobok, 2004, p. 100). Exports were seen as the only way to ensure the industry's survival. The Bulgarian military industrial complex exported more than USD 1 billion worth of arms and ammunition annually in the mid-1980s, but these exports had decreased to approximately EUR 259 million (USD 329 million) in 2010 (Novinite.com, 2011b).

In 2004 Bulgaria's main small arms and light weapons manufacturers included:

- ARSENAL Joint Stock Company (JSC) in Kazanlak;
- NITI JSC in Kazanlak;
- VMZ JSC in Sopot;
- Arcus Co. in Lyaskovets;
- Dunarit JSC in Ruse; and
- two branches of the TEREM company (owned by the MoD) in Veliko Tarnovo and Kostenets (Faltas and Chrobok, 2004, p. 98).

In March 2004 Bulgaria's Council of Ministers approved the National Programme for the Utilization/Recycling and Destruction of Surplus Ammunition on the Territory of the Republic of Bulgaria. The document enumerated existing Bulgarian production plants. It assessed their generic destruction and recycling capacities, but did not mention the companies' combined or specific demilitarization capacities. It identified several gaps in the capacity of facilities, however, including:

- the use of old technology, which was too costly to upgrade;
- the failure to meet environmental regulations;
- a limited recycling capacity and lack of equipment for the reprocessing and secondary use of elements and cartridge cases; and
- a lack of mechanization and remote-control equipment to ensure labour safety and the proper disposal of explosive or sensitive components (Rynn, Gounev, and Jackson, 2005, pp. 100–2).

In addition, many Bulgarian munitions plants did not physically separate critical technical steps (such as propellant handling) to prevent a mishap from spreading to other work areas (Munro, 2003, p. 13).

Despite these capability gaps, Georgiev (2004, pp. 45–50) explains that Bulgaria's defence industry companies presented a number of assets for demilitarization activities:

- They were usually located at distances no further than 300 km from ammunition storage depots, which reduced transportation costs drastically.⁹⁴
- They could reprocess powders, TNT, cyclotrimethylene trinitramine (RDX), explosive, and pyrotechnical mixtures obtained during explosive ordnance disposal.
- They could usefully privatize and reassign their production lines to surplus disposal activities to avoid laying off workers, especially in regions suffering from high unemployment.

Today, most parts of Bulgaria's largely privatized military industrial complex include demilitarization in their portfolios. For instance, the country's three main small arms and ammunition producers—ARSENAL, Dunarit, and Arcus—can perform some sort of demilitarization activity.

Past accomplishments

The 2004 National Programme described the ongoing reduction of the Bulgarian Armed Forces (BAF), the movement of ammunition to new locations, and the consequent deterioration of some stocks (Gobinet, 2011, p. 61). All ammunition produced prior to 1970 and of which the chemical stability of its pyrotechnical composition showed obvious signs of deterioration was reportedly earmarked for destruction under the proposed programme (Rynn, Gounev, and Jackson, 2005, p. 101; Georgiev, 2004, p. 2).

The National Programme recommended establishing a new facility at the TEREM-Kostenets plant, operating as a separate commercial enterprise and able to process surplus ammunition from across the region (Rynn, Gounev, and Jackson, 2005, pp. 102–3; Georgiev, 2004, pp. 45–50).

Georgiev (2004) estimates the total investment costs to set up such a disposal centre (without explicitly naming it in his report) at EUR 9–10 million (USD 11.4–12.7 million) for a disposal capacity of 10,000 tonnes per year. The disposal in itself would cost an additional EUR 473 million (USD 60.2 million). Based on the total quantity of the surplus ammunition declared at the time—80,000 tonnes—Georgiev calculated that the expenses for ten years of storage of the surplus ammunition (around EUR 40 million, or USD 50.9 million) would constitute a significant portion of the costs for its disposal and that the annual expenditure for ‘temporizing’ (i.e. storing) it would exceed the annual expenditure for ‘utilizing’⁹⁵ the ammunition after just six years. In other words, if the plant were not built rapidly, money would be spent on storage instead of disposal. Sales revenue from secondary products (the 30 per cent rate of recovery of scrap material, about EUR 16.5 million, or USD 21 million) would even offset a certain portion of the disposal expenses (Georgiev, 2004, pp. 67–72).

According to the Bulgarian MoD, approximately 7,000 tonnes of ammunition were destroyed or ‘utilized’ between 2001 and 2006 (Bulgaria, 2011a, slide 4):

- 1,500 tonnes in 2001;
- 1,400 tonnes in 2002, including 18 tonnes ‘utilized’ at the TEREM-Kostenets plant;

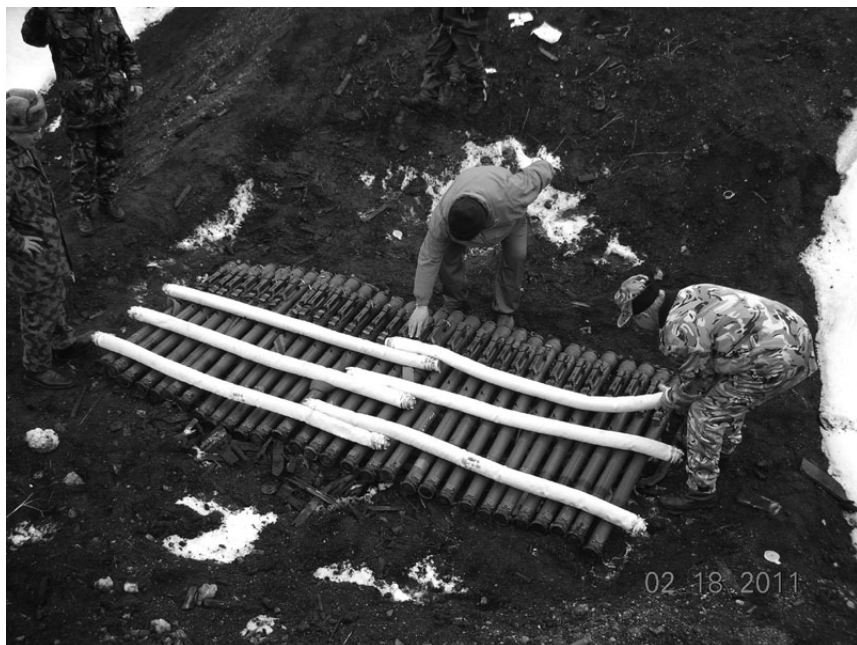
- 1,200 tonnes in 2003;
- 1,400 tonnes in 2004;
- 900 tonnes in 2005; and
- 450 tonnes in 2006.

The Bulgarian MoD qualifies this as an ‘exceptionally low speed of realization’ (Bulgaria, 2010a, para. V) until 2008, when the Integrated Programme Team was established to ‘utilize’ the surplus ammunition that the BAF did not need. Yet according to the MoD, over the past five years the demilitarization of surplus ammunition has largely been funded by external donors, ‘in compliance with different contracts signed [with] the State Department of USA and the United Nations [Development Programme]’ and carried out at the TEREM factory (Bulgaria, 2010a, para. V). The destruction of 500 X 9M32M missiles and 500 X 9K32M launchers (Strela-2M man-portable air-defence system, or MANPADS, missiles and launchers) in early 2011 stands out as a textbook example (Bulgaria, 2011a, slide 6; Novinite.com, 2011c).

Much of the demilitarization in Bulgaria is conducted by civilian companies through public tendering and is based on the Public Procurement Act (Bulgaria, 2011b, p. 7). In 2008 the MoD outsourced the demilitarization of 14,900 tonnes of ammunition to three civilian contractors (Dunarit, Bereta, and TEREM⁹⁶) at a cost of approximately BGN 27 million (USD 18.7 million). At the time of writing the contractors had reportedly processed 90 per cent of this ammunition (Bulgaria, 2011a, slide 5).

In 2011 the MoD allocated BGN 1.3 million (USD 950,000) to outsource the demilitarization of approximately 4,200 tonnes to commercial companies. At the time of writing, however, the Bulgarian government was not anticipating investing or allocating additional funds for demilitarization beyond 2011.⁹⁷ Yet it is believed that the strategic review of the BAF will cause additional reductions and downsizing, thereby generating a 39,000–40,000 tonne surplus to be demilitarized between 2012 and 2015. This will increase the cost of destruction to an estimated BGN 114 million (USD 83 million), funds that the Bulgarian government does not have.⁹⁸ These figures were confirmed in the MoD’s reply to the 2011 Small Arms Survey PSSM questionnaire (Bulgaria, 2011b, p. 8).

Demilitarization does not appear to have been included among the priority investment projects for the modernization of the BAF. There is instead a willingness to 'outsource' the demilitarization burden to commercial companies. A shortage of government funds and the government's extensive and continued reliance on international assistance programmes to finance its demilitarization efforts (Faltas and Chrobok, 2004, p. 105) suggest that the Bulgarian government may have prioritized the restructuring and modernization of the armed forces (in order to meet NATO standards) over demilitarization concerns. In 2010 an MoD presentation mentioned the 2004 National Programme as being included in the list of the 11 priority investment projects for the modernization of the BAF (Bulgaria, 2010a, slide 4). In 2011 the MoD clearly stated that demilitarization was 'not included in priority investment projects for the modernization of the Armed Forces' (Bulgaria, 2011a, slide 3).



9M32M missiles prepared for OD. Source: Bulgaria (2011a, slide 18)

Current demilitarization capacities

Bulgaria's total estimated annual surplus weapons and ammunition destruction capacity is difficult to assess. The MoD reported that it did not consider that it had any capability gaps, but admitted that '[n]o market analysis has been conducted in order to assess the capabilities of the demilitarization companies in this domain' (Bulgaria, 2011b, p. 8).

In the Small Arms Survey PSSM questionnaire the Bulgarian MoD mentions that the country's demilitarization apparatus is exclusively composed of 'private' companies, contracted via public tendering based on the Public Procurement Act, and that the MoD 'consider[s] this solution as a viable one and applicable in the region' (Bulgaria, 2011b, pp. 5, 7). However, this must be interpreted in the sense that none of these companies is directly managed by the MoD: all hold civilian status. The companies are either fully state owned, semi-private (the state is often the majority shareholder), or entirely private.⁹⁹ The proportion of state-owned, semi-private, and entirely private plants is unknown and was not provided by the MoD. This would require further research, focusing exclusively on private demilitarization capabilities. However, RASR workshop discussions revealed that Bulgarian semi- or wholly private facilities were generally considered more cost effective than fully state-owned enterprises.¹⁰⁰

The Bulgarian MoD does not appear to know exactly which companies have available capacity. In its reply to the Small Arms Survey PSSM questionnaire the MoD did not communicate details pertaining to the civilian companies' location, capacities, and existing commitments on the grounds that '[d]etailed information about these companies' weapons and ammunition demilitarization capabilities may be obtained directly from them, since this kind of information is considered as industrial and trade secret' (Bulgaria, 2011b, p. 6). It was thus not possible to estimate an overall annual Bulgarian demilitarization capacity.

Most of the data portrayed in this section was obtained during a visit to Bulgaria by Small Arms Survey researchers in April 2011.

Open burning and open detonation

In its response to the 2011 Small Arms Survey PSSM questionnaire the Bulgarian MoD did not estimate the country's overall OB/OD capacity.

National industrial demilitarization plants

In its response to the 2011 Small Arms Survey PSSM questionnaire the Bulgarian MoD did not estimate the country's overall industrial demilitarization capacity.

TEREM Ltd, TSAR SAMUIL factory, Kostenets

The military storage complex around the town of Kostenets, which is located 60 km from Sofia, became the state-owned TEREM-TSAR SAMUIL EOOD company in 1998. The company is ISO 9001-2000 certified and currently produces various pyrotechnic components (such as fuses), smoke grenades, and industrial explosives, which it sells through the MoD or MoI (TEREM-TSAR SAMUIL EOOD, 2011).

The company is still 100 per cent state/MoD owned.¹⁰¹ The directors of TEREM are appointed by the defence minister. Most of the destruction takes place in Veliko Tarnovo, close to an MoD central military storage facility. This proximity presents a number of advantages in terms of transport, security, protection, storage, and economies of scale (Faltas and Chrobok, 2004, p. 104).

The TEREM-Kostenets plant's main activity is the 'destruction and utilization' of a wide range of ordnance, including various kinds of small arms and artillery ammunition, hand and smoke grenades, anti-personnel mines, anti-tank mines, and pyrotechnic ammunition (TEREM-TSAR SAMUIL EOOD, 2011; Rynn, Gounev, and Jackson, 2005, Box 14). The company website does not specify current demilitarization capacity or output (TEREM-TSAR SAMUIL EOOD, 2011).

The plant reportedly processed 18 tonnes of ammunition in 2002 (Bulgaria, 2011a, slide 4) and participated in a 2003 UNDP-sponsored small arms and light weapons destruction project (Munro, 2003). Another 4 tonnes were reportedly 'utilized' in 2003 and 2004 (Bulgaria, 2011a, slide 4).

The director of TEREM-Kostenets, interviewed in April 2011, provided the following destruction records:

- Between 1999 and 2003 the plant destroyed around 90,000 hand grenades, 80,000 pieces of anti-tank ammunition, 180,000 artillery shells (various calibres 23–152 mm), and 10 million small-calibre cartridges (up to 14.5 mm).
- Since 2003 and by the time of the interview (April 2011) the plant had destroyed 2.7 million hand grenades, 900,000 pieces of anti-tank ammunition, 450,000 artillery shells (various calibres 23–152 mm), and 31 million small-calibre cartridges (up to 14.5 mm).
- Following Bulgaria’s signature of the 1997 anti-personnel mine convention,¹⁰² the plant destroyed approximately 500,000 anti-personnel mines in the period 2000–03 and more than 270,000 anti-tank mines since 1999.

Purpose-built incinerators are used to burn small-calibre ammunition up to 14.5 mm and scrap material is sold.¹⁰³ Two shifts of two incinerators can reportedly destroy 200,000 pieces of small-calibre ammunition each day.¹⁰⁴ UNDP also reported in 2003 that TEREM could safely process as many as 18,000 rounds of 5.45 mm ammunition with each incinerator cycle. TEREM estimated that, with each incinerator operating at full capacity, it could process approximately 200,000 rounds of 5.45 mm ammunition per shift (Munro, 2003, p. 2).

TNT is steamed out of large-calibre ammunition. It is collected, cooled with water, dried, cut, scattered, restructured, and sold. The TEREM-Kostenets plant steams out TNT from large-calibre ammunition and recycles it for civilian use, at an approximate rate of six tonnes of TNT per month.¹⁰⁵ The shells are used as scrap metal. The Bulgarian MoD (Bulgaria, 2011b, pp. 6–7) provides estimates of the resale prices for such types of scrap metal:

- copper: BGN 8,000 (USD 5,800) per tonne;
- brass: BGN 5,500 (USD 4,000) per tonne;
- steel: BGN 3,300 (USD 2,400) per tonne;
- aluminium: BGN 2,000 (USD 1,500) per tonne.

The same process is applied to hand grenades: the metal sleeve is scrapped and sold as scrap material.¹⁰⁶

The director of TEREM-Kostenets mentioned the following annual demilitarization capacities for the plant:

- 17 million small-calibre cartridges (up to 12.7 mm);
- about 8 million cartridges for 14.5 mm calibre;
- up to 2 million hand grenades; and
- about 120,000 pieces of 100 mm artillery shells—the capacity increases if smaller calibres are involved.¹⁰⁷

International donors pay Bulgarian demilitarization plants such as TEREM-Kostenets a fixed price to process small arms ammunition. For example, during a typical small arms ammunition (up to 14.5 mm calibre) destruction operation (date unspecified by the source), the US government paid the plant the following:

- 7.62 x 39 mm: USD 0.06 per piece;
- 12.7 x 108 mm: USD 0.23 per piece; and
- 14.5 x 114 mm: USD 0.45 per piece.¹⁰⁸

The Bulgarian authorities also stated that TEREM had developed technology (unspecified as to whether it is partial disassembly, total disassembly, or simply OD) to destroy air munitions such as Russian C5K rockets and Strela-2M (SA-7B) systems. However, as at the interview date (April 2011), the plant had not demilitarized any MANPADS.¹⁰⁹

VMZ JSC, Sopot

VMZ has so far been a state-owned company.¹¹⁰ It reportedly uses old technology.¹¹¹ The plant suffered an explosion on 10 January 2012 that injured three workers. According to the media, the incident was caused by malfunctioning production equipment and not by ammunition mishandling (Novinite.com, 2012a).

The plant currently employs 3,700 workers, but its production volume and revenues have decreased, which led to a number of lay-offs.¹¹² VMZ will in all probability be privatized in the short term (Novinite.com, 2011a).

In 2005 UNDP and SEESAC reported that VMZ was capable of handling ammunition destruction, but did not comment on the plant's maximum demilitarization capacity or throughput (Rynn, Gounev, and Jackson, 2005,

Box 14). The Bulgarian MoD did not provide information on the quantities of ammunition the company can currently handle or the rate at which it can process it.

Commercial industrial demilitarization plants

In its response to the 2011 Small Arms Survey PSSM questionnaire the Bulgarian MoD did not clearly describe its relationship with commercial (private or semi-private) demilitarization companies (aside from the fact that it involves issuing tenders and contracts) (Bulgaria, 2011b, p. 7).

In 2003 the UNDP office in Bulgaria assisted the Government of Bulgaria in destroying a selected quantity of AK-74 5.45 mm rifles, 5.45 mm ammunition, and 100 mm high-explosive anti-tank warheads (Munro, 2003, p. 1). The destruction took place at the TEREM-Kostenets and Veliko Tarnova branches. UNDP's 2003 *Ammunition Consultant After Action Report* states

one of the most significant problems [of the demilitarization project] was due to an apparent lack of cooperation between the contractor and the MoD. This resulted in substantial delays and nearly resulted in project cancellation. Specifically, the problem was caused by delays in obtaining weapon and ammunition release from the MoD (Munro, 2003, p. 9).

The report also states that

little technical input was provided during the [request for proposal] preparation and during the evaluation of the technical bids. The result was that little was known about the ammunition natures to be demilitarized and the processes proposed by the contractor were not described in enough detail to permit proper bid evaluation prior to awarding the contract (Munro, 2003, p. 10).

According to Bulgarian legislation, the MoD does not have the authority to interfere operationally in the work of commercial companies. However, the MoD reportedly 'reserves the right of control over the overall process of demilitarization and its outcomes. In a case of non-compliance with the contractual terms, the MoD has the right to impose a financial sanction' (Bulgaria, 2011b, p. 7). This probably implies that, if the MoD contracts the companies, then it has oversight of the work.

However, discussions with MoD officials in April 2011 suggested that in theory the MoI rather than the MoD controls the procedures and accredits demilitarization contractors.¹¹³ Interviews with Expal Bulgaria staff in Gabrovo, for instance, revealed that a situation report was given to the MoI every three months and that police performed weekly checks on the plant's ammunition storage facilities.¹¹⁴ Expal Bulgaria staff also explained that their imports were monitored by a Bulgarian inter-ministerial committee on dangerous/hazardous goods involving the MoD, MoI, Ministry of Foreign Affairs, and Ministry of Energy. The committee was described as 'strict, but very helpful'.¹¹⁵

Other discussions seemed to imply that international demilitarization contracts, such as the one VIDEX signed to demilitarize Greek landmines before the Gorni Lom explosion, fell within the responsibility of the Ministry of Industry.¹¹⁶

The following sections discuss selected examples of current or former Bulgarian small arms and light weapons and/or ammunition producers with proven demilitarization capacities. Most of them do not advertise their destruction or recycling capacities, preferring to focus on production instead. Some, such as Expal Bulgaria, have stopped production altogether and retooled their production lines exclusively for industrial demilitarization and recycling.

Arcus Co., Lyaskovets

Arcus, located in Lyaskovets, is mainly known as a producer of medium-calibre ammunition, grenade launcher ammunition, and mortar shells, in addition to various types of fuse.¹¹⁷

In 2005 UNDP and SEESAC reported that the plant could destroy and recycle all types of ammunition up to 40 mm in calibre (Rynn, Gounev, and Jackson, 2005, Box 14). Yet the current company website does not mention any demilitarization activity (Arcus Co., n.d.).

The Bulgarian MoD did not provide information on the quantities of ammunition the company can handle or the rate at which it can process it.

ARSENAL JSC, Kazanlak

ARSENAL, which is 90 per cent privately owned,¹¹⁸ has a large production facility located in Kazanlak. A minor explosion occurred on 10 August 2008. According to the MoD, this was due to human error during the production process, but the safety standards are otherwise reportedly high.¹¹⁹

In 2005 UNDP and SEESAC reported that the plant could process and recycle small arms and light weapons ammunition, including 5.45–14.5 mm cartridges, 23–57 mm anti-aircraft cartridges, 60–120 mm mortar bombs, 76–152 mm artillery shells, and RPG rockets (Rynn, Gounev, and Jackson, 2005, Box 14). The current company website does not mention any demilitarization activity (ARSENAL JSCo., n.d.).

The Bulgarian MoD did not provide information on the quantities of ammunition the company can handle or the rate at which it can process it.

Bereta Trading Ltd, Sofia

Bereta Trading's company website states that its demilitarization and storage activities are concentrated in a 6,000 m² area, with storage potential for up to 1,200 tonnes. The website states that the company can process small arms ammunition, artillery shells, engineering explosives, aviation and anti-aircraft ordnance, and anti-tank mines (Bereta Trading, n.d.).

The Bulgarian MoD did not provide information on the quantities of ammunition the company can handle or the rate at which it can process it.

Dunarit JSC, Ruse

The Russian company Dunarit, located in Ruse, was described in 2005 as a producer of aviation and artillery (57–122 mm) ammunition (Rynn, Gounev, and Jackson, 2005, Box 14). It reportedly works closely with the German company Diehl.¹²⁰

The Bulgarian MoD did not provide information on the quantities of ammunition the company can handle or the rate at which it can process it.

Expal Bulgaria JSC, Gabrovo

Two Small Arms Survey researchers visited Expal Bulgaria's Elovitza factory located in Gabrovo, approximately 240 km from Sofia, on 14 April 2011. Con-

sequently, the content of this section is somewhat richer than that for other Bulgarian demilitarization companies. The richer content does not imply that Expal Bulgaria is the only facility in Bulgaria to have these capacities.

Before its purchase by the Spanish group Maxam in 2007, the plant produced hand grenades, anti-tank mines, engineering field explosives, and small- and medium-calibre ammunition. It is now exclusively dedicated to the demilitarization of conventional NATO and former Warsaw Pact ammunition, with an emphasis on using R3 techniques to produce civil explosives using the materials recovered during demilitarization. The plant is the only Bulgarian demilitarization facility mentioned by the 2010 NATO Industrial Advisory Group report: it is certified to health, environment, and safety standards, and meets the essential requirements of European Directive 93/15 for commercial explosives (NIAG, 2010, p. 48). Despite these high standards, a Gabrovo plant employee was accidentally killed on 11 January 2012 while destroying anti-personnel landmines (Novinite.com, 2012b).¹²¹

The plant can process a wide range of surplus ordnance, including various pyrotechnics, small-calibre cartridges, mortar bombs, aviation and cluster bombs, and smoke and WP ammunition (Expal Bulgaria, 2011a, slide 3). Expal Bulgaria reports that the Gabrovo plant can process the following tonnages per working day:¹²²

- up to 5 tonnes of TNT for drying and flaking;¹²³
- up to 3 tonnes of composition B and 1.6 tonnes of Hexotonal in the discharge plants for HE composition B, Hexotonal, Trinonal, and explosive D ammonium picrate ammunition;
- up to 3 tonnes of WP ammunition in the discharge plants;¹²⁴
- up to 1,500 fuses for dismantling and removal;
- up to 1,100 cartridges for removal, dismantling, and inertization; and
- up to 1.1 tonnes of double-based powder with capabilities for drying, cutting, and recycling (Expal Bulgaria, 2011a, slides 5–12).

The plant has processed more than 400 different types of ammunition, which suggests flexible production lines. The company is currently testing a new machine to process cartridges of 5,56–20 mm calibre, with an expected

capacity of 3,600 units per hour. The machine is in test phase at the moment in Spain, but will probably be used in Bulgaria.¹²⁵

Expal Bulgaria representatives reported that, since the plant had started its demilitarization activities, it had won two tenders from an Asian country for the demilitarization of 8,000 tonnes of ammunition in 2010 and for 4,000 tonnes in 2011. The representatives stated that logistics—primarily transport costs—can make up as much as 50 per cent of contract costs. In the case of the second Asian contract, for instance, the customer covered transportation costs; 215 containers were brought from Asia to the Black Sea and delivered to Burgas; and 38 trucks brought the surplus ordnance to Gabrovo, where they were unloaded in 15 hours. The Bulgarian police reportedly provided transport security and the transfer was made in accordance with European regulations on the transport of hazardous goods.¹²⁶

During the Fourth RASR Workshop held in Ljubljana in May 2011, Expal Bulgaria representatives also reported that the company had been awarded a Slovenian contract in October 2010 to demilitarize around 900 tonnes of conventional ammunition. Of the overall contract, the Gabrovo plant is scheduled to process 76,000 hand grenades, more than 39,000 anti-tank mines, more than 1,000 155 mm improved conventional munition (PAT794), and 176 MANPADS (Igla SA-18) (Expal Bulgaria, 2011b, slides 16–18).

The company applied for the import licence to the Bulgarian Inter-Ministerial Commission. The Bulgarian MoD reportedly follows such contracts through the approval of import licences and certificates of destruction. Customer representatives monitor operations. The Slovenian MoD reportedly visits Expal Bulgaria regularly to verify the demilitarization of the 155 mm PAT794 and the Igla SA-18 MANPADS (Expal Bulgaria, 2011b, slides 19–20).

Trema, Triavna

In 2005 UNDP and SEESAC reported that the Trema plant was capable of steaming explosives out of shells and cutting empty shell casings to recoup the scrap steel. TNT was not destroyed on site, but sold to various defence companies. The report cited a possible demilitarization goal of 10,000 85–125 mm shells (timeline unspecified) at a cost of EUR 1 per 11 rounds, after the sale of scrap metal and TNT (Rynn, Gounev, and Jackson, 2005, Box 14).

The Bulgarian MoD did not provide information on the quantities of ammunition the company can currently handle or the rate at which it can process it.

VIDEX JSC, Sofia

VIDEX JSC's Midzhur plant, located near Gorni Lom, was described in 2005 as being able to process 350–400 tonnes of explosive materials per month, including artillery ammunition, anti-tank mines, and fuses (Rynn, Gounev, and Jackson, 2005, Box 14).

The plant also produced, among other items, explosives for industrial purposes. On 3 February 2010 the factory was rocked by a series of explosions. According to the MoD a damaged electrical heater was responsible for igniting a depot containing 10 tonnes of ammonite. A large part of the factory was destroyed and the blast spread to a nearby compound storing Greek anti-personnel mines awaiting demilitarization. Luckily, the factory's personnel were evacuated in time and few people were injured in the blast.¹²⁷

The Bulgarian MoD did not indicate whether the plant was still active (Bulgaria, 2011b).

Training and personnel

During workshop discussions at the Third RASR Workshop held in Sarajevo in November 2010 the Bulgarian MoD reported that many trained demilitarization, stockpile maintenance, and security personnel had found employment in the private sector during the successive waves of BAF restructuring.

Much of the specialized training is thus 'outsourced' by the Bulgarian MoD to the private sector and the MoD would not comment on commercial contractors' demilitarization training programmes (Bulgaria, 2011b, p. 8). Expal Bulgaria, for instance, confirmed that much of its training was done in-house.¹²⁸

In its reply to the 2011 Small Arms Survey PSSM questionnaire the MoD did not indicate whether it allocates a specific budget for internal training and did not identify any training gaps. It is unclear whether and how the MoD intends to keep such specialized knowledge within the ranks of the MoD (Bulgaria, 2011b, p. 8).

Demilitarization challenges and capability gaps

The following sections consider technical capability gaps, and national and regional factors that restrict Bulgaria's national demilitarization efforts.

Technical

In its reply to the Small Arms Survey PSSM questionnaire the MoD did not indicate whether it had sufficient capacity to destroy WP, cluster munitions, or surface-to-surface and surface-to-air missiles. Instead, the MoD reported that it did not consider having any capability gaps, but admitted that '[n]o market analysis has been conducted in order to assess the capabilities of the demilitarization companies in this domain' (Bulgaria, 2011b, p. 8).

National

During a meeting with Small Arms Survey researchers and US Embassy officials in Sofia on 11 April 2011, MoD representatives identified the following challenges:

- a lack of financial resources to fund demilitarization efforts;
- outdated demilitarization facilities that do not meet environmental standards, including in terms of OB/OD;
- the obligation to have at least three candidates for a tender;¹²⁹ and
- current regulations that require that surplus be destroyed in the country. Bulgarian legislation prohibits the export of weapons and ammunition for demilitarization purposes, allowing only revenue-generating trade exports (Bulgaria, 2011b, p. 6). Ordnance cannot be exported for demilitarization without being re-imported afterwards. This complicates matters, especially when local Bulgarian companies cannot or do not want to destroy specific types of weapons.¹³⁰ It also explains why the MoD has not sought to use a demilitarization facility in a neighbouring country and has not shipped surplus ordnance (rocket fuel, for instance) to foreign countries for disposal (Bulgaria, 2011b, p. 6).

Regional

Faltas and Chrobok (2004, p. 105) noted in 2004 that 'Bulgaria's [small arms and light weapons] destruction technologies, facilities and capacity exceed its own surplus' and that the country had the potential to host a regional centre for small arms and light weapons destruction.

The 2004 National Programme recommended establishing the TEREM-Kostenets plant as a separate company, which would eventually be able to process surplus ammunition from across the Balkan region once the current surplus ammunition in Bulgaria is exhausted. The document did not explore alternative solutions to the regional destruction centre, such as the use of current capacities or transportation to facilities abroad (Georgiev, 2004, pp. 67, 76; Rynn, Gounev, and Jackson, 2005, pp. 102–3).

In its reply to the 2011 Small Arms Survey PSSM questionnaire, the MoD did not reiterate TEREM's regional capacity as a future regional demilitarization centre and would not vouch for the commercial demilitarization facilities (Bulgaria, 2011b, p. 6). 📄

Croatia

Background

The following sections consider the role that the Croatian small arms and light weapons industry has played in setting up the country's national demilitarization apparatus and highlight the country's past demilitarization accomplishments.

Small arms and light weapons industry

Unlike most of the other RASR-participating countries studied, the Croatian demilitarization apparatus did not evolve out of 'retooled' defence industries. For instance, HS Produkt d.o.o. in Karlovac, Croatia's main firearms manufacturer, plays no role in the country's demilitarization apparatus (SEESAC, 2006c, pp. 8–9, 50–51).

Past accomplishments

Generally speaking, surplus destruction was not a priority for the Croatian government until very recently. In 2006 the MoD's Remont Institution in Zagreb was staffed by 13 officers trained for weapons disposal and could supposedly destroy up to 160,000 weapons a year. Yet from 2002 to 2005 only 6,389 weapons were destroyed under the auspices of the MoD. In comparison, the MoI's destruction facility in Sisak destroyed 3,000 weapons between December 2005 and July 2006. Altogether, the MoD and MoI had reportedly destroyed fewer than 50,000 small arms and light weapons by mid-2006, representing only 20 per cent of the total surplus holdings reported that year (SEESAC, 2006c, pp. 50–51).

In 2006 the annual destruction rate of the MoD averaged between 1,000 and 2,000 small arms and light weapons (SEESAC, 2006c, p. 7), with SEESAC estimating that it would take a century to destroy all existing surplus MoD stocks (SEESAC, 2006b, p. 41). To speed up the process, the Overhaul Facility

of the Armed Forces of the Republic of Croatia in Zagreb undertook the destruction of 25,000 pieces of various small arms and light weapons in January and February 2008 (Croatia, 2008, p. 3; SEESAC, 2009, slide 6). In general, small arms and light weapons destruction activities are more extensively documented and reported than ammunition demilitarization.

Surprisingly, the MoD did not declare any surplus small arms and light weapons in the 2011 Small Arms Survey PSSM questionnaire (Croatia, 2011b, Table 3, no. 2). Current small arms and light weapons destruction activities are mainly implemented by UNDP Croatia and the Croatian MoI, in cooperation with SEESAC and with the financial support of the EU. For instance, the CMC Sisak steel mill destroyed 1,130 pieces of small arms and light weapons on 10 June 2011 (SEESAC, 2011f), 1,224 pieces on 22 July 2011 (SEESAC, 2011g), and 1,509 pieces on 16 September 2011 (SEESAC, 2011a).

The Croatian MoD provided the following demilitarization figures in May 2011:

- around 6,500 tonnes of ammunition and explosive materials reportedly destroyed between 2001 and 2010;
- 26,000 pieces of small arms and light weapons destroyed in 2007 and 2008;
- 929 MANPADS destroyed in 2009 with financial support from the US government (USD 1 million); and
- 1,062 pieces of conventional weaponry (tanks, armoured vehicles, cannons, aircrafts, and helicopters) disabled from 1996 to 2010 (Croatia, 2011a, slide 10).

On 14 September 2011 a series of unplanned explosions, reportedly initiated by a wildfire, hit a Croatian Armed Forces (CAF) ammunition storage depot at the Stara Straza barracks, allegedly destroying stocks of Second World War explosives ordnance. The nearby Garcac–Kin highway and rail traffic were temporarily closed and residences within a 5 km radius were evacuated (Small Arms Survey, 2011). It remains to be seen whether this unfortunate event will prompt the government to prioritize the destruction of its declared 20,000 tonnes of surplus ammunition (see Gobinet, 2011, p. 25, Table 1).

Current demilitarization capacities

Demilitarization has long been the exclusive prerogative of the Croatian MoD's General Staff—conducted within Croatian military facilities by EOD personnel and according to prescribed regulations and commands (Croatia, 2010, p. 13).

OB/OD seems to have had priority until 2009–10. An MoD presentation stated that there were only three ways to dispose of ammunition—OB/OD, sales, and donations (Croatia, 2009a, slide 10). The previously mentioned 929 MANPADS were destroyed in 2009 with financial support from the US government using OB/OD (Croatia, 2009a, slide 16; 2011a, slide 10).

UNDP's 2009 *Ammunition Technical Assessment, Republic of Croatia* mostly addressed storage issues, but supported the budding Spreewerk private demilitarization project (UNDP, 2009b, p. 10). Croatia's 2011 reply to the 2011 Small Arms Survey PSSM questionnaire still mentions industrial demilitarization as being 'in perspective' (Croatia, 2011b, Table 2, no. 3). As at early 2011 the MoD had not contracted either private or semi-private industry actors to process its surplus ammunition stockpile.

Open burning and open detonation

A 2009 MoD presentation to the First RASR Workshop estimated national OB/OD capacity at around 4.5 tonnes per day or 1,000 tonnes per year (Croatia, 2009a, slide 11).

In its reply to the 2011 Small Arms Survey PSSM questionnaire the MoD estimates Croatia's state-run demilitarization capacity at 500 tonnes per year (Croatia, 2011b, Table 5, nos. 1, 7). This figure presumably represents only OB/OD capacity and excludes national industrial demilitarization potential and the private demilitarization capacity of contractors such as Spreewerk d.o.o.¹³¹ Gospić that do not have contracts with the MoD.¹³²

OB/OD activities reportedly cost the MoD around EUR 200,000 (USD 278,000) per year (Croatia, 2011a, slide 9). It is unclear how many OB/OD sites the MoD employs. A 2009 MoD presentation mentions three locations for OB/OD in 2009 (Croatia, 2009a, slide 15). RASR workshop discussions in Sarajevo in November 2010 hinted that the MoD used two military polygons for OB/

OD.¹³³ The MoD's reply to the 2011 Small Arms Survey PSSM questionnaire only mentions the state-run polygon in Slunj, but adds that OB/OD capacity is not fully used and could be increased (Croatia, 2011b, Table 5, nos. 1, 7).

National industrial demilitarization plants

The MoD has an industrial disassembly plant for ammunition near Knin with a reported capacity of 1,000–1,500 tonnes per year (Croatia, 2011a, slide 9).¹³⁴

Surplus small arms and light weapons can also be dismantled industrially (through cutting, crushing, and welding, for instance) to benefit from the sale of scrap material. Operations are performed in a 'secure controlled environment and covered by proper documentation on quantities and serial numbers' (Croatia, 2010, p. 14). The MoD reports no surplus small arms and light weapons in the 2011 Small Arms Survey PSSM questionnaire (Croatia, 2011b, Table 3, no 2), yet it estimates its small arms and light weapons demilitarization capacity at 500 pieces per day (Croatia, 2011a, slides 3, 9). According to SEESAC, however, the CMC Sisak steel mill was able to destroy as many as 1,500 small arms and light weapons per day in 2011 on behalf of the MoI (see section on 'Past accomplishments', above).

Commercial industrial demilitarization plants

In 2009 the MoD supported the development of an indigenous, small-scale ADF operated by a local company, Agencija Alan d.o.o., with the company Sprewerk d.o.o. contracted as a technical partner (UNDP, 2009b, p. 8). As shown in Table 30, Sprewerk d.o.o. proposed to develop a number of demilitarization capabilities at the new facility near Gospić by mid-April 2009.¹³⁵

The facility's expected production capacity was approximately 6 tonnes of ammunition per day (single shift) or 1,350 tonnes per year (for a 225-day working year) (UNDP, 2009b, p. 10). UNDP's 2009 *Ammunition Technical Assessment* highlighted the fact that the Gospić demilitarization facility lacked the capability to destroy:

- smaller-calibre ammunition, although the destruction of small arms ammunition (up to and including 14.5 mm calibre) was not considered a major issue since 'most [could] be legitimately sold to the USA for reprocessing for civilian use' (UNDP, 2009b, p. 7);

- Hexogen (RDX)-filled ammunition; and
- components and energetics recovered during the demilitarization process (UNDP, 2009b, p. 10).

Table 30 Croatia: demilitarization capabilities foreseen by Spreewerk d.o.o. for the Gospić plant, 2009

Technology	Capability	Remarks
Mechanical disassembly	Primer removal from medium- and large-calibre tank, mortar, and artillery cartridge cases	<ul style="list-style-type: none"> • Remote capability • Operator protection
	Fuse removal from shells	
Hydraulic pull apart	Removal of cartridge case from main body of shell	
TNT melt out ¹³⁶	Removal of TNT from medium- and heavy-calibre artillery and mortar rounds, aircraft bombs, and anti-tank mines	<ul style="list-style-type: none"> • TNT recovered for sale to the United States • Scrap metal recovered for local sale • System not capable of removing Hexogen (RDX) from shells
Ammunition storage	All types	<ul style="list-style-type: none"> • 128 tonnes capacity • Three-week operating stocks
Transport to German facility	Destruction of recovered fuses, primers, and propellant	<ul style="list-style-type: none"> • Necessitates repacking to UN standards for the transport of dangerous goods • Use of an alternative: TRADS¹³⁷

Source: UNDP (2009b, Table 5)

The plant has reportedly been completed,¹³⁸ but it is unclear whether it has bridged these capability gaps. Its current processing capacity is unknown. The Third RASR Workshop discussions in Sarajevo in November 2010 suggested that Spreewerk was reportedly looking into ways of dismantling WP ammunition.¹³⁹

The MoD's reply to the 2011 Small Arms Survey PSSM questionnaire briefly mentions Spreewerk, but does not indicate its current demilitarization capacity. Surprisingly, the MoD confirms that it still has not contracted Spreewerk, but states that the company has demilitarization capacity available (Croatia, 2011b, Table 5, nos. 4, 8).

The Croatian MoD did not provide information on other private or semi-private demilitarization plants, on the quantities of ammunition they can handle, or on processing rates. As at May 2011 the MoD did not have any contract with demilitarization contractors (Croatia, 2011b, Table 5, no. 14).¹⁴⁰ This situation may change with the new long-term development plan for the period 2011–20. In the course of 2011 the CAF General Staff finalized the list of excess and surplus weapons and ammunition by types and quantity. The MoD therefore plans to adapt and extend its demilitarization capacity by contracting other civilian industrial demilitarization plants via public tender. The MoD expects that combining OB/OD and civilian industrial demilitarization techniques may increase the country's ammunition destruction capacity to more than 2,000 tonnes per year (Croatia, 2011a, slide 12).

Training and personnel

A technical training programme for demilitarization and stockpile maintenance personnel is reportedly provided by CAF General Staff Support Command. No further details were provided by the MoD (Croatia, 2011b, Table 6, no. 3).

The General Staff Support Command's Ammunition Surveillance Division is responsible for laboratory testing (Croatia, 2009b, slide 7). Croatia has a propellant-testing laboratory within its military academy (MoD) that uses the NATO method. Testing equipment is reportedly relatively inexpensive, but qualified staff require 10–20 years of training.¹⁴¹

Demilitarization challenges and capability gaps

The following sections consider the technical capability gaps, and the national and regional factors that restrict Croatia's national demilitarization efforts.

Technical

In its response to the 2011 Small Arms Survey PSSM questionnaire the MoD reports a general lack of industrial demilitarization capacity (Croatia, 2011b,

Table 5, no. 16). Specifically, MoD representatives highlighted during RASR discussions that Croatia is not equipped to demilitarize WP¹⁴² or surface-to-surface and surface-to-air missiles industrially.¹⁴³

At the time of writing, Croatian authorities were reportedly discussing mobile system options with a private contractor to deal with WP ordnance, but US approval for funding was still pending.¹⁴⁴

National and regional

In its reply to the 2011 Small Arms Survey PSSM questionnaire the Croatian MoD shows no previous relevant experience with regional demilitarization practices. It has reportedly not shipped any surplus ordnance to foreign countries for disposal (Croatia, 2011b, Table 5, no. 11), and while it has never used a mobile ammunition disassembly plant, it clearly states that it has ‘no need’ for such a plant (Croatia, 2011b, Table 5, no. 13). Finally, the MoD has never considered using a regional demilitarization facility because of the ‘high costs [and] transport problems’ (Croatia, 2011b, Table 5, nos. 5, 6). It is unclear whether these statements would apply to the Sprewerk plant.

However, Croatia promotes its developing cluster ammunition demilitarization capacity in regional forums. The country ratified the Oslo Convention on 5 June 2009, which entered into force on 1 August 2010. In 2011 the Croatian MoD prioritized the disposal of cluster ammunition with support from Norwegian People’s Aid, which completed the research and development phase of a demilitarization feasibility study during July 2011. At the time of writing, preparations for drawing up the destruction plan for the 170 tonnes of cluster munitions were reportedly ongoing (Croatia, 2011a, slides 6, 11). 📄

Macedonia

Background

The following sections consider the role that the Macedonian small arms and light weapons industry has played in setting up the country's national demilitarization apparatus and highlight the country's past demilitarization accomplishments.

Small arms and light weapons industry

The usual link between defence production and demilitarization capacity is not as evident in Macedonia as it is in many other of the region's states.

UNDP's 2004 assessment of small arms availability in Macedonia reported that only two small factories produced limited quantities of small arms, light weapons, ammunition, and explosives: the Suvenir Metal Products Equipment Company of Samakov and the 11 Oktomvri/Eurokompozit firm of Prilep. The primary customers were the MoD and MoI, but UNDP reported that both factories faced financial difficulties and that both ministries were dependent on foreign imports for their security needs (Grillot et al., 2004, Box 3.2). The UNDP report did not assess the companies' demilitarization capacities at the time.

The Suvenir factory was one of the former Yugoslavia's reserve small arms ammunition production facilities. After Macedonia's independence, the company continued to produce ammunition, including blank cartridges. The factory reportedly still has the capability to produce bullets and cartridges, and has assembly machines and its own indoor shooting-testing range to assess lot quality.¹⁴⁵ 11 Oktomvri/Eurokompozit still produces anti-tank rocket launchers such as the M79 Osa and the M80 Zolja.¹⁴⁶

Past accomplishments

In 2001 NATO's Task Force Harvest Mission spearheaded ammunition collection and destruction efforts in Macedonia.

More recently, workshop discussions during the regional conference Towards a Sustainable Solution for Excess Weapons and Ammunition revealed that the Macedonian government had adopted a decision in November 2010 to destroy excess ammunition.¹⁴⁷ The Macedonian representative stated that the MoD could cover 70–80 per cent of the country's general demilitarization needs and that the Macedonian authorities would issue tenders for the rest.¹⁴⁸

Current demilitarization capacities

The Army of the Republic of Macedonia (ARM) has three EOD teams (21 members in total) who are responsible for OB/OD, ammunition dismantling, and range clearance.¹⁴⁹

Open burning and open detonation

In its reply to the 2011 Small Arms Survey PSSM questionnaire the Macedonian MoD notes that its main OB/OD range is located within the military compound of TA Krivolak near the village of Mushanci and that it has a capacity of 15 tonnes of TNT per detonation (Macedonia, 2011d, p. 2; 2011e, slide 6).¹⁵⁰

The MoD's reply to the 2011 Small Arms Survey PSSM questionnaire was the only one to report that the MoI and ARM jointly prepared the explosive ordnance to be destroyed at the Mushanci training area. The MoD's reply also details the procedure. The preparation reportedly involves 'preparing [a] 4-metre long, 3-metre wide and 4-metre deep open detonation fougasse' and in the case of closed detonation a '1-metre deep, 8-cm wide closed detonation fougasse' (Macedonia, 2011d, p. 2).

According to the MoD, TA Krivolak's polygon has not been and is still not used to its maximum capacity (Macedonia, 2011d, p. 3).

The compound also includes two cauldrons that are used to burn small arms ammunition.¹⁵¹ The MoD reports that the cauldrons are used to burn ammunition of up to 12.7 mm in calibre (Macedonia, 2011c, slide 21). Ammunition of a higher calibre (such as 14.5 mm) is reportedly dismantled into its constituent elements. The powder and primers are incinerated in the cauldron and metal scrap is reportedly recycled.¹⁵² Three litres of fuel are used to burn 30,000 bullets in approximately one hour, at a cost of approximately MKD



OD preparation. © Macedonian EOD team, 2011

1,080 (USD 23) (Macedonia, 2011d, p. 2; 2011e, slide 6). It is unclear whether the ammunition is dismantled in Krivolak or Erebito (see next section).

National industrial demilitarization plants

In its reply to the 2011 Small Arms Survey PSSM questionnaire the Macedonian MoD notes that the ARM's demilitarization facility is located in the Erebito military compound and storage complex near Tetovo (Macedonia, 2011d, pp. 1–2). The facility reportedly includes storage depots and warehouses for ammunition and gunpowder, a compressor station, a 'delaboration' dismantling plant, and a workshop dedicated to the repair of wooden packaging (Macedonia, 2011c, slide 4).

The Erebito facility also stores ammunition awaiting demilitarization and reportedly has a maximum storage capacity of 7,900 m² (Macedonia, 2011d, pp. 1–2). Macedonia's EOD team leader confirmed on 17 September

2011 that the Erebino warehouse was stocked to 90 per cent of its maximum storage capacity.¹⁵³ Macedonia reports that as at May 2011 the occupied storage space for all MoD sites combined was around 60 per cent of total storage capacity (Macedonia, 2011c, slide 19; 2011a).

The Macedonian MoD's response to the Small Arms Survey PSSM questionnaire did not indicate whether R3 techniques are used to reduce destruction costs by selling scrap metal, propellants, and explosives resulting from the dismantling process. The MoD's presentation to the regional conference Towards a Sustainable Solution for Excess Weapons and Ammunition highlighted that Erebino is not equipped to melt out and recycle explosives, which suggests that R3 processes are currently not employed in the plant (Macedonia, 2011c, slide 21). According to an ITF expert, only metal scrap is currently recycled, whereas explosives and propellants are not. There is currently no melting out equipment in Macedonia: the MoD is reportedly considering the purchase of equipment to melt out TNT-based explosives.¹⁵⁴

In the Small Arms Survey PSSM questionnaire the MoD hints that an explosive melting/recycling line (RDX and TNT) is being set up in the Erebino disposal facility.¹⁵⁵ The MoD did not estimate the new line's potential capacity (Macedonia, 2011d, p. 2).

Commercial industrial demilitarization plants

In its reply to the 2011 Small Arms Survey PSSM questionnaire the Macedonian MoD did not comment on the capacities of commercial demilitarization companies. When asked to describe Macedonia's private and semi-private demilitarization companies and their capacities in the questionnaire, the MoD replied that these companies were 'not [within its] responsibility' (Macedonia, 2011d, p. 2).

Training and personnel

In its reply to the 2011 Small Arms Survey PSSM questionnaire the Macedonian MoD reports that the Training Command and the Military Academy have developed a specific training programme for ammunition and armament storage and destruction (Macedonia, 2011d, p. 3).

The MoD reports that it allocates around MKD 60,000 (USD 1,350) annually for the training of personnel in the Training Command, but it is not clear whether this sum is attributed exclusively to demilitarization, stockpile maintenance, or security personnel (Macedonia, 2011d, p. 3).

Macedonia's EOD team leader reported that the priority was to develop a pool of EOD instructors to train EOD teams according to NATO standards for dealing with improvised explosive devices and provide combat support to entities of the ARM.¹⁵⁶ The MoD reports a training gap for courses for the destruction of missiles (Grad, Šturm, Igla SA-18, OFAB-100, OFAB 250, S-8, etc.) (Macedonia, 2011d, p. 3).

If an explosive melting/recycling line is indeed being set up in the Erebino disposal facility, then the plant's staff will also need to be trained accordingly.

Demilitarization challenges and capability gaps

The following sections consider technical capability gaps, and national and regional factors that restrict Macedonia's national demilitarization efforts.

Technical

In its response to the 2011 Small Arms Survey PSSM questionnaire the Macedonian MoD reports that the ongoing destruction of 152 Šturm (9M114) missiles is an immediate surplus destruction priority (Macedonia, 2011d, p. 3). Macedonia's EOD team leader confirmed on 17 September 2011 that the destruction of this ordnance was planned for 24–28 October 2011.¹⁵⁷

Although the Macedonian MoD reportedly contracted the RONCO Consulting Corporation¹⁵⁸ to destroy Strela-2M MANPADS systems in Mushanci (Macedonia, 2011d, p. 2), ARM EOD teams have indicated that they too can and do destroy shoulder-launched rocket systems and MANPADS using OD. Moreover, Macedonia had, and still has, production capacity for shoulder-launched rocket systems such as the Zolja. In all likelihood, then, it has the knowledge and capabilities to demilitarize them, either partially or entirely.¹⁵⁹



M114 Šturm missiles before destruction. © Macedonian EOD team, 2011.

National and regional

When asked in the 2011 Small Arms Survey PSSM questionnaire whether Macedonia had ever used or considered using or collaborating with other demilitarization facilities in the region, the Macedonian MoD confusingly replied that this was ‘not [within its] responsibility’ and that its facilities provided it with sufficient demilitarization capacity (Macedonia, 2011d, p. 2). 📄

Montenegro

Background

The following sections consider the role that the Montenegrin small arms and light weapons industry has played in setting up the country's national demilitarization apparatus and highlight the country's past demilitarization accomplishments.

Small arms and light weapons industry

Before the break-up of Yugoslavia in the 1990s the Montenegrin arms industry produced ordnance, energetics, and ammunition on behalf of the Yugoslav National Army,¹⁶⁰ such as:

- deep-sea mines in Opatovo (the current status of the production facility is unclear);
- plastic-bonded explosive PEP 500 in Poliex-Berane (see section on 'Commercial industrial demilitarization plants', below). The main explosive ingredient—pentaerythritol tetranitrate (PETN)—was produced by PRVA ISKRA Barič in Serbia and the synthetic plastic binder was produced in Bosnia. In the former Yugoslavia, what is now known as the Poliex facility was initially established to produce plastic-bonded explosives based on PETN and synthetic binder. For this reason, the factory possessed adequate storage capabilities for raw materials and final products, drying facilities, plastic explosives production lines, and mixers, as well as its own OB/OD site—all of which were easily converted for demilitarization processes; and
- anti-hail rockets in two facilities: Podgorica and Opatovo.¹⁶¹

Past accomplishments

A Technical Agreement (TA) was signed in 2007 between the US Department of State and the Montenegrin MoD. It foresees the destruction of surplus

ammunition from the MoD, and surplus weapons and ammunition held by the police (Lazarevic, 2010, p. 11).¹⁶² As at May 2011 approximately 900 tonnes of weapons and ammunition had reportedly been demilitarized out of the total 1,888 tonnes initially earmarked (Montenegro, 2011d, slide 7). On 31 October 2011 the US ambassador to Montenegro and Montenegro's minister of defence signed an annex to the TA, thereby approving additional US government funds for the programme, which is to be completed by October 2012 (USDoS, 2011).

In addition to the TA, the Montenegro Demilitarization Programme (MONDEM), a joint project of the Montenegrin MoD, the OSCE, and UNDP, completed the disposal of toxic hazardous waste¹⁶³ and the demilitarization of 1,025 pieces (approximately 3,300 tonnes) of conventional (i.e. heavy) weaponry (Montenegro, 2011a, slide 17; 2011d, slide 10). More than 1,300 tonnes of surplus ammunition were earmarked for demilitarization in two phases (Montenegro, 2011d, slide 12). The first phase, supported by 12 donor states and conducted by UNDP and the MoD, had destroyed 430 tonnes as at November 2010. Phase II of MONDEM would still need to destroy 870 tonnes (Montenegro, 2011b, slide 15), but at the time of writing the programme was currently on hold due to funding shortages.¹⁶⁴

The MoD approves the technical procedures for dismantling or destruction carried out under MONDEM and supervises the process. In the framework of the TA, destruction procedures are under the exclusive jurisdiction and responsibility of the contractors and subcontractors, but the MoD nevertheless maintains access to the process (Montenegro, 2011c, p. 7).

Current demilitarization capacities

As at May 2011 the Montenegrin MoD, the TA process, and MONDEM had destroyed approximately 1,497 tonnes of ammunition since 2006 (see Table 31).

Over more than five years (2006–May 2011) this implies an average annual demilitarization capacity of approximately 300 tonnes of ammunition.

The Montenegrin government finances the destruction of unstable, critical ammunition and propellants,¹⁶⁵ yet the country's ammunition demilitarization

Table 31 Ammunition demilitarized in Montenegro, 2006–May 2011 (tonnes)

	Planned	Executed
Montenegrin MoD	—	174.76
MONDEM	1,302	430.43
TA process	1,888	892.29
Total	3,190	1,497.48

Source: Montenegro (2011b, slides 3, 16; 2011c, p. 2)

Table 32 Weapons demilitarized in Montenegro, 2006–May 2011 (pieces)

	Planned	Executed
MONDEM	883	825
TA process	200	200
German Embassy assistance	495	495
Total	1,578	1,520

Source: Montenegro (2011b, slide 5; 2011c, p. 2)

capacity seems limited: apparently fewer than 200 tonnes had been destroyed as at May 2011 in factories in Montenegro using government funding (Montenegro, 2011d, slide 6). The MoD estimates that at the current rate it will take 15 years to destroy Montenegro's remaining 4,500 tonne ammunition surplus (Montenegro, 2011b, slide 16).

Similarly, as at May 2011, 1,520 weapons had been destroyed since 2006 via the TA process, via MONDEM, and with the assistance of the German Embassy (see Table 32). It is, however, unclear what the term 'weapons' comprises in the various documents. Apparently the figure includes small arms and light weapons as well as heavy conventional weapon systems such as tanks (Montenegro, 2011d, slide 4).

Over more than five years (2006–May 2011), this implies an average annual demilitarization capacity of approximately 300 weapons.

Both averages show that Montenegro's demilitarization capacity is heavily dependent on MONDEM, the TA, and external donor funding in general. The MoD lacks the funds to develop its own demilitarization capacity in the near future or mid-term and will therefore look for regional cooperation opportunities.

Open burning and open detonation

The US-funded TA was initially based almost exclusively on OB/OD.¹⁶⁶ It was also used to destroy ordnance that was not earmarked for destruction under the MONDEM programme.¹⁶⁷

In its response to the 2011 Small Arms Survey PSSM questionnaire the Montenegrin MoD did not estimate its national OB/OD capacity. So far, surplus ordnance has been destroyed at the Golija, Praga, and Pusti Lisac demolition ranges. To select new OB/OD sites, the MoD sets up an ad hoc commission (Montenegro, 2011c, p. 1).

National industrial demilitarization plants

In 2007 UNDP Montenegro and SEESAC's Ammunition Technical Assessment (ATA) determined that only three licensed facilities were potentially suitable to develop an 'indigenous' demilitarization capacity: the Booster Company in Nikšić, the Poliex Military Facility in Berane, and the 4th November Military Facility¹⁶⁸ in Mojkovac (SEESAC, 2007, Table 8). The Zeljezara-Nikšić smelter, reportedly used in May 2003 by the Ministry of Internal Affairs to destroy more than 5,000 small arms at a cost of USD 5 per weapon destroyed (Florquin and O'Neill Stoneman, 2004, p. 35), was deemed capable of handling the resultant scrap processing (SEESAC, 2007, pp. 12–13).

Commercial industrial demilitarization plants

Montenegro does not have any fully government-owned demilitarization facilities. Instead, surplus ammunition demilitarization is outsourced to two joint-stock companies and ammunition producers: Tara-Aerospace and Defence Products in Mojkovac, and Poliex in Berane.

- Tara-Aerospace and Defence Products (32 per cent owned by the Swiss company BT International and 34 per cent by the state of Montenegro) in Mojkovac can destroy pyrotechnic mixtures, primers, small-calibre ammunition, and various types of 'special' ammunition (Montenegro, 2011c, p. 5). Referred to in the 2007 ATA as the 4th November Company, the plant was earmarked to demilitarize low-explosive-content ammunition with a

transportable EWI—ostensibly because storage capability precluded the storage of commercially viable quantities of medium- or large-calibre ammunition (SEESAC, 2007, p. 12).

- Poliex (46.4 per cent state-owned), founded in 1982 and located 13 km from Berane, can destroy all types of ammunition and reportedly has the greatest potential as a regional facility (Montenegro, 2011c, p. 5). The 2007 ATA reported that the plant ‘has experience in dealing with RDX (Hexogen), PETN and Ammonium Nitrate’ and proposed that the facility be equipped to ‘support reverse assembly, pull-apart or remote cutting, to breakdown cannon, medium and large calibre ammunition prior to TNT recovery’, as well as to demilitarize large-calibre naval ammunition (SEESAC, 2007, pp. 11–12, 15).

MONDEM used both companies to destroy 430 tonnes of ammunition during the first phase of its programme. The Government of Montenegro financed the destruction of about 175 tonnes of ammunition in critical condition (Montenegro, 2011c, p. 5; 2011d, slide 13). According to the MoD, the combined destruction capacity of the two plants is more than 1,500 tonnes per year. As at May 2011 they were not being used due to a lack of funding (Montenegro, 2011c, p. 6).

- The Booster company in Nikšić is an entirely private enterprise engaged in demilitarization. It will probably be subcontracted for the implementation of the destruction of surplus ammunition within the framework of the TA, funded by the US government. So far under this programme nearly 900 tonnes of surplus ammunition have been destroyed (Montenegro, 2011c, pp. 5–6). The facility was built following the destruction of a plant in Vir due to an unplanned explosion in 2006.¹⁶⁹ The 2007 ATA highlighted the Nikšić facility’s limitations on explosive limit licences, but also noted that the plant’s demolition area was adequately located in the mountains away from any population (SEESAC, 2007, p. 11). Booster’s demilitarization capacity is not known.

All three plants reportedly have available destruction capacity (Montenegro, 2011c, p. 6).

Training and personnel

The Montenegrin MoD reports that its logistics staff are not sufficiently trained, particularly in the fields of NATO logistics procedures (standards pertaining to storage and maintenance) and the English language (Montenegro, 2011a, slide 27). The MoD does not have technical training programmes for demilitarization and does not directly allocate a budget for this training. Training, however, is undertaken in the MONDEM framework (Montenegro, 2011c, p. 8) and is also provided by NATO (Montenegro, 2011a, slide 19).

Demilitarization challenges and capability gaps

The following sections consider the technical capability gaps, and national and regional factors that restrict Montenegro's national demilitarization efforts.

Technical

Montenegro has destroyed all of its cluster munitions (Landmine and Cluster Munition Monitor, 2011). According to the MoD, improving the country's indigenous demilitarization capacity will now require addressing the following challenges (Montenegro, 2011a, slide 18; 2011c, p. 7):

- There is an obvious lack of government funds assigned to demilitarization.
- A considerable quantity of ammunition must be demilitarized by OB/OD. So far, surplus ordnance has been destroyed at the Golija, Praga, and Pusti Lisac polygons (Montenegro, 2011c, p. 1), but difficulties have been experienced in finding an appropriate OB/OD demolition polygon following civilian protests.
- Local demilitarization companies are developing slowly and there is a general lack of dismantling equipment. As at December 2011 there are too few capabilities for melting out TNT from the ammunition. Poliex-Berane has significant demilitarization capabilities that could easily be enhanced if funds are made available.¹⁷⁰

- Montenegro has its own propellant master-sample collection facility located in Sasovići-Zelenika. However, the facility can only conduct basic analysis (heat treatment at 100 °C) and instrumental analysis needs to be carried out in Serbia, which keeps certain propellant lots in Montenegro due to its Mediterranean climate. There is also a lack of trained personnel to carry out propellant analysis.¹⁷¹
- There is no capacity to destroy large quantities of ammunition containing WP,¹⁷² sea mines, and torpedoes. Sea mines comprise complex chemical components and about 300 kg of explosives each. Navy torpedoes weigh 500 kg each and contain 350 kg of explosives.¹⁷³

The MoD has not had the opportunity to use a mobile ammunition disassembly plant, but believes that it would be useful, especially for certain types of ammunition that it does not have the capacity to destroy (Montenegro, 2011c, p. 7).

National

Montenegro actively participated in all four RASR workshops. The MoD also organizes regular donor conferences¹⁷⁴ and involves the media to inform the public about issues related to overstocked ammunition depots and refurbishment programmes such as Taraš (Montenegro, 2011c, p. 7; SEESAC, 2011d).

Despite efforts to improve initial public outreach, the MoD struggled to find appropriate demolition polygons outside of populated areas where detonations can safely take place. For example, a Survey researcher travelled to Montenegro from 9 to 13 August 2010 and visited the Brezavik demolition polygon in the Golija region during an MoD surplus destruction campaign that had started in July. The local people blocked roads with stones and trees and generally tried to prevent the MoD from accessing the destruction site (King and Diaz, 2011, Box 1.3). No destruction took place during the researcher's visit. Recurrent protests and demonstrations against OB/OD campaigns have shown that the topic remains sensitive in the eyes of the Montenegrin population.

Regional

As at May 2011 Montenegro had not used other demilitarization centres in the region to destroy its surplus ordnance, but expressed great interest in a regional approach to PSSM (Montenegro, 2011c, p. 6).

The MoD is willing to consider regional cooperation regarding:

- ammunition stability inspections;
- the dismantling of complex sorts of ammunition;
- the exchange of surplus vehicles and weapons spare parts;
- standardization and codification; and
- logistic personnel training in the field of NATO logistical procedures (Montenegro, 2011a, slide 26). 🇲🇪

Romania

Background

The following sections consider the role that the Romanian small arms and light weapons industry has played in setting up the country's national demilitarization apparatus and highlight the country's past demilitarization accomplishments.

Small arms and light weapons industry

During the cold war the Romanian arms industry produced most of the country's military equipment and also generated significant arms export revenues. According to Faltas and Chrobok (2004, p. 87), Romania ranked as the ninth-largest arms exporter in the world in the early 1980s. The country's arms industry declined substantially after the cold war. Today it is still represented by two state-owned companies, namely the national company ROMARM SA and the trade company Romtehnica, which promotes Romanian-manufactured defence products (Wood, 2007, p. 12).

According to the NATO Industrial Advisory Group's 2010 report (NIAG, 2010, p. 64), ROMARM also represents Romania's main demilitarization capacity. The company is a holding structure with 100 per cent Romanian state-owned capital, under the authority of the Ministry of Economy and Commerce (ROMARM SA, n.d.).

Past accomplishments

As mentioned in the first RASR *Special Report* (Gobinet, 2011, p. 100), surplus stockpile figures appear erratically in Romania's reports to the UN Programme of Action to Prevent, Combat and Eradicate the Illicit Trade in Small Arms and Light Weapons in All Its Aspects. In its 2003 report Romania indicated that it was in the process of destroying 195,510 small arms and light weapons and 36,692,747 pieces of ammunition with financial support from

Norway, the United Kingdom, and the United States. ROMARM was reportedly responsible for the destruction programme (Romania, 2003, p. 10).

These surplus figures were similar to those appearing in a contract that ROMARM signed with the US Department of State in 2002.¹⁷⁵ The contract was reportedly for the destruction of almost 200,000¹⁷⁶ small arms and light weapons (including pistols, sub-machine guns, machine guns, grenade launchers, and mortars), 1,281,524 pieces of 7.62 mm ammunition, and 62,400,000 pieces of 7.92 mm ammunition (Faltas and Chrobok, 2004, p. 94). According to Faltas and Chrobok (2004, p. 94), one condition for funding the project reportedly laid down by the United States was ‘the use of a private company to undertake destruction using existing industrial facilities’. ROMARM, however, is a state-owned (and thus not private) conglomerate.

There is very little open source information available regarding recent Romanian demilitarization contracts and activities. The response of the Romanian Ministry of National Defence (MoND) to the 2011 Small Arms Survey PSSM questionnaire mentions the existence of a Multiannual Programme for Ammunition Demilitarization 2009–2015, without providing further details. It does not indicate whether the MoI coordinates its PSSM and destruction activities with the MoND (Romania, 2011, p. 4).

Current demilitarization capacities

A Romanian submission to the OSCE Information Exchange on Small Arms and Light Weapons 2002 (cited in Faltas and Chrobok, 2004, p. 93) in summary describes the procedures followed by the MoND and MoI to destroy small arms and light weapons. This reportedly includes stripping weapons of all non-metallic parts, heating the receiver with an oxyacetylene torch, crushing the receiver and barrel with a hydraulic press, and transporting metal scrap to a smelter for melting and recycling (Faltas and Chrobok, 2004, p. 93).

In its reply to the 2011 Small Arms Survey PSSM questionnaire the MoND reports that Romania ‘has the necessary facilities [to demilitarize all the weapons] and ammunitions that became dangerous in using or storing’ (Romania, 2011, p. 4).

Since April 2010 new legislation (no further details were provided) apparently allows the Romanian MoND to send weapons and ammunition earmarked for demilitarization to national defence industry companies 'without funds assignment (free of charge)' (Romania, 2011, p. 4). It is not clear how these companies finance the demilitarization they carry out, but the MoND reports that 'there have been no major gaps in this process since we had the possibility to send these goods to the defence industry companies' (Romania, 2011, p. 4).

Open burning and open detonation

In its response to the 2011 Small Arms Survey PSSM questionnaire the Romanian MoND did not estimate the country's overall OB/OD capacity.

National industrial demilitarization plants

According to the 2010 NIAG report (p. 64), the various subsidiaries of the ROMARM group can demilitarize:

- small arms and medium-calibre ammunition: 5.45–35 mm ammunition;
- 57–203 mm artillery ammunition (including the recovery of explosives (TNT) from 57–152 mm projectiles);
- missiles;
- HE projectiles and landmines; and
- fuses, anti-personnel/anti-tank mines, detonators, detonating cord, explosives, and propellants.

The following selected subsidiaries produce a wide range of ammunition, but also carry out demilitarization activities on behalf of ROMARM:

- SC UPS Dragomiresti SA can set up demilitarization lines for artillery projectiles of 57–240 mm calibre (UPS Dragomiresti, 2011).
- SC TOHAN SA Zarnesti currently dismantles and demilitarizes medium-calibre and artillery ammunition between 25 mm and 155 mm. The plant's capacity varies according to the nature of the contract, but in a fax exchange¹⁷⁷ TOHAN reported that it can process up to 4,000 tonnes of am-

munition per year. TOHAN, like most of the state-run companies, is a branch of ROMARM, but the plant works predominantly with the Romanian MoD.

- SC Uzina Mecanică Sadu SA is a Romanian defence plant located in Gorj county, southern Romania, that specializes in producing infantry small arms ammunition.¹⁷⁸ UM Sadu is a branch of ROMARM SA and entirely owned by the state. Funding comes from the Romanian state, including contracts with Romtehnica. The plant has also reportedly received donor funding from other countries, including Sweden, Norway, and the United States, to demilitarize Romanian surplus ordnance. The company website does not mention any demilitarization activity, but the plant destroys and demilitarizes ammunition that it produced itself: daily destruction capacity is approximately 10 tonnes, but this varies depending on the amount and calibre of the ammunition being processed. The plant does not demilitarize small arms and light weapons. It suffered an explosion on 11 February 2011 that killed two people and injured one (Mediafax, 2011).

Commercial industrial demilitarization plants

In its reply to the 2011 Small Arms Survey PSSM questionnaire the MoD reports that '[t]he civilian Romanian companies specialized in ammunition and armament demilitarization are under coordination of the Ministry of Economy, Trade and Affairs, which have information related to their infrastructure' (Romania, 2011, p. 4). This should probably be interpreted to mean that industrial demilitarization contractors are not within the responsibility of the MoND, but under the Ministry of Trade. The ROMARM subsidiaries that undertake demilitarization remain state owned.

Open source research reveals the existence of at least one fully private demilitarization company: the main activity of SC Uzina Mecanică Băbeni is the demilitarization of small arms and light weapons, conventional weapons systems, and their ammunition.¹⁷⁹ UM Băbeni reportedly receives fewer contracts from the Romanian state than a ROMARM subsidiary, but makes up for it by operating as a subcontractor for larger demilitarization companies such as MAXAM Europe. The plant's daily processing capacity fluctuates

between 20 and 100 tonnes, depending on the weight and type of ammunition and weapons it is processing.

Training and personnel

In its response to the 2011 Small Arms Survey PSSM questionnaire the Romanian MoND reports having its own training programmes for demilitarization, stocks maintenance, and storage security (Romania, 2011, p. 4).

Demilitarization challenges and capability gaps

The following sections consider the technical capability gaps, and the national and regional factors that restrict Romania's national demilitarization efforts.

Technical

In its response to the 2011 Small Arms Survey PSSM questionnaire the Romanian MoND indicates that they do not consider the use of mobile ammunition disassembly plants to be an opportunity for the Romanian Army (Romania, 2011, p. 4).

National and regional

In its response to the 2011 Small Arms Survey PSSM questionnaire the Romanian MoND reports that Romania does not export surplus ordnance for disposal abroad and that the 'MoND has not been involved in other regional agreements yet because it was not [considered to be] an opportunity for the Romanian Army' (Romania, 2011, p. 4).

The MoND considers that the companies—it is unclear whether reference was made to national plants or to private companies —'could extend their processing capacity due to demands and could be used as a regional hub for demilitarization and disposal of ammunition' (Romania, 2011, p. 4). 📄

Serbia

Background

The following sections consider the role that the Serbian small arms and light weapons industry has played in setting up the country's national demilitarization apparatus and highlight the country's past demilitarization accomplishments.

Small arms and light weapons industry

Serbian demilitarization activities are closely linked to small arms and light weapons and ammunition production plants.

Leading Serbian defence companies have traditionally included:

- ZASTAVA ORUŽJE, Kragujevac;
- PRVI PARTIZAN, Užice;
- SLOBODA, Čačak;
- MILAN BLAGOJEVIĆ, Lučani;
- UTVA, Pančevo;
- TRAYAL, Kruševac;
- PRVA PETOLETKA, Trstenik;
- IRITEL, Beograd;
- MILE DRAGIĆ, Zrenjanin;
- EDEPRO, Beograd;
- KRUŠIK, Valjevo; and
- PRVA ISKRA, Barić (Jandrić, 2009; Davis, 2002, pp. 47–50).

Some of these producers, such as KRUŠIK and PRVA ISKRA, have diversified their portfolio to include demilitarization activities. For instance, the MoD exchanges decommissioned anti-tank mines with PRVA ISKRA, which provides the army with TNT explosive in return (Dragović, 2011).

In the former Yugoslavia, TRZK was the main ammunition refurbishment and demilitarization site. It has retained its role and currently constitutes the

bulk of the Serbian demilitarization apparatus. The plant does not directly produce bulk quantities of new ammunition, but it reportedly produces special-purpose ammunition (quantities unknown) by refurbishing and recycling old ammunition components into cartridges.¹⁸⁰ It also performs a range of additional activities pertaining to the repair, refurbishment, and evaluation of ammunition (Serbia, 2009b, slide 7).

Past accomplishments

Approximately 4,000 tonnes of surplus ammunition have been destroyed annually since 2006 (see Table 33).

Table 33 Annual quantities of surplus ammunition demilitarized by the Serbian MoD, 2006–10 (tonnes)

2006	2007	2008	2009	2010	Total
3,500	3,500	4,500	4,000	4,000	19,500

Source: Serbia (2011a, slide 4)

Table 34 Breakdown of significant quantities of ammunition demilitarized by the Serbian MoD, 2006–10 (pieces)

Ammunition type	Quantity (pieces)
Anti-tank mine TMM-1	53,089
Mortar shell 60 mm	22,716
Rifle grenade M57	54,912
Artillery ammunition 82 mm	25,683
Artillery ammunition 90 mm	49,210
T-55 tank gun ammunition 100 mm	44,316
Artillery ammunition 100 mm for T-12 gun	33,158
Artillery ammunition 105 mm	18,453
Artillery ammunition 122 mm for D-30 howitzer	7,830
Artillery ammunition 130 mm	5,887
Aerial bombs	3,528

Source: Serbia (2011a, slide 5)

The figures presented by the TRZK representative at the 11th South-East Europe Clearinghouse Conference, Belgrade, in May 2011 differ slightly:

3,000 tonnes in 2006, 4,200 tonnes in 2007, and a total figure of 19,700 tonnes for the same period (Serbia, 2011b, slide 5). Table 34 breaks down these averages by ammunition type.

In its response to the 2011 Small Arms Survey PSSM questionnaire the MoD did not provide figures for small arms and light weapons destruction. Serbia's MoI reportedly destroyed approximately 27,000 surplus and confiscated weapons in 2009 and 28,285 in 2010 with the assistance of SEESAC and the EU (Karadaku, 2011).

Current demilitarization capacities

The Serbian MoD estimates its total annual destruction capacity for surplus weapons and ammunition at approximately 5,000 tonnes, with a possibility of increasing this to 8,000–10,000 tonnes (Serbia, 2011d, p. 3). It is unclear whether this involves OB/OD potential, but the figures seem to indicate that Serbian facilities currently have plenty of demilitarization potential still available and that the Kragujevac plant can expand its activities. According to the MoD, Serbia will solve its surplus problem within two years (Serbia, 2011c, slide 14; Dragović, 2011).

Open burning and open detonation

OB/OD is used as a demilitarization method in Serbia, but the MoD clearly advertises the country's industrial dismantling and recycling capacity (Serbia, 2009b, slide 4).

National industrial demilitarization plants

The MoD's TRZK is Serbia's main demilitarization facility and also acts as a training facility and national testing laboratory (Serbia, 2009b, slide 7).¹⁸¹ The plant carries out ammunition surveillance tests, supported by software developed in-house. Propellant master samples are located at TRZK. Experienced staff are able to carry out propellant stability tests at the plant's laboratory according to the latest NATO standards. The service is provided for the Serbian and Montenegrin armed forces, but recently Serbia offered to share its data for propellant stability with other nations in the region on request.¹⁸²

TRZK's demilitarization capacity is estimated to be 3,000–4,000 tonnes of ammunition per year (Serbia, 2011b, slide 5; see Table 35). It cannot yet process G-class and H-class (WP) ammunition, of which Serbia still had approximately 1,300 tonnes in May 2009 (Serbia, 2011c, slide 14; 2011d, p. 4; 2009b, slide 5).¹⁸³ The plant incorporates R3 techniques to reduce destruction costs and directly reinvest the profits into destruction. Explosives can, for instance, be recycled for industrial use (Serbia, 2011d, p. 2).

Table 35 Serbia: TRZK's demilitarization capabilities, 2011

Type of ammunition	Output (pieces/8 hours)
Rounds up to 14.5 mm	5,000–20,000
Anti-aircraft ammunition 20–57 mm	1,000–3,000
Mortar shells 60–240 mm	500–3,000
Artillery ammunition 57–203 mm	500–1,000
Hand grenades	5,000
Rifle grenades	1,000–1,500
Anti-tank mines	500–1,000
Anti-personnel mines	2,000–3,000

Source: Serbia (2011a, slide 3; 2011c, slide 14; 2011d, para. V-A; 2009b, slide 8).

Serbia has repeatedly highlighted that the TRZK plant is underutilized and that it can at least double its capacity to anywhere between 6,000 tonnes per year (Serbia, 2011b, slide 13) and 8,000–10,000 tonnes per year (Serbia, 2011d, p. 3) by opening additional demilitarization lines that could potentially process even WP and cluster munitions. The most significant improvements would concern the demilitarization of calibres less than 30 mm (see Table 36).

Economies of scale would also reduce TRZK's demilitarization costs from the current EUR 780 (USD 1,084) per tonne to EUR 460 (USD 639) per tonne (Serbia, 2011a, slide 13). The plant therefore has the will and potential to expand nationally and regionally, but has so far lacked the necessary funding to do so. However, in February 2012 the Serbian MoD, the head of the OSCE Mission to Serbia, and the UN resident coordinator in Serbia reportedly signed a cooperation protocol according to which foreign donors will invest USD 11 million for ammunition storage and disposal over the next five years.

Table 36 Serbia: projected TRZK demilitarization capabilities

Ammunition types and calibre	Current	Current	Projected
	pieces/shift	tonnes/shift	tonnes/shift
Ammunition 7.62 & 7.9 mm	20,000	0.65	5
Ammunition 12.7 & 14.5 mm	4,000	0.72	5
Anti-aircraft ammunition 20 mm	2,500	0.87	3
Anti-aircraft ammunition 23 mm	1,800	0.9	3
Anti-aircraft ammunition 30 mm	1,200	2	2
Artillery ammunition 57 & 76 mm	1,000	10	10
Artillery ammunition 100 mm	500	20	20
Artillery ammunition 105 mm	500	14	14
Artillery ammunition 122 mm	500	18	18
Artillery ammunition 130 mm	400	35	35
Artillery ammunition 155 mm	350	21	21
Mortar bombs 60 mm	3,000	7.5	7.5
Mortar bombs 82 mm	2,000	12	12
Mortar bombs 120 mm	1,000	18	18
Hand grenades	4,000	2	2
Rifle grenades	1,000–1,500	1–1.5	1–1.5
Anti-tank mines	500–800	4–6	4–6
Anti-personnel mines	2,000–3,000	1–2	1–2

Note: If the plant were to increase its capacity, the most significant improvements would be in the demilitarization of calibres less than 30 mm (first four rows of the table).

Source: Serbia (2011b, slide 11; 2011a, slide 12)

A portion of these donor funds will contribute to strengthening TRZK’s demilitarization capabilities (Tanjung, 2012).

It is not clear whether the plant’s technical and safety compliance has been independently assessed. NATO and EU officials reportedly visited the site, but at the time of writing it had yet to receive any sort of official international certification.¹⁸⁴ Environmental compliance specifically seems to be a preoccupation, given the extent of the investments needed to bring the plant up to standard (see section on ‘Technical gaps’, below).

In addition to TRZK, two other facilities perform demilitarization in Serbia (Serbia, 2011b, slide 5; 2011d, p. 3; 2009b, slide 9):

- PRVA ISKRA in Barić demilitarizes all surface-to-air missiles and artillery projectiles, aerial bombs, and anti-tank and anti-personnel mines, and recycles TNT-based explosives for the civil market in cooperation with TRZK. PRVA ISKRA has larger TNT melting-out capabilities and has the necessary equipment to clean recovered TNT and bring it to meet the military standard, if required. Recovered TNT is used for commercial purposes. The company can also reclaim other types of explosives, such as RDX and cyclotetramethylene-tetranitramine (HMX). An ammonium nitrate/fuel oil production site is located inside the facility.¹⁸⁵
- KRUŠIK in Valjevo disassembles surface-to-air and anti-tank missiles.

It is unclear whether the two facilities have available demilitarization capacity. According to the MoD, the annual costs of a demilitarization facility are around EUR 3 million (USD 4.2 million) (Serbia, 2011d, p. 2).

Commercial industrial demilitarization plants

PRVA ISKRA and KRUŠIK are understood to be majority state owned, but the details of ownership are unclear. According to the questionnaire returned by the Serbian MoD, 'there are no private[ly]-owned companies dealing with demilitarisation of ammunition' (Serbia, 2011d, p. 3). This must probably be interpreted to mean that no completely private contractors are carrying out demilitarization activities on behalf of the Serbian MoD.

Training and personnel

Serbia provides technical training programmes for demilitarization and stockpile security personnel at its Military Academy, within units of the Serbian Armed Forces, and in TRZK's Technical Repair Facility. Training for the demilitarization of cluster munitions is not provided, however. In its response to the 2011 Small Arms Survey PSSM questionnaire the Serbian MoD reports that assistance would be needed in this regard (Serbia, 2011d, p. 4).

Demilitarization challenges and capability gaps

The following sections consider the technical capability gaps, and the national and regional factors that restrict Serbia's national demilitarization efforts.

Technical

Serbia cannot process H-class (WP) and cluster ammunition (Serbia, 2011d, p. 4; 2011c, slide 14).¹⁸⁶ The MoD has expressed its willingness to address both gaps regionally, i.e. fund transport to and demilitarization by neighbouring countries with existing capacity (Serbia, 2011c, slide 16) or develop its own capacity as a regional demilitarization hub for H-class and cluster ammunition (Serbia, 2011c, slide 17).

Serbia has not rented or used a mobile ammunition disassembly plant, but has expressed an interest in using one to dispose of its stockpile containing WP (Serbia, 2011d, p. 4). Serbia has one of the biggest stockpiles of WP ammunition in the region; establishing a specific line might require too much investment, therefore a mobile plant is likely to be the best option.

The current demilitarization infrastructure demands two kinds of upgrade: the automation of various hazardous operations needs to be increased and much of the infrastructure does not meet environmental standards (Serbia, 2011d, p. 4). This latter issue is where most of the funds will most likely go when international assistance is received.

In order to develop TRZK into a regional demilitarization facility a number of upgrades have to be made to make the plant comply with environmental standards. The MoD provided the following indicative procurement prices in 2009:

- A stationary thermal disposal plant costs EUR 8 million (USD 10.95 million).
- A containerized thermal disposal plant costs EUR 3 million (USD 4.1 million).
- Procurement of shell-cutting (water jet or saw) and explosive washing-out equipment (explosive water-jet extraction for explosives that cannot be melted out, i.e. RDX-based) was estimated at EUR 1.1 million (USD 1.51 million).¹⁸⁷

- Supervision and verification equipment for fulfilling ecological norms was estimated at EUR 600,000 (USD 821,000).
- The cost of equipping the regional ammunition demilitarization training centre was estimated at EUR 150,000 (USD 205,000) (Serbia, 2009b, slide 10).

In 2011 the MoD estimated the costs of adapting the TRZK plant to proper environmental standards at EUR 5.75 million (USD 7.696 million) (see Table 37).

Table 37 Serbia: breakdown of funds needed to adapt the TRZK plant to environmental norms in 2011 (EUR*)

Costs of the items	Amount (pieces)	Costs per item	Total costs
Equipment for the ecological destruction of ammunition and their elements (unspecified)	1	2,000,000	2,000,000
Equipment for the ecological destruction of gunpowder and explosive material (unspecified)	1	1,250,000	1,250,000
Equipment for the demilitarization of explosive fillings/substances with water and high pressure (steam) (unspecified)	2	300,000	600,000
Total financial needs			3,850,000
Construction of infrastructure for preparing the location			400,000
Delivery of equipment			150,000
Technological support, tools, and software support			350,000
Reserve pieces and reserve filters			440,000
Assembly and testing of the equipment			440,000
Training and technical support			120,000
Total			5,750,000

* EUR 1 = USD 1.3385

Source: Serbia (2011a, slide 11 (trans.))

National and regional

Serbia has not shipped surplus ordnance to foreign countries for disposal and has reportedly never used a demilitarization facility in a neighbouring country (Serbia, 2011d, p. 3).

Instead, the MoD is now advocating that TRZK's experience, workforce, infrastructure, capacities, and geography would make it an ideal SEE demilitarization hub (Serbia, 2011b, slides 9, 10) in the next two or three years. Regional practitioners did not reject this option, but face the prospect of having to convince their respective governments to destroy their surplus elsewhere and not on their own territory at times when work is scarce and unemployment is high.

Serbia and Montenegro already collaborate on a number of projects. TRZK runs propellant tests on Montenegrin stockpiles once a year and sends results back to Montenegrin officials. This type of collaboration could be extended to increase the consistency of chemical testing throughout SEE. PIB was mentioned as a Serbian facility that could potentially process Montenegro's surplus sea mines (see Montenegro section, above).¹⁸⁸

The problem has thus mainly been financial, yet the prospect of donor funds for 2012 may pave the way for significant technical upgrades of TRZK (Tanjung, 2012). It remains to be seen whether the plant—which functions as a military unit—will be given the leeway to adapt to the constraints of a regional or international demilitarization market.¹⁸⁹ 📄

Slovenia

Background

Slovenia's small arms and light weapons industry has played a partial role in setting up the country's current national demilitarization apparatus. The best example lies in the company Skupina KIK Kamnik d.d., a Slovenian explosives manufacturer, which runs a facility located in Skopice (Brežice). Demilitarization activities at this location started after the Second World War. The facility was initially used for the disposal of aerial bombs left at the nearby military air base by the German army. The plant extracted energetic materials out of the ammunition (by melting out TNT) and prepared them for further processing. KIK Kamnik produced different types of industrial explosives and blasting agents. TNT was used in the production of powder explosives and ground gunpowder was used to produce water gel blasting agent. The demilitarization facility remained operational until Slovenia's independence, at which point the lack of raw materials stopped operations. Although there is no evidence of KIK Kamnik being currently active in industrial demilitarization, it reportedly continues to use secondary TNT in the production of powder explosives, based on market demand.¹⁹⁰

The Slovenian company AREX-Šentjernej must also be mentioned. It produces small arms and light weapons, in particular the FN 2000 rifle, as well as other small arms and spare parts in cooperation with the Belgian company FN Herstal. AREX also produces plastic blank ammunition in different calibres for military use.¹⁹¹

Current demilitarization capacities

In its response to the 2011 Small Arms Survey PSSM questionnaire the Slovenian MoD did not report on its estimated annual destruction capacity and did not specify whether this capacity is being fully used. The MoD reports that it 'does not have this kind of information currently. When and if these

data are needed, we acquire them through previously published formal notice call' (Slovenia, 2011, p. 4).

The Slovenian MoD reports that it currently has two contracts for ammunition, rocket, and explosive ordnance destruction (no further information was provided) (Slovenia, 2011, p. 5). The MoD also reports that the financial planning process of the Slovenian Armed Forces (SAF) allows it to 'provid[e] enough means for maintenance and safe operation of capabilities for maintenance of ammunition', which seems to imply that Slovenia covers all of its demilitarization expenses (Slovenia, 2011, p. 4).

Open burning and open detonation

In its response to the 2011 Small Arms Survey PSSM questionnaire the Slovenian MoD reports that the SAF uses and manages the Poček-Zelena dolina demolition range (Slovenia, 2011, p. 3). The MoD does not mention the polygon's explosive capacity. On 18 June 2007 an explosion at the specialized 'Poligon 208' civil defence training and destruction range near Pivka was not a storage accident, but was reportedly caused by the mishandling of triggers and/or fuses during the preparation of fougasse for OD by KIK Kamnik employees (Slovenia, 2011, p. 6).¹⁹²

National industrial demilitarization plants

In its response to the 2011 Small Arms Survey PSSM questionnaire the Slovenian MoD reports that the SAF have the exclusive use of an ammunition maintenance and industrial destruction plant in Borovnica. The plant's capacities are qualified as 'limited and adapted for destroying smaller amounts of ammunition' (Slovenia, 2011, p. 3), but are not specified.

Commercial industrial demilitarization plants

In addition to the SAF's Borovnica facility, the MoD reports that it cooperates with 'firms which apply to formal notice call', i.e. it issues tenders to private demilitarization contractors in Slovenia, the Czech Republic, the Slovak Republic, Italy, and Bulgaria (Slovenia, 2011, p. 4). The MoD does not list the Slovenian companies it has contracted/is contracting, but states that the

supervision [by the MoD] of private demilitarisation companies/factories over ammunition and weapons destruction is included in contract definitions. Supervision [by the MoD] is also conducted over companies which have the license for production of or trade with military weapons and equipment (Slovenia, 2011, p. 5).

Unfortunately, in its response to the 2011 Small Arms Survey PSSM questionnaire the MoD did not specify the demilitarization capacities and capabilities of the private companies it contracts.

Training and personnel

In its response to the 2011 Small Arms Survey PSSM questionnaire the Slovenian MoD does not report on its training programmes for demilitarization, stocks maintenance, and storage security and does not indicate specific training needs or capacities in this field.

Demilitarization challenges and capability gaps

The following sections consider the technical capability gaps, and national and regional factors that restrict Slovenia's national demilitarization efforts.

Technical

In its response to the 2011 Small Arms Survey PSSM questionnaire the Slovenian MoD reports that it does not have the capacity to destroy WP, cluster munitions, and surface-to-surface and surface-to-air missiles (Slovenia, 2011, p. 5).

National and regional

Owing to its limited indigenous demilitarization infrastructure, the Slovenian MoD resorts to shipping excess ammunition, explosives, and rockets abroad for demilitarization. Recipients reportedly include Bulgaria, the Czech Republic, the Russian Federation, and Italy (Slovenia, 2011, p. 4). The reference to Bulgaria and Italy is probably to a Slovenian demilitarization contract

awarded in October 2010 to Expal Bulgaria and UEE Italia SRL to process around 900 tonnes of conventional ammunition, including almost 5 million small-calibre cartridges, 76,000 hand grenades, more than 39,000 anti-tank mines, more than 22,000 HE mortar bombs, 30,000 rifle grenades, more than 1,000 rounds of 155 mm improved conventional munition (PAT794) cluster ammunition, and 176 MANPADs (Igla SA-18) (Expal Bulgaria, 2011b, slides 16–18).

In its response to the 2011 Small Arms Survey PSSM questionnaire the Slovenian MoD clearly states that the impact of demilitarization on the environment fosters negative public opinion and that it wishes these activities to maintain a low profile (Slovenia, 2011, p. 4). The MoD does not report having collaborated with another regional demilitarization facility in the past and does not foresee any equipment or training upgrades that could allow the Borovnica plant to assume regional demilitarization tasks. 📄

Endnotes

- 1 The participants in the conference Towards a Sustainable Solution for Excess Weapons and Ammunition: Policy, Logistical and Financial Aspects of Excess Weapons and Ammunition Disposal organized by the Regional Arms Control Verification and Implementation Assistance Centre, the International Trust Fund (ITF – Enhancing Human Security), and the Croatian MoD in May 2011 reached similar conclusions.
- 2 The Small Arms Survey sent questionnaires to the MoDs of each of the RASR-participating countries in January and February 2011. As at 1 October 2011 all had responded to the Small Arms Survey PSSM questionnaire, with the exception of Bosnia and Herzegovina.
- 3 One tonne AUW = 1 cubic metre = 1 unit of space for storage and transportation planning = approximately 50,000 rounds of small arms ammunition (e.g. 7.62 x 39 mm cartridges).
- 4 1 ton US = 0.907 tonnes (metric); 1 ton UK = 1.016 tonnes (metric).
- 5 Albania (2011e, p. 6).
- 6 Albania (2011b, slide 27).
- 7 NAMSA (2011b, slide 6).
- 8 NAMSA (2009d, p. G-9).
- 9 NAMSA (2009d, p. G-9).
- 10 Albania (n.d.b, Graph 3).
- 11 Albania (2011e, p. 6).
- 12 BiH (2011a, slide 3).
- 13 EWG (2010a, slide 7).
- 14 BiH (2011a, slide 3).
- 15 BiH (2011a, slide 3).
- 16 Survey researcher interview with TEREM-Kostenets director, 12 April 2011.
- 17 Croatia (2011a, slide 12).
- 18 Croatia (2011a, slide 9).
- 19 Croatia (2011a, slide 9).
- 20 Croatia (2011b, Table 5, nos. 1, 7).
- 21 Croatia (2009a, slide 11).
- 22 Croatia (2011b, Table 5, no. 7).
- 23 Macedonia (2011d, p. 2; 2011e, slide 6); TNT = trinitrotoluene.
- 24 Demilitarization practitioners often call demolition ranges (OB/OD) polygons and the term will be used in this report.
- 25 Macedonia (2011d, p. 3).
- 26 Montenegro (2011b, slides 3, 16; 2011c, p. 2).
- 27 Montenegro (2011b, slide 5; 2011c, p. 2). It is unclear what the term ‘weapons’ comprises in the various documents. Apparently the figure includes small arms and light weapons, as well as heavy conventional weapon systems such as tanks (Montenegro, 2011d, slide 4).
- 28 Montenegro (2011c, p. 6).

29 Montenegro (2011c, p. 6).
30 Serbia (2011a, slide 4; 2011b, slide 5).
31 Serbia (2011d, p. 3).
32 Serbia (2011b, slide 5).
33 Tehničko Remontni Zavod Kragujevac.
34 Serbia (2011b, slide 13).
35 International demilitarization contracts, such as the one VIDEX signed to demilitarize Greek landmines before the Gorni Lom explosion, reportedly fell under the responsibility of the Ministry of Industry, for instance (Survey researchers' meeting with Bulgarian MoD and US Embassy representatives, Sofia, 11 April 2011).
36 Author interview with Blaz Mihelic, ITF, Slovenia, 15 November 2011.
37 Survey researchers' debriefing with Bulgarian MoD representatives, Sofia, 15 April 2011.
38 Pyrotechnic material and devices that produce an incendiary, illumination, lachrymatory, smoke, or sound effect.
39 Ammunition containing both explosives and WP or other pyrophoric material.
40 RASR workshop participants are mainly MoD representatives, with a few exceptions provided by representatives from the MoI and the Ministry of Foreign Affairs.
41 Confiscated, seized, or collected small arms, for instance, are distinct from 'surplus' and often fall within the responsibility of MoIs (see Karadaku, 2011). Lazarevic (2010) shows that in SEE, disposal policy regarding this category is diverse, as such small arms can often be absorbed into state arsenals and re-used by state forces.
42 Survey researchers' discussions with Expal Bulgaria representatives, Gabrovo, 13 April 2011.
43 For instance, the Kargo 10 joint freight railway initiative, signed by Serbia, Croatia, and Slovenia in April 2010, seeks to optimize regional railways networks (Radic and Jovanovic, 2011).
44 Survey researcher notes, Third RASR Workshop, Sarajevo, 3 November 2010.
45 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
46 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
47 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
48 Saferworld (2005, p. 75) mentions a different average rate of 22,500 7.62 mm rounds per hour.
49 A committee was formed to oversee the implementation of the National Action Plan. The appointment of a deputy minister of defence, with prime responsibility for equipment and ammunition disposal, provided a focal point. This ensured coordination across government and the various international donors (author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011).
50 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
51 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
52 Law 10017 of 13 November 2008 (Albania, n.d.b, p. 13).

- 53 'Open ranges' means there are no closed, fenced, or flagged areas and there is no 24-hour guard (NAMSA, 2009d, p. G-2).
- 54 Based on the maximum likely OB/OD capacity of 23,410 tonnes, the proposed Albania III budget for OB/OD was EUR 6,271,854 over four years. The MoD costs the OB/OD activity at 250 EUR/tonne (including 50 EUR/tonne for transportation) (NAMSA, 2009d, Table 5).
- 55 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
- 56 Percentages vary: in the questionnaire returned by the MoD in 2011, ULP Mjekës was expected to process 52 per cent, KM Poliçan 45 per cent, and UM Gramsh 3 per cent (Albania, 2011e, p. 5).
- 57 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
- 58 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
- 59 The system incorporates a rotary kiln, a dual-purpose afterburner and car bottom furnace, and a pollution-abatement system (gas cooler, cyclone, and baghouse) (NAMSA, 2009g, p. D-11).
- 60 31,336 tonnes gross weight, according to Albania (n.d.b, p. 6).
- 61 This is the most widely used method for the destruction of small-calibre ammunition (NAMSA, 2009a, p. B-1).
- 62 To maximize R₃ (NAMSA, 2009g, p. D-7).
- 63 Excluding 7.62 mm model 1953 and 1956 ball (footnote from the original NAMSA source), which are dismantled rather than incinerated in the EWI to maximize R₃. The metals recovered from disassembly are significantly more valuable as scrap than those incinerated. ULP Mjekës's dismantling production rates for 7.62 mm ball models 1953 and 1956 for 2009 were estimated at 10,000 per hour (NAMSA, 2009g, p. D-9, Table 5).
- 64 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
- 65 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
- 66 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
- 67 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
- 68 Poliçan received a donation of four bandsaws from Denmark in 2010, for instance (Good-year, 2010).
- 69 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
- 70 TNT and ammonium nitrates—TD-42—that cannot be melted out; therefore the mortar body must be cut open to release the explosive filling.
- 71 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
- 72 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.

- 73 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
- 74 Author correspondence with Major Shkelqim Sina, Albanian MoD, 23 July 2010.
- 75 Author correspondence with Major Shkelqim Sina, Albanian MoD, 23 July 2010.
- 76 According to NAMSA, it may be true that Albania does not currently have the capacity to dismantle these items, but there is no need for it to do so. It previously destroyed surface-to-air missile warheads and small quantities of WP using OD (author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011).
- 77 RASR workshop discussions also hint that Albania, with OSCE and UNDP funding, shipped ammunition to Montenegro for demilitarization. This was unfortunately not corroborated, but it would provide an interesting regional case study.
- 78 Author interview with D. Towndrow, Ammunition Support Branch, NAMSA, 4 November 2011.
- 79 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 80 EUFOR monitors only storage sites, not disposal sites: monitoring the destruction process does not fall within its responsibility. EUFOR oversees the documentation for the storage, transportation, and movement of small arms, light weapons, and ammunition (interview with Per Normak, politico-military adviser to the EU special representative and EUFOR commander, 1 July 2010).
- 81 Author interview with Blaz Mihelic, ITF, Slovenia, 15 November 2011.
- 82 See reference to this TRADS in the Croatia section.
- 83 An efficient explosive waste incinerator can destroy 28,000 rounds per hour (Threat Resolution Ltd, 2004, 4-C-3).
- 84 Author interview with Amna Berbic, cluster coordinator, Justice and Security Cluster, UNDP BiH, Sarajevo, 1 July 2010.
- 85 Author interview with Amna Berbic, cluster coordinator, Justice and Security Cluster, UNDP BiH, Sarajevo, 1 July 2010.
- 86 Author interview with Amna Berbic, cluster coordinator, Justice and Security Cluster, UNDP BiH, Sarajevo, 1 July 2010.
- 87 Author email correspondence with Jasmin Porobic, 7 February 2011, containing ammunition destruction stats in BiH for 2010.
- 88 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 89 Statement by UXB Balkans representative, Third RASR Workshop, Working Group 3, Sarajevo, 4 November 2010. For more on Dynasafe, see <http://www.uxb.com/pages/dynasafe.html>.
- 90 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 91 Statement by BiH representative, Third RASR Workshop, Working Group 1, Sarajevo, 3 November 2010.
- 92 For instance, due to different interpretations by entity institutions, the Agreement on Final Disposal of All Rights and Obligations over Moveable Property that Will Continue to Serve Defence Purpose (WAP 1) signed by the entity prime ministers in March 2008 was not implemented until 2009 (NATO, 2011, slide 8).
- 93 Statement by BiH representative, Third RASR Workshop, Working Group 2, Sarajevo, 3 November 2010.

- 94 According to Georgiev (2004, p. 50), transportation costs could represent 20–30 per cent of the total disposal costs in countries where storage depots were far from disposal facilities.
- 95 Some documents use the term ‘utilization’ when referring to the process of dismantling ammunition and the subsequent use of its components. Utilization is described in a Bulgarian MoD’s presentation as ‘decomposition in laboratories, separation of the individual elements and ... commercial realization of products’—waste gunpowder, explosive substances, and packaging materials, ferrous and non-ferrous metals (Bulgaria, 2011a, slide 4).
- 96 Survey researchers’ meeting with Bulgarian MoD and US Embassy representatives, Sofia, 11 April 2011.
- 97 Author interview with Bulgarian MoD, 29 November 2011.
- 98 Statement by Bulgarian representative, Third RASR Workshop, Working Group 1, Sarajevo, 3 November 2010.
- 99 This was confirmed during a meeting between Survey researchers and Bulgarian MoD and US Embassy representatives, Sofia, 11 April 2011.
- 100 Statement by Bulgarian representative, Third RASR Workshop, Working Groups 1 and 2, Sarajevo, 3 November 2010.
- 101 Survey researchers’ meeting with Bulgarian MoD, Sofia, 11 April 2011.
- 102 Survey researcher interview with TEREM-Kostenets director, 12 April 2011.
- 103 It is unclear whether the incinerators use pollution-abatement systems.
- 104 Survey researcher interview with TEREM-Kostenets director, 12 April 2011.
- 105 Survey researcher interview with TEREM-Kostenets director, 12 April 2011.
- 106 Survey researcher interview with TEREM-Kostenets director, 12 April 2011.
- 107 Survey researcher interview with TEREM-Kostenets director, 12 April 2011.
- 108 Survey researcher interview with TEREM-Kostenets director, 12 April 2011.
- 109 Survey researcher interview with TEREM-Kostenets director, 12 April 2011.
- 110 Survey researchers’ meeting with Bulgarian MoD and US Embassy representatives, Sofia, 11 April 2011.
- 111 Survey researcher’s meeting with Centre for the Study of Democracy and Vitosha Research, Sofia, 15 April 2011.
- 112 Survey researcher’s meeting with Centre for the Study of Democracy and Vitosha Research, Sofia, 15 April 2011.
- 113 Survey researchers’ meeting with Bulgarian MoD and US Embassy representatives, Sofia, 11 April 2011.
- 114 Survey researchers’ interview with Expal staff, Gabrovo, 13 April 2011.
- 115 Presentation by Expal representatives, Gabrovo, 13 April 2011.
- 116 Survey researchers’ meeting with Bulgarian MoD and US Embassy representatives, Sofia, 11 April 2011.
- 117 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 118 Survey researchers’ meeting with Bulgarian MoD officials, Sofia, 11 April 2011.
- 119 Survey researchers’ debriefing with Bulgarian MoD officials, Sofia, 15 April 2011.
- 120 Survey researchers’ meeting with US Embassy officials, Sofia, 11 April 2011.
- 121 At the time of writing, local authorities and Expal staff were carrying out an investigation.
- 122 Personnel work in two shifts, 14 hours per day.
- 123 TNT is removed with hot water, not steam.

- 124 Apparently the Gabrovo plant is currently the only facility in Bulgaria (and, according to Expal Bulgaria, in SEE) to process WP ordnance industrially (presentation by Expal Bulgaria representatives, Gabrovo, 13 April 2011).
- 125 Presentation by Expal Bulgaria representatives, Gabrovo, 13 April 2011.
- 126 Presentation by Expal Bulgaria representatives, Gabrovo, 13 April 2011.
- 127 Survey researchers' debriefing with Bulgarian MoD officials, Sofia, 15 April 2011.
- 128 Presentation by Expal Bulgaria representatives, Gabrovo, 13 April 2011.
- 129 Survey researchers' meeting with Bulgarian MoD and US Embassy representatives, Sofia, 11 April 2011.
- 130 Survey researchers' meeting with Bulgarian MoD and US Embassy representatives, Sofia, 11 April 2011.
- 131 A subsidiary of the German demilitarization company Spreewerk Lubben GbmH.
- 132 Statement by Croatian representative, Third RASR Workshop, Working Group 2, Sarajevo, 3 November 2010.
- 133 Statement by Croatian representative, Third RASR Workshop, Working Group 2, Sarajevo, 3 November 2010.
- 134 Statement by Croatian representative, Third RASR Workshop, Working Group 2, Sarajevo, 3 November 2010. Workshop discussions hinted that Croatia's overall demilitarization capacity was close to 3,500 tonnes per year. This figure now seems overly optimistic.
- 135 A number of Croatian companies had apparently claimed that they could undertake ammunition demilitarization operations, but their proposals included the manual disassembly of ammunition and were not vetted by the MoD (UNDP, 2009b, p. 8).
- 136 'An enclosed system that filters the TNT and recycles the water' (UNDP, 2009b, Table 5, note 29).
- 137 UNDP proposed that the Croatian MoD borrow a TRADS donated by UNDP to BiH's Doboj facility to process these latter components. This would avoid the costs inherent in repacking, marking to UN standards, and then transporting to Germany for disposal (UNDP, 2009b, p. 10).
- 138 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 139 Statement by Croatian representative, Third RASR Workshop, Working Group 2, Sarajevo, 3 November 2010.
- 140 Survey researcher notes taken during Third RASR Workshop, Sarajevo, 4 November 2010.
- 141 Statement by Croatian representative, Third RASR Workshop, Working Group 1, Sarajevo, 3 November 2010.
- 142 Survey researcher notes taken during Third RASR Workshop, Sarajevo, 4 November 2010 hint that Croatia formerly had the capacity to deal with WP and G-class ammunition, but not any more.
- 143 The latter two are only destroyed by OB/OD (Croatia, 2011b, Table 5, no. 15).
- 144 Statement by Croatian representative, Third RASR Workshop, Working Group 2, Sarajevo, 3 November 2010.
- 145 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 146 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 147 The MoD did not refer to this decision in its response to the 2011 Small Arms Survey PSSM questionnaire.

- 148 Survey researcher notes taken during regional conference Towards a Sustainable Solution for Excess Weapons and Ammunition, Pula, May–June 2011.
- 149 Survey researcher correspondence with Macedonian EOD team leader, 17 September 2011.
- 150 Because 15 tonnes are a large quantity for one detonation, it is conceivable that the EOD operators fire 3 x 5 tonnes simultaneously using short delay (author interview with Blaz Mihelic, ITF, 15 November 2011).
- 151 Cauldrons do not have a pollution-abatement system, which means that mercury and other heavy metals are released into the environment (author interview with Blaz Mihelic, ITF, 15 November 2011).
- 152 Survey researcher correspondence with Macedonian EOD team leader, 17 September 2011.
- 153 Survey researcher correspondence with Macedonian EOD team leader, 17 September 2011.
- 154 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 155 Survey researcher correspondence with Macedonian EOD team leader, 17 September 2011.
- 156 Survey researcher correspondence with Macedonian EOD team leader, 17 September 2011.
- 157 Survey researcher correspondence with Macedonian EOD team leader, 17 September 2011.
- 158 In the questionnaire, the MoD referred to the 'RONKO-COMPANY from the US' (Macedonia, 2011d, p. 2).
- 159 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 160 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 161 Anti-hail protection with long- and medium-range anti-hail rockets is based on dispersing pyrotechnical mixture based on silver iodide. These rockets are explosive and differ little in terms of their propulsion from rocket weapons.
- 162 'Restructuring processes in the police from 2005 resulted in considerable surplus weapons and ammunition', including MANPADS (see Lazarevic, 2010, p. 8).
- 163 MONDEM contracted the SAKAB company to dispose of 42,670 kg of rocket fuel TG-02, 48,080 kg of oxidizer AK-20K, and 25,835 kg of napalm bomb powder by shipping them abroad to Sweden for destruction (Montenegro, 2011a, slide 13; 2011d, slide 9; 2011c, p. 6).
- 164 Statement by Montenegrin representative, Third RASR Workshop, Working Group 1, Sarajevo, 3 November 2010.
- 165 For instance, about 21 tonnes of various kinds of chemicals are currently being disposed of through the company Kemis-Termoclean Zagreb, and the company FWW Vienna is destroying it. The costs of destruction are covered by the Government of Montenegro (Montenegro, 2011c, p. 6).
- 166 The current intention is to give more importance to industrial demilitarization processes (author interview with Blaz Mihelic, ITF, 15 November 2011).
- 167 Survey researcher meeting with MoD and Military General Headquarters, Podgorica, Montenegro, 5 July 2010.
- 168 Now known as Tara-Aerospace and Defence Products (TADP, n.d.).
- 169 Involving 200 tonnes of military explosives that the company had imported to transform for civilian use (Survey researcher notes taken during Third RASR Workshop, Sarajevo, November 2010).
- 170 Author interview with Blaz Mihelic, ITF, 15 November 2011
- 171 Author interview with Blaz Mihelic, ITF, 15 November 2011
- 172 Some missiles can reportedly be destroyed in Berane.

- 173 Survey researcher notes taken during 11th South-East Europe Clearinghouse Conference, Belgrade, workshop discussions, June 2011.
- 174 The last one was held in Podgorica in September 2010 (Montenegro, 2011c, p. 7).
- 175 Faltas and Chrobok (2004, p. 94) estimated the value of the contract at USD 4.8 million.
- 176 According to Faltas (2008, p. 98), out of the 195,510 military weapons selected for the US-sponsored destruction programme, 166,637 were obsolete Second World War sub-machine guns.
- 177 Fax from SC TOHAN SA, 5 October 2011.
- 178 Survey researcher telephone interview with general manager of SC Uzina Mecanică Sadu SA, 26 October 2011.
- 179 Survey researcher telephone interview with general manager of SC Uzina Mecanică Băbeni, 25 October 2011.
- 180 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 181 The laboratory uses NATO standards. Unsafe ammunition is reportedly destroyed within 30 days of testing. The MoD reportedly pays EUR 400 for analysis of a single sample (statement by Serbian representative, Third RASR Workshop, Working Group 1, Sarajevo, 3 November 2010).
- 182 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 183 The plant can separate WP, but not demilitarize it at this stage—the regional use of mobile facilities was mentioned as a possible solution (statement by Serbian representative, Third RASR Workshop, Working Group 2, Sarajevo, 3 November 2010; Serbia, 2011d, p. 4).
- 184 Statement by Serbian representative, Third RASR Workshop, Plenary, Sarajevo, 4 November 2010.
- 185 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 186 Although the development of a process to demilitarize cluster munitions and air missiles is reportedly ‘under way’ (Serbia, 2011d, p. 4).
- 187 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 188 Survey researcher notes from the Third RASR Workshop, Sarajevo, 4 November 2010; notes from the 11th South-East Europe Clearinghouse Conference, Belgrade, May/June 2011.
- 189 One representative from Montenegro stated that to obtain destruction rates from TRZK, he had had to go through the Jugoimport agency (notes from the 11th South-East Europe Clearinghouse Conference, Belgrade, May/June 2011).
- 190 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 191 Author interview with Blaz Mihelic, ITF, 15 November 2011.
- 192 Three workers died and two were injured.

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