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report 13

Destroying Small Arms and Light Weapons

Survey of Methods and Practical Guide

april 99

Today, the destabilizing accumulation of small arms and their violent use in many countries around the world are high on the international agenda. One approach to the resolution of these problems is micro-disarmament, that is, taking small arms and light weapons—the tools of civil war—out of conflict areas. As part of a comprehensive peace process that includes, among other things, the demobilization, reintegration and reconciliation of combatants, micro-disarmament is an indispensable element.

BICC *Report 13* examines the issues and methodologies regarding the destruction of light weapons, small arms and ammunition, primarily within the context of peace-building operations in a post-conflict society. Several situations in which collection and destruction of weapons were carried out are analyzed for lessons learned. Current destruction methodologies and available technologies are reviewed with the aim of introducing appropriate destruction methods for each individual situation.

Editing:
Moira Davidson-Seger
Heike Webb

Cover photo:
"The Flame of Peace"
Bonfire of small arms in Mali
Robin Poulton

Photos:
Many Photos shown in this report were taken and collected by the author during the field studies and have a more documentary character.

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Destroying Small Arms and Light Weapons

Survey of Methods and Practical Guide

by David DeClerq

april 99

Zusammenfassung
Summary in German

Kleinwaffen stellen sowohl aus der Sicht der Rüstungskontrolle und der internationalen Sicherheit wie unter dem Blickwinkel von Kriminalität und innerer Sicherheit einen komplexen Problemkreis dar, der in den 90er Jahren enorm an Bedeutung gewonnen hat. Die Kontrolle der Kleinwaffen erfordert ein umfassendes Konzept mit politischen, geographischen, ökonomischen und sicherheitsbezogenen Elementen. In der Vielfalt der Ansätze zur Bekämpfung der explosionsartigen Verbreitung und des unrechtmäßigen Gebrauchs von Kleinwaffen, insbesondere nach dem Ende von Bürgerkriegen, kommt der Vermeidung der destabilisierenden Wirkung unkontrolliert verfügbarer Überschußbestände große Bedeutung zu (siehe Di Chiaro, 1998). Neben anderen Aspekten umfaßt dieses Problem auch die wirksame und wirtschaftliche Entsorgung überschüssiger Kleinwaffen, vorzugsweise durch umweltschonende Vernichtung.

Der vorliegende BICC Report untersucht die Probleme und Methoden der Vernichtung und Entsorgung von Kleinwaffen, stellt diese in den Kontext von friedensschaffenden Maßnahmen nach größeren Konflikten und bettet die jeweiligen Erfahrungen in den gesellschaftlichen Zusammenhang ein.

Eine Vielzahl von UN-Initiativen und Operationen haben sowohl die Möglichkeiten als auch die Probleme der praktischen Umsetzung von Kleinwaffenabrüstung aufgezeigt. Die meisten dieser Operationen sind unter politischen und normativen Vorzeichen analysiert worden. In der vorliegenden Studie wird anhand von Fallbeispielen der Grad des praktischen Erfolgs der Waffenvernichtung beschrieben.

Exemplarisch seien zwei Beispiele erwähnt:

- In Mali wurden in der Mitte der neunziger Jahre nach dem friedlichen Ende eines innerstaatlichen Konfliktes einige Tausend Feuerwaffen eingesammelt und öffentlich in einer sogenannten 'Friedensflamme' verbrannt (siehe Titelbild). Die Bedeutung dieser Operation lag mehr in ihrem Symbolwert und ihrem Beitrag zur nationalen Versöhnung als in der konkreten Entsorgung von Kleinwaffen.

- In Nicaragua und El Salvador fanden zwischen 1989 und 1997 verschiedene UN-Friedensmissionen statt, die direkt oder indirekt zur Einsammlung und Vernichtung von Kleinwaffen führten. Auch in der serbisch-kroatischen Enklave Ostslavonien wurden unter der Obhut einer UN-Friedensmission Waffen eingesammelt und entsorgt.

Mit dem Vertrag über konventionelle Streitmächte in Europa (KSE-Vertrag), der 1992 in Kraft trat, wurde zum ersten Mal die Vernichtung von konventioneller Rüstung, einschließlich von Vorschriften über erlaubte Methoden, vereinbart. Diese Vorschriften, die genau beschreiben, welche Waffenkategorien wie zu zerstören sind, sind auch für die Entsorgung von Kleinwaffen relevant. Der Hauptteil der vorliegenden Studie analysiert die vielfältigen Methoden zur Zerstörung von Kleinwaffen. Welcher Methode unter spezifischen Verhältnissen der Vorzug zu geben ist, hängt von der Menge und dem Typ der zu entsorgenden Waffen ab, von der verfügbaren Zeit, der vorhandenen Infrastruktur, den verfügbaren finanziellen Mitteln und von politischen und psychologischen Faktoren, wie zum Beispiel der Beteiligung von ehemaligen Kämpfern an der Mikroabrüstung. Genaue Kostenschätzungen sind schwierig. In der Praxis ist die theoretisch optimale (das heißt zuverlässigste oder kostengünstigste) Methode nicht unbedingt die unter den gegebenen Verhältnissen beste: Zeit, Geld, Durchsetzbarkeit und andere Kriterien erfordern häufig Kompromißlösungen.

Das Verbrennen von Kleinwaffen, in Mali und Nicaragua durchgeführt, ist billig aber nicht umweltschonend. Außerdem ist der übrigbleibende Abfall weniger wertvoll als bei anderen Zerstörungsmethoden. Eine andere einfache und billige – und dabei gleichzeitig effektive – Methode ist das Zerdrücken der Waffen durch ein schweres Fahrzeug, zum Beispiel einen Kampfpanzer, der sie überfährt. Primitiv und billig und für die Umwelt nicht belastender als das Verbrennen ist das Versenken der Kleinwaffen auf dem Meeresgrund. Kleine Mengen an Feuerwaffen können auch mit Handwerkzeugen wie Hammer und Amboß oder einer Kreissäge kostengünstig zerstört werden. Wirksam ist auch das Einschmelzen von Kleinwaffen in Hochöfen der metallverarbeitenden Industrie.

Gasflammen, mit denen Waffen unbrauchbar gemacht werden, sind ein bewährtes Mittel, wobei ein Plasmaschneider schneller arbeitet als Schneidbrenner. Die Methode ist wirksam und hinterläßt wertvollen Schrott. Sie ist allerdings relativ langsam und teuer. Außerdem stellt sie technische Anforderungen, die nicht immer erfüllt werden können.

Umweltschonend und schnell ist die Benutzung von hydraulischen Pressen und Scheren. Bei größeren Mengen lohnt sich die Beschaffung der teueren Maschinen. Schreddern ist die effizienteste Methode für die Zerstörung von Kleinwaffen. Große Maschinen arbeiten sehr schnell und umweltfreundlich und garantieren eine totale Zerstörung. Sie produzieren außerdem wertvollen Schrott, wenn die Waffen vorher zerlegt und nach Material sortiert wurden. Dieses Verfahren erfordert allerdings sehr hohe Investitionen.

Die Zerstörung von Munition und anderen explosiven Stoffen ist gefährliche Spezialistenarbeit. Demontage, Delaborierung und umweltschonende Entsorgung sind zu empfehlen. Gezielte Detonation in abgelegenen Gegenden ist die billige und schmutzige Alternative.

Schlußfolgerungen und Empfehlungen des Autors:

- Die direkten Kosten der Vernichtung von Kleinwaffen sind selten ein Problem.
- Die Kosten des Einsammelns und des Verzichts auf Verkauf können erheblich sein.
- Für alle Verhältnisse gibt es eine probate Methode, Kleinwaffen zu zerstören.
- Perfektionismus bei der Vernichtung von Kleinwaffen zahlt sich oft nicht aus.
- Es empfiehlt sich, nach dem Modell des Vertrags für konventionelle Streitmächte in Europa, eine Verifikationsstelle für die Zerstörung von Kleinwaffen ins Leben zu rufen.
- Privatwirtschaftliche Firmen mit Kompetenzen auf dem Gebiet der Entsorgung von Waffen und Explosivstoffen können ebenfalls diese Rolle übernehmen.
- Eine dritte Möglichkeit wäre das Erstellen eines Standardverfahrens oder eines Leitfadens durch eine kompetente Organisation wie das Pearson Peacekeeping Centre in Kanada.
- Die UNO sollte die Beschaffung von Geräten zur Vernichtung von Kleinwaffen für ihre Friedenstruppen erwägen.
- Große Mengen von Munition sind nur auf teuerem Wege zu entsorgen. Die Kosten sollten die Verantwortlichen aber nicht von einer notwendigen Abrüstung abhalten.
- Wo die Verhältnisse es zulassen, kann ein Recycling des Materials zerstörter Waffen einen Teil der Vernichtungskosten ausgleichen.
- Es kann dem Frieden nützen, wenn Rüstungsproduzenten dazu veranlaßt werden, bei der Entsorgung von überschüssigen Waffen behilflich zu sein.

Introduction

The issue of small arms and light weapons, from both an arms control and international security perspective, and from a criminal and public safety domestic security perspective, catapulted into prominence in the 1990s. This attention was brought about by several factors including the demise of the Cold War and an increasing awareness of the casualties that were produced as a result of intra-state conflict including, in many cases, post-conflict violence aided and abetted in its severity by the holdovers of the tools of hostile conflict—small arms and light weapons. Academics, non-governmental organizations (NGOs), governments and various international regimes have examined the concerns surrounding small arms and light weapons and have made numerous recommendations accordingly (see DFAIT, 1996 and 1997a; Prep Com website; BICC website; BASIC website[1]). The issue is complex and multifaceted and requires a holistic approach across a broad spectrum of legal, geographical, political, economic, commercial and security concerns, both international and domestic.

Of the many aspects which warrant study regarding light weapons and small arms, the important matter of collection and destruction—also called micro-disarmament—(DFAIT, 1997a, p. 1) is an important one, in particular as it applies to the potentially destabilizing surpluses of military-class light weapons and small arms within the context of a country emerging from intra-state conflict.

[1] For detailed information on internet services, see references.

It is debatable whether the term 'micro-disarmament' would apply to collection and destruction done within the context of a state destroying surplus war stocks or destroying firearms collected as seized contraband or as part of a domestic firearms regulation initiative. The collection and destruction of surplus and/or illegal weapons as a means to reducing further firearms casualties through post-conflict criminal action or renewed hostilities has been suggested in a number of studies. A UN Panel of Governmental Experts on Small Arms recommended among other things that:

"The United Nations should support, with the assistance of the donor community, all appropriate post-conflict initiatives related to disarmament and demobilization, such as the **disposal and destruction** of weapons ... ;

... two sets of guidelines should be developed: to assist negotiators of peace settlements in developing plans to disarm combatants, particularly as it concerns light weapons, small arms and munitions, and to include therein plans for weapons collection and **disposal preferably by destruction**;

... all such weapons which are not under legal civilian possession, and not required for the purposes of national defense and internal security, should be **collected and destroyed** by states as expeditiously as possible; and

All States should exercise restraint with respect to the transfer of surplus small arms ... . All States are recommended to also consider the possibility to **destroy** all the surplus of such weapons" (United Nations, 1997, pp. 29–30).

Micro-disarmament has already met with some success within the context of post-conflict situations, both as an initial disarmament measure involving former combatants and as a method of mitigating casualties through criminal activities. Some micro-disarmament measures have been implemented well after hostilities have ceased. It is within this framework that the UN recommendations were made and under which other authorities on the subject have put forth observations and suggestions. Edward Laurance, from the Monterey Institute of International Studies Program for Arms Control, Disarmament and Conversion—the consultant to the UN Panel of Experts on Small Arms—has proposed a treaty on small arms and light weapons in which he states that collection and destruction should have a prominent place, given their practical and symbolic importance (Laurance, 1997, p. 19). The British American Security Information Council (BASIC) has conducted several studies on small arms and light weapons where either the focus of the study was on collection and destruction and/or where the recommendations strongly encouraged collection and destruction (BASIC, 1997a; 1997b; Vines, 1998). Within their studies, the BASIC papers reiterated and elaborated on the UN Panel recommendations. A meeting sponsored by the International Committee of the Red Cross (ICRC) and the Norwegian Red Cross in Oslo, where participants from fourteen countries attended, recommended that "the immediate destruction of surplus arms and ammunition to prevent them spreading further should be an integral part of peace agreements and demobilization processes" and that "international assistance be made available to States for the disposal of surplus small arms and light weapons" (Prep Com, 1998).

There are several examples of post-conflict micro-disarmament initiatives —most with mixed results. The UN was involved in most of them, either directly as part of a peacekeeping mandate or indirectly in an advisory or other sponsorship role. Micro-disarmament attempts, which demonstrate various degrees of less than complete success, have occurred in Nicaragua, El Salvador, Guatemala, Namibia, Mozambique, Angola, Somalia, Cambodia, Haiti and Mali. Many of these missions have been subsequently evaluated in terms of the micro-disarmament component of the mandate. The findings provide a plethora of information on what to avoid and how to successfully plan such programs from a policy perspective. The most significant studies have been carried out by the United Nations Institute for Disarmament Research (UNIDIR), BASIC in the papers mentioned above, by the Monterey Institute of International Studies, and by the Lessons Learned Unit of the Department of Peacekeeping Operations (DPKO) UN, Headquarters New York. A synopsis of several studies and interviews including the UNIDIR studies was completed by David DeClerq in his study for DFAIT on micro-disarmament (DFAIT, 1997a, pp. 44–47).

Micro-disarmament should not be a 'stand alone' process, particularly in the context of post-conflict rapprochement; it must be part of what can be called a peace process continuum of disarmament, demobilization and reintegration. (For details, see DFAIT, 1997b.) In fact, without this continuum, voluntary disarmament may be very difficult to implement and, without collection, there can be no destruction. The Development Assistance Committee of the Organisation for Economic Cooperation and Development views disarmament as part of the whole demobilization/reintegration scheme (OECD, 1997, p. 64).

"Micro-disarmament should not be a 'stand alone' process, it must be part of what can be called a peace process continuum of disarmament, demobilization and reintegration."

There has thus been a significant amount of research devoted to policy analysis and the implementation shortfalls of micro-disarmament. However the analysis provides many helpful recommendations most of which focus by-and-large on what should be done—policy direction—leaving the operational aspect of how to do it—operational implementation—largely untouched. To date, micro-disarmament destruction techniques have at best been very superficially addressed—particularly from a cost-analysis perspective. Failure to do this may leave policy-makers susceptible to arguments which could undermine attempts at micro-disarmament such as suggestions that it is too expensive or too difficult to organize and implement. Such reasoning may reflect a lack of political will, and/or an unproved assumption regarding cost, technical, geographical or infrastructure constraints. This applies whether one is looking at collection and destruction within the definition of micro-disarmament or at the destruction of surplus weapons in a more benign setting such as surplus war stocks.

Aim and methodology

This study will examine the issues and methodologies regarding the destruction of light weapons, small arms and ammunition, primarily within the context of peace-building operations in a post-conflict society. Firearms collection and destruction conducted within the scope of domestic firearms regulations in some selected countries will also be addressed with a view to providing useful considerations and guidance for similar actions, not only in post-conflict situations but in a domestic effort to destroy surplus military weapons and seized illegal weapons within or outside an international agreement or understanding. Several post-conflict situations where collection and destruction of weapons were carried out either by the state, NGOs and citizens groups or an outside third party will also be analyzed for lessons learned. A review of current destruction methodologies and available technologies will be undertaken with a view to suggesting appropriate destruction considerations including possible roles for commercial participation. Potential organizational considerations for micro-disarmament will also be examined.

About the author:

David DeClerq, a retired infantry officer of the Canadian Army, has more than 15 years of experience in strategic security analysis. He worked as a consultant to the foreign ministry in Ottawa and represented his country on the UN Panel of Governmental Experts on Small Arms. Mr DeClerq is a member of the Canadian Council for International Peace and Security and holds an MA in International Affairs from Carleton University.

Intra-state Conflict— Two Case Studies

A number of UN initiatives and operations have demonstrated the problems and potentials of micro-disarmament with regards to practical implementation. Most of these missions have been the subject of substantial policy-prescriptive analysis. For purposes of this study, only two micro-disarmament initiatives will be discussed as these illustrate a degree of success in destroying a number of weapons through relatively cost-effective procedures. In almost all the cases of micro-disarmament within the context of implementing peace agreements, physical destruction was generally not a significant problem insofar as methodology and costs were concerned: it was collection and, in some cases, the lack of disposal which created difficulties.

Sahara-Sahel[1]

The Secretary-Generals Advisory Mission to the Sahara-Sahel in 1994 was not a UN peace operation; it was however the first UN advisory venture addressing the issue of light weapons proliferation including collection and destruction and hence it is useful to examine.

In October 1993, a request by the President of Mali to the UN Secretary-General to assist in the collection of an increasing excess of light weapons within his country met with agreement and a UN Advisory Mission was formed, visiting Mali in August 1994. The mission outcome resulted in the Secretary-General stating in his report to the General Assembly on the Advisory Board on Disarmament Matters that the mission had heightened the need for practical answers to questions such as incentive programs, the level of stability required before programs could be implemented, and codes of conduct for supplier states. He stressed the requirement for an adequate level of personal security in countries plagued with a proliferation of light weapons if micro-disarmament was to work (Boutros-Ghali, 1995).

The micro-disarmament component of the mission focused on Mali and involved the destruction of 2,642 rifles, machine-guns, grenade launchers and pistols, all in good working order which were collected and destroyed by burning in March 1996. These weapons were turned in as a result of negotiations implementing a cease-fire agreement between the Government of Mali and the Tuareg Rebellion leadership. The collection program was voluntary and the destruction method was inexpensive to implement: a public bonfire (*Disarmament Times*, May 1996; Discussion with a Canadian member of the original Advisory Mission).

The methodology for collection and destruction was quite simple; four cantonments were selected where weapons from the clans of that particular area were collected. Incentives were offered in the form of a modest payment for weapons including free food and an initial retraining allowance. Lesser financial support was provided to combatants who surrendered without weapons. The arms were transferred to a central location in Timbuktu where a concrete platform had been constructed. A pyre was constructed in alternating layers of wood and weapons and the resulting pile was soaked in gasoline. There was no preliminary disabling of the firearms through bending, crushing or cutting. All weapons were proofed to ensure that they contained no live ammunition. While the ex-combatants did not take part in the actual destruction, the clan chiefs did witness the burning. According to Henny J. van der Graaf, (Brigadier General Retired)—the chief UN representative who certified the destruction on behalf of the UN —the weapons were completely disabled and unusable after the burning (Van der Graaf, personal communication, July 1998).

So what was the cost? The military in Mali were initially unpersuaded about the benefits of such destruction (Poulton and Youssouf, 1998, p. 120). In short, they saw few benefits but many costs on the basis that the weapons could have been used by the security forces—and in fact many had been stolen from the security forces. This would have been a cheap source of replenishment which, in their view, would have to be provided for elsewhere from a scant national treasury. According to the same source, Mali's President saw it not as a military matter but a political matter: it could not be judged in terms of costs so much as in terms of benefits; national reconciliation and peace were far more valuable than the cost of the weapons—its symbolic value was beyond cost-analysis. More cynical analysis suggested that it was a public relations effort of little value as replacement weapons were relatively easy to obtain (Poulton and Youssouf, 1998, p. 121). Whatever the case, the direct cost of destruction was in reality the price of the firewood and the gasoline. A cost-analysis could be applied to 'lost opportunity sales or recovery' and the actual cost of paying soldiers to

Figure 1: Members of the UN Observer Group cutting an assault rifle with an oxy-acetylene torch ▶

[1] This outline draws primarily from the following sources: United Nations, 1995; Van der Graaf, 1996; Poulton and Ibrahim, 1998.

Photo: Douglas Eaton

"Cost-benefit analysis is extremely difficult to apply."

collect, secure and burn the weapons including transportation costs, and so on, not to mention the payments handed out for the weapons. However, to do this without factoring in the intangible and/or unquantifiable aspects of moving toward a more secure environment and 'peace and national reconciliation' would leave an incomplete picture. In simple terms, cost-benefit analysis is extremely difficult to apply in such circumstances.

Central America[2]

UN peacekeeping operations in Central America involved several separate missions and mandates. The UN Observer Group in Central America (ONUCA) operated from 1989 to 1992 and was responsible among other things for the supervision and disarmament of the Nicaraguan Resistance. The UN Observer Mission in El Salvador (ONUSAL) functioned from July 1991 to 30 April 1995. Among its tasks were the supervision and disarmament of a coalition of five armed opposition groups collectively known as the FMLN. The UN Observer Mission in Guatemala (MINGUA) ran from January to May 1997. As weapons destruction was not a responsibility of the mission, it will not be discussed here. There are many good studies which discuss and analyze the effectiveness of these missions, including the disarmament component (Wrobel, 1997; BASIC, 1997b). The only aspect which will be addressed here is the disarmament process with special emphasis on small arms and light weapons destruction methodologies.

[2] For more basic details on all UN Central American missions, see internet website of the UN Peacekeeping Operations.

The destruction of weapons collected from the Nicaraguan resistance was a known part of the mandate and, as a result, planning for such activities was conducted prior to the mounting of the mission. The mission Chief of Staff, Canadian Brig. Gen. Ian Douglas, consulted with several experts on small arms destruction in Canada (Douglas, personal communication, June 1998). These included the Royal Canadian Mounted Police (RCMP), military armorers and private consultants. It was concluded that an oxy-acetylene cutting torch was the best process to use under the circumstances. Consideration was given to such basic procedures as using a bulldozer or other suitable vehicle to crush the weapons. It is interesting to note that one method considered was a weapon destruction point consisting of two NCOs from the Venezuelan Battalion with sledge hammers and two cement blocks (Murphy, 1991, p. 51). However, the isolation of some of the collection sites and the potential number of sites suggested that oxy-acetylene was more appropriate; oxy-acetylene equipment is relatively cheap to buy or lease and is available almost everywhere. The equipment is easily portable as it can be moved by helicopter and light vehicle; moreover personnel can be easily trained to use it (see Figure 1). At the time it was the preferred method of destroying illegal and contraband weapons seized by Canadian authorities.

A Standing Operating Procedure (SOP) for weapons destruction was developed as a handbook detailing the description and number of cuts to be made for each type of weapon. In general, for assault weapons and handguns, the weapons were cut completely through at the receiver.[3] Not only did the cut ensure that the weapon was unusable in its present state; because of the oxy-acetylene heat, the surrounding metal was melted so the congealed slag made it impossible for even a skilled armorer/gunsmith to repair it. While the one-cut approach could make some spare parts available to be retrieved, their value was minimal and the likelihood that even one reasonably functioning firearm could be reassembled out of several hundred destroyed ones was extremely slight. According to ONUCA's official report, a total of 14,920 small arms were destroyed along with 4 heavy machine-guns, 134 mortars and 1,265 grenade launchers (Wrobel, 1997, p. 31). Thus, small arms made up over 90 percent of all weapons destroyed.

[3] The receiver is that portion of the firearm which seats the bolt or breech block and is the chassis for the firearm; it is the frame to which all other components (barrel, trigger mechanism, breech bolt, etc.) are fastened.

The sites were all established on a particular pattern and the number of oxy-acetylene torches at each site was set according to the number of weapons likely to be decommissioned there. The actual cutting was done by members of the ONUCA Venezuelan Infantry Battalion in the presence of the former combatant who gave up the weapon. This was a confidence-building measure ensuring that the weapon would not merely be handed over to the government or military against which the resistance had been fighting. It was also a psychological reminder that hostilities were indeed over and was a sign of commitment to a 'new order'. In addition, it was one of the first steps in the peace process continuum of disarmament, demobilization and reintegration. If the continuum did not exist, it would probably have meant no collection of weapons. At each site, collected munitions were burned, in the case of ball ammunition, or destroyed using plastic explosives (C4) in the case of grenades, mortar rounds and other explosive munitions.

The equipment used to destroy weapons and munitions was purchased or leased by the UN Chief Administrative Staff (civilian). Expenditures regarding the destruction costs in Central America were

Photo: Douglas Eaton

▲ ***Figure 2: Ex-combatants cutting their assault rifles with a hacksaw in El Salvador***

unavailable. The fact that there were a sufficient number of trained officers to carry out the weapons destruction program—particularly the destruction of ammunition and explosives—was more good luck than good planning. The UN did not request experts in these areas from the contributing countries. Proper SOPs and safety training, together with the requisite number of experts is an important consideration for any mandate which involves weapons and munitions destruction. In addition, it was the opinion of Brig. Gen. Douglas that two of the most important considerations in such a weapons destruction procedure were (a) that it be done immediately and (b) that it be implemented within the context of a well-planned and -funded reintegration program. The importance of immediate destruction was based on his experience in Liberia: if the weapons were guarded for long periods of time pending disposal decisions, it was too easy for them to 'leak' into the area again. Moreover guarding the weapons ties up security forces and, over time, the weapons were less likely to be destroyed and more likely to be disposed of in a way which destabilized the area once again.

The destruction program which took place in El Salvador under ONUSAL was similar in many ways to the one in Nicaragua. Two minor differences were that the ex-combatants took part in actually destroying their own weapons and that hacksaws (see Figure 2) were also used to destroy weapons. The number of arms destroyed in El Salvador was listed as 9,851 small arms (over 96 percent of all weapons handed in) and 379 support weapons (Wrobel, 1997, p. 138). As in Nicaragua there were problems in finding the requisite number of qualified personnel within ONUSAL to properly supervise the destruction procedures.

There were several minor incidents regarding the inability to properly proof weapons, one resulting in injury. There was also an instance of improperly setting an explosive charge but, other than scattering munition components around a large area, there were no injuries.

The disposition of the scrap metal resulting from the destruction is not entirely clear. In the case of Nicaragua some of it was delivered to an American company which converted the scrap into prostheses. This effort was symbolic. Its political value cannot be quantified in monetary terms. In all likelihood this procedure was not cost-effective in real terms. Information on whether or not scrap metal was eventually sent to local scrap recyclers could not be obtained.

The Domestic Destruction of Surplus and/or Illegal Small Arms

Outside the sphere of conventional disarmament and the context of intra-state peace agreements, weapons destruction is routinely carried out under a number of scenarios. (See BICC website for an international survey.) These range from destroying many thousands of surplus military small arms and light weapon—which are no longer required and, in some instances, have no military re-sale value and/or cannot legally be sold to distributors for the civilian market—through post-conflict buy-back programs supported by national governments, to the more mundane aspect of destroying illegal weapons seized as part of criminal investigations.

A review of the destruction procedures used by some states indicates how many methods exist for disposing of firearms in various ranges of cost-effectiveness. They provide useful guidelines for any organization or state seeking to implement a similar program.

Australia

Australia has just completed a massive destruction of previously legally held civilian firearms which were subsequently declared illegal. The program was initiated in reaction to a single civilian shooting rampage in Tasmania which left dozens of people killed and wounded. While not welcomed by some firearms owners for various reasons, one of the keys to its success was a generous compensation package for restitution which was funded by a one-time additional medicare tax. The Federal Government then financed the State buy-back programs. The firearms buyback was administered by six states and two territories. Each state had its own procedure for disposing of firearms but most were similar. A description of the procedure of the largest state, New South Wales, is outlined below (Mackenzie; Roelandts, personal communication, June 1998).

In New South Wales (NSW) a total of 182,000 firearms were collected at various sites which included 400 police stations, a large metropolitan site in Sydney (relocated to four different areas in the city) and two mobile collection stations. The NSW police were responsible for receiving the firearms. When their owners handed in the firearms, they were issued checks on the spot in accordance with the value of the firearms as published in the *Australian Firearms Compensation Hand Book*. Where there was a claim that the firearm in question had greater value due to unique circumstances or, from a collectors perspective, rarity, a special evaluation was made. Of interest is the fact that 25,000 legal firearms for which there was no compensation were also submitted. A comprehensive firearms accounting procedure using computers, ledgers and security checks was followed at all stages of collection and disposal.

The firearms collected at police stations were transported under contract to a private security firm in locked high top 'wheelie bins' and transported to the Weapons Disposal Section. They were then dismantled to separate metal and non-metal parts. The non-metal components were shredded whilst the metal was conveyed to a smelter for recycling. There was no partial cost recovery as there was no payment for the scrap metal. Some ammunition and explosives were also handed in and transported to destruction sites in accordance with explosives regulations (DFAIT, 1998; Canadian Government, 1998).

The two mobile collection stations and the Sydney static center used portable 10 ton hydraulic presses to bend barrels and smash receivers which rendered the firearms totally inoperable. These firearms were then loaded into a dumpster refuse bin and taken to a giant shredder where they were shredded and processed through a separator which sorted the non-metallic parts out. The scrap was then sent to steel mills. According to Australian sources, the cost of running the two mobile collection sites was 1.2 million Australian dollars.

The 10 ton hydraulic presses were portable (requiring two people to move them), electrically powered, and could be operated by one person. The presses for the mobile sites were bolted to the floor of a truck. The hydraulic ram press processed one firearm at a time in less than 30 seconds. The presses were manufactured specifically for this operation by Tieman Industrial Pty Ltd, 145 Lavarack Avenue, Eagle Farm, Queensland 4009 at a cost of 1,500 Australian dollars.

Figure 3: Firearm being destroyed with a plasma cutter at RCMP Forensic Laboratory, Ottawa ▶

Photo: De Clerq

Photo: De Clerq

▲ ***Figure 4: Crane placing old vehicle containing firearms into giant shredder***

Consultation with the recycling industry in New South Wales revealed no interest in purchasing the material due to the alleged poor quality of the metal components of firearms and the environmental problem associated with the disposal of the non-metallic parts. Some recycling plants wanted to charge 100,00 Australian dollars a short ton to process and dispose of the collected firearms. Agreements reached involved non-payment for scrap with the police responsible for transporting the metal to the smelter or the recycling yards.

In a post-operation report, the NSW police made several recommendations which included:

- more use of mobile collection sites
- payment for firearms on the spot, except where evaluations were needed
- the establishment of an expert Special Evaluations Committee for rare or otherwise valuable or unique firearms
- a comprehensive and up-to-date evaluations list for firearms
- crushing as the preferred method of disabling a firearm (rather than simply cutting the barrel); a 10 ton hydraulic press for example would easily do the job and is relatively inexpensive
- safety instructions and procedures for those collecting and disposing of firearms were vital because there had been instances of loaded firearms being handed in and a few rare cases of deliberately sabotaged firearms which could have exploded during the disabling process.

Canada[4]

Discussion of the Canadian experience regarding the disposal of firearms will center on the more common and on-going aspect of disposing of firearms seized by customs and police authorities in the line of duty. Such destruction is practiced in many states where contraband and/or illegal weapons are confiscated. In the Canadian case, because relatively small quantities of firearms are involved, the weapons are shipped to the RCMP forensic laboratories

[4] The information in this section was obtained from the RCMP Central Forensic Laboratory, Chief Scientist-Firearms, and the Armourer who readily answered all questions and permitted the author to tour and photograph destruction activities (Smith and Bryant, personal communication, June/July 1998).

in Ottawa where they are kept until a sufficient quantity makes it feasible or necessary to commence destruction.

The firearms are cut in half at the receiver using a plasma cutter (see Figure 3). The plasma cutter costs about 3,000 Canadian dollars and replaced a previously used oxy-acetylene torch. The plasma cutter is portable, can be run off any electrical source including a generator, and is much quicker than an oxy-acetylene torch—taking about 20 to 30 seconds to cut an assault rifle in two. The armorer technician responsible for firearms established that approximately 1,200 handguns were destroyed in this manner in a period of 8 hours using the plasma cutter (Bryant, personal communication, June 1998). In Canada, once a firearm has been cut through the receiver it is legally no longer a firearm. The scrap is divided into two on-site dump buckets—one for barrel ends and one for butt ends. This is to prevent anyone from possibly attempting to repair the firearm—which in any case would be difficult, if not impossible. The two dump buckets are then taken at separate times to a scrap recycler dealer rather than a foundry as the scrap dealer is in a position to sell the scrap on the open market to a suitable steel-recycling company. The firearms parts are usually loaded into an old car at the recycling site and, in front of witnesses, hoisted by a large crane and deposited into a multi-million dollar giant steel scrap shredder where it is shredded into large pellet-size pieces. It is certainly the opinion of the RCMP staff in charge of destruction that the shredder alone is sufficient to destroy any and all light weapons and small arms without preliminary preparation (see Figures 4 and 5). The preliminary destruction procedure using the plasma cutter is merely an additional security measure. It was confirmed that several decades ago the Canadian Army, through a government agency, disposed of firearms (Sten guns, that is, short-barreled personal automatic firearms and Bren guns, that is, light machine-guns) directly to a scrap dealer without prior destruction or supervision at the site. Some of these weapons and/or parts found their way intact onto the illegal civilian market. The scrap dealer shredding is done at no cost but the scrap dealer gets the metal free. The reason given for no payment is that the quantities are small and must be witnessed, therefore the normal recycle yard routine must be adjusted to accept the firearms. While the shredder is capable of taking the firearm complete with non-metallic parts, the RCMP strip the weapons to metal parts only as part of the deal to shred the weapons for no cost.

In another small arms destruction procedure, the RCMP were responsible for overseeing the destruction of some 22,000 RCMP .38 caliber revolvers which had recently been replaced by more modern 9 mm pistols. The destruction involves placing the handguns in a steel 45 gallon drum with holes drilled in it to prevent heat build-up. The sealed

Photo: De Clerq

▲ ***Figure 5: Shredder end product—baseball size compressed and mangled steel parts***

drums, which weigh about 800 lb each when filled, were loaded by fork lifts into trucks and transported to a local foundry where they were melted down. The foundry did not charge for the procedure, nor did the RCMP receive any payment for the scrap metal. All of this was done under supervision and witnessed by competent authorities. The Ottawa police force used the hydraulic shears of a local scrap recycler to quickly and completely sever firearms obtained in a local gun amnesty program.

South Africa[5]

South Africa is faced with a particularly daunting influx of military-type assault weapons from neighboring countries which are emerging from intra-state conflict and from internal firearms sources both legal and illegal. As is often the case in states where security forces cannot provide a satisfactory level of protection to the population, legal firearms have proliferated, keeping pace with the rise in criminal violence and illegal firearms. The number of police seizures of firearms has increased accordingly. At the end of 1997, 4,504 confiscated firearms—many of them 'homemade'—were destroyed at the Transworks in Koedoespoort, Pretoria. The estimated commercial value was 2 million South African rand. After being stored for some time, each weapon was cataloged by the police for destruction. Initially the weapons were broken using a hydraulic press located at the police's logistics head office in Silverton, Pretoria. The 20 tons of scrap metal were then loaded in special 'trunks' which were sealed and taken under police escort to the Transworks steel mill. When the sealed trunks arrived at the mill they were inspected again by the police against an original inventory list. The trunks were then hoisted with an electro-magnet and dropped into the furnace, beginning the transition from guns to new cars (*Star* (South Africa), 7 October 1997).

Within a different context, another South African weapons destruction effort was undertaken in 1994 known as the Gun-Free South Africa Campaign. Its goal was to focus attention on firearms as the tools of the escalating crime and violence. The voluntary collection program was modest in its achievements. Places of worship were the preferred collection sites because it was felt that people were more likely to go to such sites rather than to a police station. However police stations were used in some areas. At the collection sites, each weapon was received by a member of the clergy who handed it to a South African Police officer who then proofed the weapon and destroyed it using a oxy-acetylene torch or an angle grinder. All weapons collected were then transferred by the police to a police storage facility (Meek, 1998).

United States

In the United States, municipal, state and federal law enforcement authorities all undertake the destruction of illegal firearms using a variety of methods. The Department of Defense (DOD) may have one of the more established large-scale methodologies for destroying surplus weapons in the world. Several attempts were made to obtain official details on the procedures through US Government and Military sources but responses were not forthcoming. There are several military installations in the US which have their own large-capacity shredders (Pielet, personal communication, June 1998). These installations oversee the shredding or compaction of the light weapons under secure conditions. The scrap metal is then sold through tender for recycling. National Rifle Association (NRA) bulletins of March 1994 and December 1995 state that the DOD confirmed that a weapons destruction program lasting about two years destroyed over 3 million firearms including colt .45 pistols, M1 carbines and an assortment of other rifles (NRA 1994; 1995). The NRA lobby was apparently successful in stopping further destruction activities. According to NRA sources, most of the destruction took place at two facilities in Anniston[6] and Birmingham, Alabama using a shredder and a compactor which destroyed the entire firearm including shipping box, sling and cleaning kit. The gist of the NRA complaint was the destruction of many valuable collectors items; the destruction of vast numbers of military heritage firearms and the allegation that the actual cost of destruction was US $3.50 a firearm while the resale value of each firearm averaged about US $250.00. In other words the lost opportunity cost (resale value in dollars) plus the actual cost of destruction suggested a destruction cost of perhaps several million dollars to the tax payer. There is no indication of how the US $3.50 cost per weapon for destruction was derived, however the cost estimate is feasible based on the going price for a shredder plus attendant labor.

Once guns are turned into scrap, there is no guarantee that some parts will not resurface to be reassembled into working firearms. Armscorps USA, based in Baltimore, uses US military parts to rebuild firearms such as the M-1 and M-14. According to Melvin Glaxton and William Gaines of the Chicago Tribune[7] based on an interview with Mr Friese from Armscorps, the firearms are reconstructed using imported parts (85 percent) from places such as South

[5] For details on the situation in South Africa, see also: Smith, 1996; Cock, 1995; Meek, 1998.

[6] According to information received from SSI Shredding Systems Inc., Wilsonville, Oregon, the Anniston Army Depot bought two of their shredding systems for destroying weapons. They were advised by an authority at the Anniston Army Depot that a unit can process small arms such as an AK-47 in a little less than a minute. Larger light weapons such as Browning .50 caliber machine-guns and 81 mm mortars must first be cut to reduce the size. The portable shredder can destroy the receiver of a .50 caliber machine-gun but not the barrel.

[7] For full details see *http://www.kentuckyconnect.com/heraldleader/news/011298/n1guns.html.*

Korea, while 15 percent of the parts come from domestic US army scrap from demilitarized small arms. The company gets regular notices from the military announcing sales and inviting scrap inspection and bid offers. Defense Department records show that in May 1995, Mr Friese, through an intermediary, was the highest bidder on 100,000 pounds of scrap sold by the military at its depot in Crane, Indiana. The invitation to bid stated that the scrap consisted of "demilitarized small arms parts" and other steel of similar quality. By the time Mr Friese and his workers sorted through the 3-foot-high, 20-foot-long pile of supposedly inoperable guns, he had more than 250,000 usable parts. Friese states that Armscorp has more than 500 million weapons parts, including the parts recovered from military scrap—enough complete kits to build a million M-14s.

El Salvador

El Salvador is somewhat unique in its domestic approach to addressing a crime wave exacerbated by a surplus of small arms and light weapons left over from the internal conflicts of the 1980s. In a program called 'Goods For Guns', over 3,100 small arms and light weapons and almost 50,000 rounds of ammunition including grenades, detonators, and mines were collected and destroyed in the fall of 1996.

At the request of the author, Mr William Godnick, director of Prep Com, made some queries regarding the destruction methodology on a recent visit to El Salvador in July 1998. He stated that there was no consistent method of destruction—some weapons were cut and other had their barrels filled. They were not completely destroyed but were made unusable and stored by the army for eventual use in a monument made from the weapons. Explosive ordnance was detonated as soon as possible due to storage concerns. The general procedure has been to dig several holes one meter deep and 50 cm wide and—after obtaining permission from state and local authorities including an environmental approval—to explode the ordnance. The explosives were sometimes destroyed in an area where the detonation could double for use as a construction project. Thus if a road had to be built or widened, it was done in conjunction with the destruction of explosive ordnance thereby assisting in maximizing the use of expensive detonation requirements (Godnick, 1998).

Mozambique

A modest weapons collection program was conducted in Mozambique in 1996/97. The destruction technique used there was a bench saw in the back of a truck to provide a mobile 'collection and destruction site'. However, this allegedly proved too expensive and too unreliable, so weapons are now bought to churches for destruction. Generally the weapons are destroyed at the collection site, but explosives and ammunition are given to the police for destruction (Meek, 1998). There is no indication as to how the weapons were eventually destroyed. While the micro-disarmament failure of the Mozambique UN peacekeeping mission ONUMOZ has been well documented, it is interesting to note that when "the United Nations assessed various options to destroy additional weapons in metal foundries, the idea was rejected as too expensive" (Vines, 1998, p. 6). No explanation was provided as to how this decision was reached and why other methods were not considered.

Haiti

Weapons collected by the US-led Multi-National Force mission were destroyed or disabled by the 8th Ordnance Company, US Army, in Haiti. Some modern weapons in good condition were passed to the US Department of Justice to be re-issued as necessary to the new Haitian Police Force. Weapons of historical value were set aside as museum pieces; and the remainder were sent to the Letterkenny Army Depot in Pennsylvania to be melted down at a destruction facility (BASIC, 1997b, p. 8; Laurance, 1996). This is probably part of the US Army weapons destruction capability previously described.

Nicaragua

A separate effort at weapons collection was initiated in Nicaragua in an effort to reduce weapons in circulation which had not been destroyed under the ONUCA mandate (BASIC, 1997b, p. 8; Laurance, 1996). This was a combination gun-buy-back program and confiscation effort which resulted in some 142,000 weapons—some 30 percent of which were non-functioning—being destroyed. These weapons were destroyed in public bonfires as both a cheap method of disposal and as a political and sociological statement regarding the commitment to reducing violence and increasing public security. The attempts to obtain any information from the Nicaraguan Army on the details of how the weapons were burned, costs involved, and effectiveness of the technique were unsuccessful.

Slavonia

In 1996/97, the UN in collaboration with Croatia supervised a weapons buy-back program in Eastern Slavonia, Baranja and West Sirmium (Croatia). Weapons which were old or in poor condition were kept by the United Nations Transitional Administration for Eastern Slavonia, Baranja and Western Sirmium (UNTAES) for destruction. Small arms were crushed and heavier weapons were disabled by pouring concrete into their barrels. Ammunition and explosives were destroyed under controlled conditions by UNTAES demolition teams organized by the Force Engineer at special sites well away from public areas (Boothby, 1998).

Photo: J3 Arms Control Verification, Canadian Armed Forces

Box1: The Treaty on Conventional Armed Forces In Europe (CFE Treaty)[8]

The CFE Treaty was the first international agreement which formally initiated a regime which oversaw the destruction of conventional armaments—main battle tanks, artillery and mortars above 100 mm, armored combat vehicles and combat aircraft and helicopters (CFE, 1990). The agreement was signed by the former member states of the Warsaw Pact including successor states and NATO member states. It entered into force in July 1992 and, over the next four years, was responsible for the formalized and verified destruction of some 50,000 pieces of treaty-limited equipment. The relevance to the issue of the destruction of small arms and light weapons is manifested in several ways.

In two protocols, the CFE Treaty lays out very precise details on exactly what equipment is subject to the Treaty provisions and how to destroy such equipment. The protocol on Existing Types clearly establishes what weapons systems, platforms or vehicles must be limited, leaving no doubt as to what systems are subject to the destruction protocol. This provides a model for any mandate or effort to destroy small arms, be it a UN mandate or a national program to destroy weapons. The destruction protocol clearly establishes what constitutes destruction and how it is to be done—several methods are deemed permissible. The closest example applicable to small arms and light weapons destruction is the protocol for the destruction of artillery (see Annex). Some states were quite creative in employing various destruction techniques for reducing costs through efficiencies and recycling. Germany designed and used a massive shredder to reduce armored combat vehicles to scrap. Poland used a giant ball weight and electro-magnet to smash tank hulls (see Figure 6).

Most signatory states to the Treaty formed arms control verification organizations which—depending on the circumstances of individual countries—were responsible for conducting verification inspections of other signatory states to ensure that the treaty-limited equipment notifications were accurate in terms of location and numbers and that destruction was carried out in accordance with the destruction protocols. Where a state received inspections, these same organizations were responsible for escorting the visiting verification teams and in many cases were responsible for helping ensure that the destruction protocols were properly carried out. These organizations spent considerable time and effort in developing operating procedures and training mostly military officers and senior non-commissioned officers for various responsibilities to ensure that the Treaty was properly implemented. The national verification organizations conducted verification inspections as part of their own national teams and frequently as part of a multi-national team.

Many of these verification organizations have an indefinite existence. Their experience and knowledge is a valuable resource which has applicability beyond the CFE Treaty and should be offered and exploited wherever and whenever possible. They also plan and conduct inspection and observation activities under the CSCE (OSCE) Vienna Document 1994 and assist in other arms control activities, such as inspections under the Dayton Accords. There are few reasons why these verification organizations could not develop the requisite expertise to oversee the collection and destruction of small arms and light weapons within the context of an international regime, or to assist the UN, regional organizations or individual states in that regard. The requirement for assistance (financial or technical) was noted in the summary report emanating from the meeting held under the auspices of the ICRC and the Norwegian Red Cross in May 1998 (Prep Com, 1998). At the very least their organizational structure, knowledge and skill levels and *modus operandi* provide a model for weapons destruction monitoring and/or implementation regimes, whether small scale in support of UN peace missions or part of an international agreement to destroy surpluses.

8 The information is drawn from *Treaty on Conventional Armed Forces in Europe*, Paris, 19 November 1990, and the author's own experience in the Canadian Armed Forces as a policy analyst, arms control inspector and information support analyst pertaining to Canadian involvement in the CFE Treaty, the Document of the Stockholm Conference on Confidence- and Security-Building Measures and Disarmament in Europe (OSCE, 1986), the Vienna Document (OSCE, 1994) and other arms control activities from 1988 to 1996.

◀ ***Figure 6: Tank hull destruction by smashing in Poland***

Analysis of Small Arms and Light Weapons Destruction Methods

It is clear from the survey of small arms destruction to date that there is a profusion of methodologies for destroying small arms and light weapons, ranging from the cheap and simple but perhaps less reliable and less environmentally friendly methods of burning to the advanced and very reliable but more costly methods of shredding. A choice of system for destroying small arms and light weapons is made according to several factors including: quantity; time constraints; security requirements; political, psychological and publicity factors (the value of participation by ex-combatants for example); national infrastructure (road networks and domestic destruction and recycling capabilities); labor costs, and available implementation funds. Using ordinary cost analysis and cost-benefit analysis to determine the best destruction procedure is difficult and sometimes unreliable, even if one can account for all the variables. Intangibles cannot be quantified, and assumptions often cannot be proven. This present analysis will try to incorporate reasonable direct costs and considerations only. More detailed cost-benefit-analysis is a matter which perhaps requires addressing, not only for the more concrete issue of destruction but for the entire aspect of micro-disarmament.[9] Also, in terms of the reliability of various techniques regarding the certainty of destruction, "better is sometimes the enemy of good enough"! If one technique guarantees a destruction probability of 99 percent while another guarantees a destruction probability of 95 percent, costs might sometimes mean that the 95 percent solution should be given preference.

[9] For an interesting conceptual approach to cost-benefit analysis, particularly within the field of social issues, see Kopp, Krupnick and Thomas, 1997.

Burning

This is an established procedure which has been used in both Mali and Nicaragua. It has the advantage of being simple to execute and is very inexpensive in terms of incremental costs. Its essential ingredients are fuel (wood or coal), a flammable substance to enhance rapid heat generation (gasoline or diesel oil), some care, and a modicum of skill in stacking the firearms to maximize destruction. No doubt the procedures can be improved upon through trial burns and the use of crude furnaces. Burning provides a visible and tangible statement in symbolic and real terms which has a political and psychological impact difficult to quantify. It may be appropriate for less developed states and for states emerging from severe intra-state conflict where a new direction and new hope must be symbolically and concretely demonstrated. The procedure is more labor-intensive which is generally not a significant problem for less developed states.

On the other hand, however, burning runs the risk of being less effective in terms of total destruction, and the resulting scrap is less desirable for recycling. Some experts have questioned the ability of open fires to produce enough heat to adequately destroy all firearms. Information was provided by the Chief Scientist-

"Burning may be appropriate for less developed states and for states emerging from severe intra-state conflict where a new direction and new hope must be symbolically and concretely demonstrated."

Firearms for the RCMP that firearms burned in this manner would probably be unusable even if there was no visible damage, as the metal would have been sufficiently affected to make firing dangerous if not impossible. However, burning is not a 100 percent-guaranteed disabling procedure unless the barrels and receivers are visibly bent, twisted or otherwise deformed (Smith, personal communication, June/July 1998). This can be overcome through spot checks and re-burning if necessary or, if it is a case of only a few weapons, destruction by other means such as sledge hammers. As for recycling, unless a state has an indigenous capability to recycle through its own steel mills it is highly unlikely that the transportation costs alone would be off-set by any potential gain through scrap steel recycle payments. In situations like this, it might be better to bury the scrap firearms *in situ* or, if appropriate, construct a peace memorial or monument. Another disadvantage might be the environmental concerns of smoke pollution and scrap metal pollution. However it is highly probable that in the situation where this method is likely to be used, such 'pollution' would be an infinitesimal proportion of what the state and its citizens already generate and would be incomparable to the potential for casualties and social suffering which might take place if the procedure were not carried out.

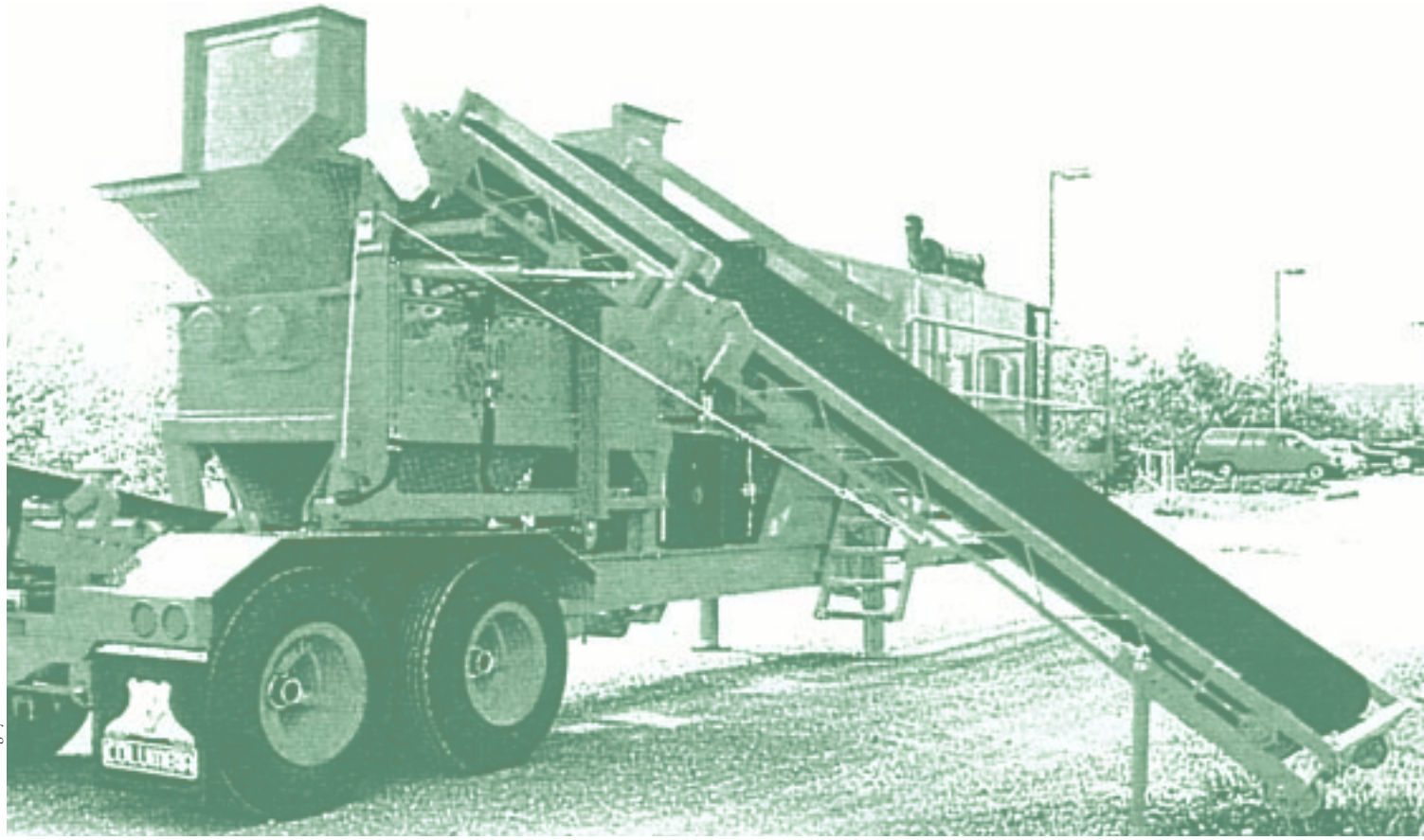

Photo: Shredding Systems Inc.

▲ *Figure 7: Shredding Systems Inc. 2400-HM mobile shredder*

Cutting: oxy-acetylene torch and plasma cutter

Oxy-acetylene cutting is a well-established and proven method for destroying weapons of all types and sizes. It can be used for destroying the smallest handgun up to large-caliber systems requiring reduction under the CFE Treaty. It has the advantage of being relatively simple to use. Personnel can be trained in a day to use the cutting torch, including safety lessons. Local contractors can be employed under supervision, or the equipment can be purchased or leased for use by the security forces or supervising agency personnel. The equipment is available on a worldwide basis and is portable enough to be flown to isolated spots by helicopter or light aircraft or moved by light truck. It is relatively maintenance free and spare parts are normally plentiful. If procedures for cuts are followed—at least one cut through the receiver—the cut plus the resulting slag from the congealing of the metal renders the weapon useless. If nothing more is done and the pieces are made available, it is conceivable that a gunsmith might be able to produce one working model out of several hundred scrap weapons, but the work involved and the potential danger to the subsequent user would makes this an unprofitable undertaking. To be absolutely certain, a second cut could be made through the barrel at or near the chamber—two cuts would indeed ensure that the weapon is useless.

> *"Oxy-acetylene cutting is a well-established and proven method for destroying weapons of all types and sizes."*

Disadvantages to this method center primarily on the number of weapons that can be cut in a given time frame. While some may take less than a minute, others may take more time. Operator skill also has some bearing on the matter. Nevertheless it may be unrealistic to expect to cut more than 40 to 50 in an hour or 400 to 500 in a 10-hour day, even with changes in operators. Arguably, the scrap metal should be disposed of to prevent parts being used for spares but again it is questionable whether this makes sense if spare parts are easily available.

The expense of purchase, lease or a commercial contract with a cutting operator obviously varies from area to area and region to region. One would expect that leasing and commercial contracting would be cheaper in less developed countries. In Canada, a new system (valves, connectors and hoses) costs 250 Canadian dollars (CDN $); the lease of the two medium tanks is about CDN $65 a year. An oxygen refill is approximately CDN $25 and an acetylene refill is about CDN $65. One would expect to get 15 to 20 hours of cutting from medium tanks before requiring a refill. The cutting ratio use of oxygen and acetylene is about two oxygen to one acetylene which requires changing an oxygen tank every 10 hours and an acetylene tank every 20 hours (Candasamy, personal communication, June 1998). As tanks must be leased, it does not pay to buy the ancillary equipment. If one assumes a weapon can be cut once at the rate of one per minute then it would be fair to suggest that, not counting labor, the costs in gases alone are about twelve to fifteen cents a weapon. As the lease and ancillary equipment are essentially one-time purchases, the cost on a large number of weapons, for example 10,000, might be an extra three cents for a total equipment material cost of about fifteen to eighteen cents a weapon. The cost of transportation, collection, labor, and supervision are all variables dependent on a number of factors and cost-analysis accounting assumptions. If labor were added at ten dollars an hour, it would raise the cost of destruction (two men per site) to about sixty cents a weapon.

A plasma cutter is more expensive (in terms of equipment) but a faster way to do the same thing as oxy-acetylene. It can cut weapons twice as fast as oxy-acetylene and provides a much cleaner cut. The cleaner cut, because it does not produce a large slag component, may make the weapon more susceptible to repair but again this is a relatively small concern in most countries. By the same token, double cuts are more practical. A plasma cutter suitable for this type of work costs about 3,000 Canadian dollars. It requires an electrical 220 volt current and can be run off a portable generator. A 5 kWh generator costs in the range of CDN $1,200. In addition, it requires the use of compressed air or compressed nitrogen. Compressed air is a cheaper commodity but again a compressor and tank would be required with each cutter. According to the chief firearms technician responsible for destruction of weapons with the RCMP, the plasma cutter is much easier to use than the oxy-acetylene one. It is, however, susceptible to moisture problems which can effect maintenance and repair costs (Bryant, personal communication, June 1998).

Cutting/crushing: hydraulic shears

Mechanical methods of cutting or bending have been used as a destruction method for disabling weapons by numerous police forces including some in Australia, South Africa and Canada. It is a relatively simple procedure which is environmentally friendly. Shears run in cost from a few thousand dollars to tens of thousands of dollars. The price reflects both their capability in terms of the size of steel they can cut or bend and the speed with which they can do it. The machinery can be bought new or used and can be custom designed. Several manufacturers who were contacted said they could meet the specifications of portability and capability insofar as destroying small arms were concerned and would be prepared to construct shears to whatever specifications were required. Crew-served weapons, particularly items such as .50 caliber machine-gun barrels would require a more expensive shear capability. According to correspondence with the director of Alan Ross Machinery Corporation, Northbrook, Illinois, in June 1998, the best equipment would be a hydraulic alligator shear.[10] Such machines can be made self-powered (diesel generator), be sent into the field, and are available in a variety of blade sizes (8 inch [20 cm] to 24 inch [61 cm]) which generate anywhere from a 30-ton to 90-ton cutting force. They are easy to use and would be able to take advantage of low-cost labor under the supervision of security personnel. The company claimed it could produce a 'field rugged' equipped model, conforming to most military requirements and custom manufactured for prices from US $10,000 upwards. Depending on size, these machines can make anywhere from 8 to 50 cuts per minute. Thus, a few persons at a well organized site could easily destroy a stockpile of 5,000 small arms in a day. Similarly, Ramjet Fluid Power Ltd, New Zealand stated that they supplied hydraulic alligator shears to some Australian police forces for the purpose of small arms destruction. They recommended an RJ 14/50 Alligator Shear with 14 inch blades and a 50-ton shearing force. Such a machine can cut weapons at the rate of eight per minute but, with a skilled operator, this could be increased to 10 or 12 per minute. It weighs 800 kg and can be fitted with its own power source and made truck/trailer portable (Turnock, personal communication, July 1998).

> *"Cutting/crushing is a relatively simple procedure which is environmentally friendly."*

[10] For details on hydraulic alligator shears (new and used) and other equipment see internet websites of Alan Ross Machinery Corporation and Recycler's World.

Shredding

There seems to be little doubt that shredding is perhaps the quickest and most effective way to destroy small arms and light weapons. In developed countries it is often the preferred final step in destruction. This procedure has several advantages over other methods. First is capacity: a giant shredder can literally destroy thousands of firearms a day. Second is finality: a weapon which goes through a shredder is rendered completely useless, not only with regard to operation but as a source of spare parts. Another consideration is that shredder scrap metal product is normally destined for recycling by the nature of where the bulk of shredding is done, namely, scrap metal recycle depots. Under some circumstances it might be feasible to commercially contract a mobile shredder on lease to destroy weapons *in situ* while in other instances it might be more effective to transport the weapons, either disabled or intact, to a giant shredder location. Shredded scrap which consists of non-metallic refuse does not have as high a scrap metal value as scrap which is 99 percent pure. On the plus side, the lower value is offset by the high speed and high capacity of destruction.

Disadvantages of this method of destruction center primarily on expense and availability. Even in developed countries with extensive recycling capabilities, large capacity fixed location shredders are located in only a few places. These machines cost several million dollars. Smaller, more mobile shredders are also available but these are not cheap and their purchase for destruction of weapons only would not be cost-effective unless one was in the business of doing many thousands of light weapons per year. (See Figures 4 and 5 for an example of a giant fixed location shredder and Figure 7 for an example of a mobile shredder.) As noted in the destruction procedures for Canada and Australia, the use of the shredder was merely the final step in a destruction procedure which entailed initial disabling, secure transport and supervised destruction. While legal considerations and fail-safe security requirements may recommend this procedure, there is little doubt that it is not required to satisfy final destruction requirements. There is no reason why operating weapons could not be transferred intact in locked trucks accessible through removable tops to a shredding site and be destroyed in the shredder immediately under supervision. In most countries, security need not be any more than would be involved in transporting large sums of money—perhaps a driver, two security guards and a supervisor with the requisite accounting logs. In less stable countries, more security would be necessary. An alternative solution is to bring mobile shredders to weapons depots for destruction within a secure environment. There is little doubt that, where the economic and industrial infrastructure of a country permits, this type of destruction procedure may be the most efficient and cost-effective particularly for large quantities of weapons. As will be discussed under recycling, some cost recovery is probably achievable particularly for large numbers of weapons.

> ***"Shredding is perhaps the quickest and most effective way to destroy small arms and light weapons."***

Crushing/bending with vehicles

During a discussion with Mr John Hardy, Lieut. Col. retired Canadian Army, he stated that in the mid-1950s—when the Canadian Army was replacing its light machine-gun of the day (Bren guns)—orders were received to destroy those currently being held by laying them flat on a hard stand (asphalt or preferably concrete) and running over them lengthwise with a Centurion tank. Mr Hardy, who was involved in the destruction, vouched that the weapons were totally mangled as the tank had no track pads and hence the weapons were repeatedly hit about 36 times with tank cleats from a 50 ton tank (Hardy, personal communication, June 1998). Anecdotal information suggests that weapons seized from one of the factions in the Yugoslavian conflict were at least partially disabled by running them over with a Canadian tracked armored personnel carrier (M113A). Heavy tracked military vehicles and/or bulldozers of various sizes are not uncommon in most countries including less developed states. There is no reason to suggest that crushing in this manner is not a viable technique. It can be done by laying the weapons down lengthwise and running them over; or laying them down crosswise on a log, cement blocks or a curb and running them over. Even heavy wheeled vehicles such as loaded tandem dump trucks could perform the same task if the small arms were laid out across beams, logs or blocks. Bulldozers or even front-end loaders could also use their blades in the same manner as shears to bend weapons. A visual inspection by a competent authority would be able to identify whether or not the firearm was destroyed and whether the process needed repeating. (See Box 2 for the results of tests carried out by the author using a front end loader.)

Box 2: Destruction testing using a loader blade

The author obtained two .303 caliber Enfield rifles courtesy of Mr Murray Smith, Firearms Scientist for the RCMP forensics laboratory, to conduct field expedient destruction testing. The .303 Enfield is perhaps one of the most difficult rifles to destroy as its receiver and barrel tend to be thicker and stronger than those of modern assault rifles. A local contractor, Mr Lawrence Wyatt, agreed to the use of his construction equipment. Rather than use an available large bulldozer or another heavy piece of equipment, it was decided to use a smaller tractor with a front dump blade—one that would be in common use by small contractors throughout the world.

The firearms were held tight in the jaws of the blade and the hydraulic pressure on the downstroke was used to bend the gun metal against the hard gravel surface In other words, the barrel (rather than the stock, as in the photograph) was pointing downward. This is the preferred method because if the stock is pointing downward, the receiver is not adequately disabled. The experiment using the preferred method was successful in bending the barrels and the receiver to the extent that the weapons were completely disabled. It is the opinion of the author that such a procedure could destroy two to six firearms at a time, taking about one minute. The procedure would probably be quicker once the operator and those feeding the blade became more familiar with the operation. While the hard gravel surface was adequate, a concrete or similar hard surface would enhance the operation. This is just one example of how adequate destruction can be carried out at little cost.

Photo: De Clerq

▲ ***Figure 8: Firearms in the jaws of a front dump blade***

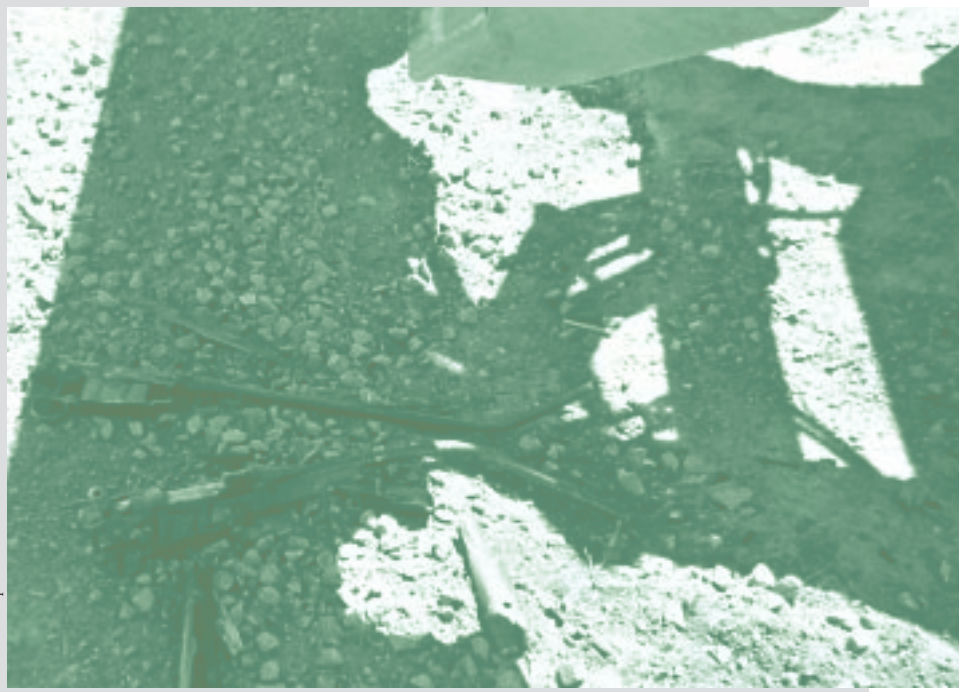

Photo: De Clerq

▲ ***Figure 9: Firearms after being placed in blade with barrels downwards***

Dumping at sea

Article 210 of the Law of the Sea Convention declares that "states through laws, regulations and measures shall ensure that dumping is not carried out without the permission of the competent authorities of States." It goes on to say that "dumping within the territorial sea and the exclusive economic zone or onto the continental shelf shall not be carried out without the express prior approval of the coastal State, which has the right to permit, regulate and control such dumping after due consideration of the matter with other States which by reason of their geographical situation may be adversely affected thereby." The Ocean Dumping Act London Convention on the Prevention of Pollution from the Disposal of Wastes and other Matter, passed in 1972, provides a framework for managing ocean dumping activities and for conducting basic oceanic research. The law bans ocean dumping of radiological, chemical, and biological warfare agents and high-level radioactive waste. Amendments in 1988 and 1993 extended this ban to sewage sludge, industrial waste, and medical wastes.

Industrial wastes are defined as any wastes and similar matter other than: dredged material, fish wastes, ships and platforms, organic waste of natural origin, inert inorganic geologic material and bulky items such as steel and concrete. The issue of firearms and ammunition disposal at sea was debated at the convention because one of the parties to the convention was at that time disposing of such wastes at sea on a regular basis. The decision of the Convention was that firearms and ammunition were considered industrial waste and thus included in the prohibition. The Convention was amended again in 1996. The new Protocol used a reverse listing approach enumerating those items

> *"Dumping at sea would undoubtedly be a relatively inexpensive method of destroying large quantities of small arms and light weapons."*

which may be considered for disposal at sea. The reverse list is the same as the list of what is not industrial waste. The Protocol also includes a process of assessing the suitability of the wastes on the reverse list for disposal at sea. The process involves an examination of alternatives: permits for disposal of wastes at sea would only be issued where it is the environmentally preferred and practical option. Obviously this would not be the case for most industrialized states (Osborne; Tay, personal communications, July 1998).

It would appear from the above conventions that dumping small arms and light weapons at sea may only be a viable destruction method for some less developed countries and only if other alternatives were not economically available. Used small arms and light weapons are unlikely to have significant amounts of lubricants, perhaps 2–3 ml of light oil each—many would have less. The dumping of 100,000 light weapons, even without decontamination of lubricants would probably mean that about 250 liters of diffused light oil would be dumped along with the firearms. If one were to compare the ecological pollution possibilities to, for example, air pollution through burning the equivalent number of weapons or even cutting them using oxy-acetylene torches, then the procedure appears practical. The use of a dump barge and/or containers would seem to offer the best procedure for dumping. Semi-trailer truck containers could pick weapons up at various points where they could be taken to a port facility for loading onto ships and sea disposal. The containers would be locked and guarded. Dumping at sea would have to be done in deep water where economical retrieval would not be possible. This would undoubtedly be a relatively inexpensive method of destroying large quantities of small arms and light weapons. It might be worthwhile to seek exemptions for such dumping (ammunition excluded), given the assumed benefits of destruction.

Other methods

The destruction methods listed above are those most applicable to larger quantities of small arms. There is no doubt that simple methods such as a sledgehammer and anvil (particularly useful for handguns); hacksaw, grinder, bandsaw and bench saws with special carbide blades; direct disposal into blast furnaces or foundry furnaces; and plugging barrels with metal welds are all feasible methods. It was noted that cement was used to plug barrels in Slavonia and El Salvador. In the opinion of several expert armorers this latter method is highly suspect as a means of permanently disabling weapons (see also Smith, personal communication, June/July 1998). In general, the primary drawbacks of all these other methods are that they are either labor-intensive, time-consuming, dependent on special resources, perhaps not 100 percent effective or—in the case of special cutting blades—perhaps somewhat expensive. Nevertheless they all have their special niche and should be considered as an option where appropriate.

Ammunition and Explosives Destruction (Demilitarization)

> *"The destruction of explosive ordnance is somewhat more complex, time-consuming and costly than the destruction of ball ammunition and some pyrotechnics."*

The destruction of ball ammunition and explosive ammunition does not lend itself to as many choices as the destruction of small arms and light weapons. In the case of ball ammunition it essentially requires destruction through burning and for explosive ordnance, destruction through open detonation. When dealing with small amounts of ball ammunition, this is not particularly expensive nor complicated. In fact ball ammunition could be merely expended in the normal way by firing on a range or into a butt/backstop. See Box 3 for a basic procedure for destroying ball ammunition which is both simple and inexpensive.

As ammunition is an expendable product, the military forces of most states maintain large quantities for both training purposes and as war reserves. While destruction of small quantities of ball ammunition are relatively easy to achieve, large quantities—such as those held by the US military—present difficulties. The destruction of munitions through burning and detonation may cause the emission of particulates, suspected carcinogens and nitrous oxides which presents concerns regarding the environment. A number of trials are underway to overcome some of these problems (for details, see United States Army, 1995). In many cases, particularly in states with strict regulations and huge quantities of ammunition, destruction can become very expensive. For example, in the United States 200,000 short tons of ammunition required demilitarization in 1990 (United States Army, 1995). According to ABC News, the US Army destroys 67,600 tons of munitions annually at a cost of US $100 million a year (Petri, 1997).

The US Under-Secretary of Defense for Acquisition and Technology stated the US has an existing stockpile of three million tons of ammunition of which 400 thousand tons require demilitarization now and that the latter amount will double in the next few years (Kaminski, 1996). When one looks at these problems in comparison with the relatively paltry amount of ammunition handed in on UN peace missions, disposal of the latter is relatively easy.

The destruction of explosive—particularly high explosive—ordnance such as grenades, mines, mortar bombs, artillery shells and so on is somewhat more complex, time-consuming and costly than the destruction of ball ammunition and some pyrotechnics within the context of peace-operations. As stated previously, the normal procedure is to use explosive detonation *in situ*. There are several reasons for doing this, not the least of which is the unreliability of some of the ammunition which creates safety problems if stored and moved to a central location. Procedures for such disposal are taught to specialists in all professional militaries (combat engineers and selected ordnance personnel) and are annotated in various explosive ordnance disposal manuals. Disposal procedures using plastic explosives such as C4 are generally acceptable for the small quantities of explosive ordnance handed over on peacekeeping missions. Larger quantities, such as ammunition dumps left over from the Gulf War and obsolete war reserve munitions, may require a different approach.

The requirement to rid a state or an area of unwanted munitions, be they unexploded ordnance on old weapons ranges, unwanted national reserves, or former combat zones such as found in the states of the former Yugoslavia and in the Middle East, has spawned a commercial industry ready to take on the challenge at a price. Such organizations can be found throughout the world. Some of these businesses are organized and contracted through munitions-producing companies such as SNC Industrial Technologies Inc. in Canada. (For a listing of many of these companies, see United States Special Operations, 1998.) Of interest is the fact that some major producers of ammunition in the United States have criticized the giving of surplus ammunition stock to other countries as it poses unfair competition. Aliant Tech Systems, a major US manufacturer of military ammunition, criticized a gift to Greece of 58,000 rounds of tank ammunition as it then enabled Greece to cancel a US $30 million order. Aliant is on record as stating that the US government should adopt demilitarization, that is, destruction, as the preferred strategy for disposing of surplus ammunition (Lumpe, 1996). This suggests that it might be possible to co-opt ammunition producers into helping to destroy ammunition collected as surpluses!

Box 3: Field destruction of ammunition

This is an abbreviated description regarding the destruction of ammunition under field conditions. It is the procedure authorized for ammunition destruction by the Canadian Armed Forces (Anglin, personal communication, 1998). All military forces have similar procedures as do commercial explosives ordnance destruction firms. There is probably more state-of-the-art equipment available that can do larger quantities more quickly.

1. The field furnace consists of an all-steel cabinet weighing approximately 157.5 kg and is designed with a removable cover, a side door for removal of burned by-products and a removable tray which serves as the fire box. See Figure 10 for a schematic drawing. The furnace is designed to burn condemned or surplus small arms ammunition, pyrotechnics but not black powder and high explosives due to the risk of violent explosion.

2. The field furnace should be set on a hard platform—concrete or rocks—and all flammable material should be cleared within a radius of 7.5 meters. When a burn is taking place, personnel should retire to a distance of 45 meters.

3. Items to be burned must be removed from packaging as burning even under slight confinement may result in an explosion. All ball ammunition (except 20 mm MP, HE, HEI and DU) and ammunition containing EC smokeless powder, may be burned.[1] Only small quantities of bulk primers may be burned at one time. As well as ball ammunition, small quantities of detonators, blasting caps, explosive bolts and relays and some pyrotechnics may also be burned.

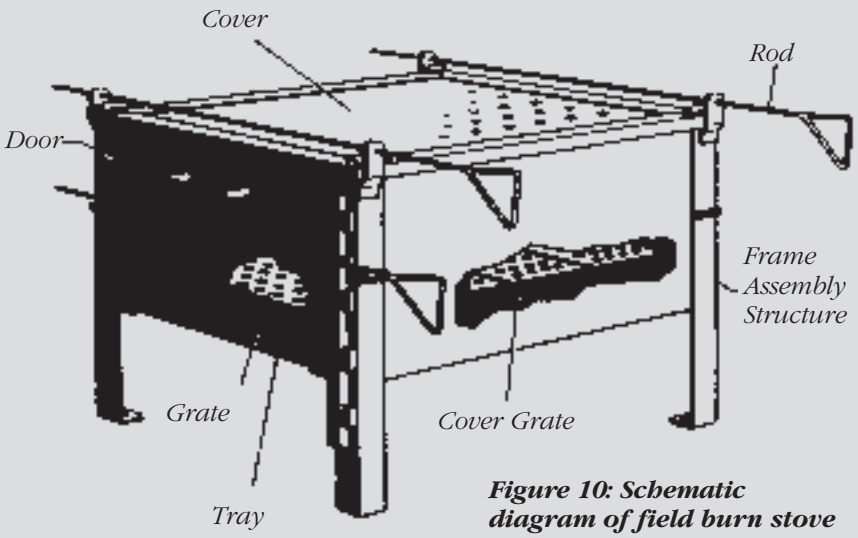

Figure 10: Schematic diagram of field burn stove for ammunition

4. Fuel oil or motor oil or other suitable combustion material may be used to aid burning. Ignition may be electric or non-electric. The furnace shall be observed but not approached while burning is in progress. A waiting period of 30 minutes is recommended before approaching the furnace. The furnace shall be allowed to cool before opening and removing refuse. The refuse shall be inspected and if necessary unburnt or functioning ammunition will be re-burned. The remainder shall be certified 'Free From Explosives' prior to declaration as scrap for salvage.

5. A sample of recommended burn quantities for this type of furnace is as follows: All .22 caliber—2,500 per burn. All 5.56 mm to 9 mm—500 per burn. .50 caliber—100 per burn. The author is aware that the recommended number of cartridges per burn has been exceeded with no problems. Presumably a larger, stronger furnace could safely burn more ammunition.

[1] Author's note: This means virtually all small arms ammunition of the type collected on most UN missions may be burned using this method.

Scrap Recycling

Recycling the scrap from weapons destruction programs has had indifferent results as regards assisting in cost recovery. All of the destruction programs examined in this study failed, or apparently failed, to obtain any cost recovery from recycling. The exception appears to be US Army weapons destruction in the continental United States; the relevant information on defense recycling procedures are described in a recent US Army document (Mather, 1996). It specifically refers to selling non-ferrous metals, which are truly scrap and do not require demilitarization, and ferrous metals. The described procedure is designed to solicit better prices. According to a scrap recycler broker from Chicago, the US military puts out tenders for scrap bids on destroyed weapons (Pielet, personal communication, June 1998). Current prices for shredded steel with a 25 percent contamination level (plastic and wood) are between US $40 to $60 a ton. Scrap steel which is 99 percent pure may fetch a price of US $100. A German source suggested that, as much of the steel is chromium, molybdenum and nickel alloy, it should command a premium price if uncontaminated—in the neighborhood of US $105 (Hempel, personal communication, July 1998). It should be noted that Australian mills claimed the metal was inferior and thus wanted to charge rather than pay!

Both sources indicated that brass shell cases, clean, fired and without primers would fetch US $1,300 to $1,400 a ton. Small arms casings would fetch much less. Apparently shell casings from former Warsaw Pact countries are in demand because of their high silicon content. An official from the Canadian Company Bakermet which shreds weapons for the RCMP speculated that if the quantity was large enough, perhaps 100 tons or more, they would probably pay CDN $40 to $60 a ton delivered. Normally one tandem truck load is approximately 20 tons.

Over the last few years, new small arms have been developed that contain substantially less steel and more plastics and polymers than their predecessors. This development means that these small arms will not be attractive for recycling purposes and will have little cost recovery potential when destroyed.

It was clear from the sources consulted that price was a variable depending on market requirements and location. If the cost of transport is equal to or more than the price offered for the scrap metal then it is obviously not a worthwhile proposition to attempt recycling for cost-recovery purposes. This may be a particular problem in developing countries which lack scrap-recycling facilities, a good transportation network and steel mills. Notwithstanding, in countries which have a steel-recycling capability, it appears likely that an aggressive marketing campaign by the authorities disposing of weapons might meet with some success. This can be approached on two levels—one is the actual value of the product and the second is the community service/public relations aspect of contributing to improving the security situation in a given state.

“All of the destruction programs examined in this study failed, or apparently failed, to obtain any cost recovery from recycling.”

At the very least, where the situation permits, destruction through shredders, should be at no cost. Calling for tenders is a worthwhile consideration where the numbers of firearms being destroyed warrant it. The tenders should include a requirement to actually destroy the firearms under a witness accounting program, which could completely eliminate all direct costs of destruction and even make a small profit.

Recommendations and Conclusions

There are many lessons, observations and recommendations to be drawn from the analysis of the available information on weapons destruction to date.

1. **The direct cost of destruction was not an apparent problem** in any of the destruction operations, be they micro-disarmament destruction within a UN peacekeeping mandate or the more benign requirements of disposing of illegal or surplus small arms and light weapons in both developed and less developed countries. Where direct cost concerns might have been a factor (Mozambique), it appears that creativity and will may have been lacking.

2. **The indirect cost of destruction can be significant.** That is, the cost of buy-back incentives and reimbursement for property, and the cost of lost sales or use opportunity by governments and their security forces. It is difficult to quantify this in relation to the political and psychological benefits which may accrue from destruction.

3. **There are numerous ways to destroy small arms and light weapons.** These range from the very inexpensive such as burning or crushing/bending with vehicles to mass destruction through shredding. There is a technique suitable to every environment whether one is considering costs, political and psychological factors, numbers, or infrastructure. Leasing equipment from commercial firms or hiring commercial firms to assist in destroying weapons under supervision are realistic options in some areas.

4. **On a cost-analysis basis, it is not always necessary to choose the most effective procedure.** Sometimes 'better is the enemy of good enough'. In many instances (Canada and Australia) redundancy, fail-safe security procedures, and perhaps legal concerns added to the cost of destruction. If a shredder will completely destroy a weapon, why cut it up first?

5. **It might be worthwhile establishing a 'small arms/light weapons destruction verification capability'** similar to that which exists for the CFE Treaty. Such a capability would assist in developing the expertise to maximize effectiveness through various destruction techniques and ensure cost-recovery is diligently pursued. It should also develop suitable expertise in ammunition and explosives destruction and develop the requisite safety and identification knowledge to either implement, or supervise the implementation of, micro-disarmament projects. Such a capability could be developed on a national basis either as an adjunct to CFE Treaty verification organizations, where they now exist, or as a designated UN component with various countries on standby to provide the requisite personnel and equipment.

6. Where costs permit and the complexity of the destruction requirements dictate such a measure, **commercial explosives ordnance disposal firms should be considered** in lieu of the above verification organization.

7. Instead of implementing the recommendations made in 5. and 6. above—or as a parallel action—**a standing operating procedure or guide to collection and destruction could be prepared** by a competent organization such as the Lester B. Pearson Canadian International Peacekeeping Training Centre, Nova Scotia. Such a guide should include weapon identification, destruction methodologies, collection point organization, and safety considerations, to name but a few.

8. **The UN should consider purchasing and maintaining equipment for a light weapons destruction capability in their holding depots.** This equipment could include such items as oxy-acetylene cutting torches, plasma cutters and hydraulic alligator shears for deployment with UN peacekeeping forces or for use by a UN light weapons destruction unit as applicable.

9. **Large quantities of ammunition—particularly explosive ordnance—are more costly to destroy.** There are few alternative methods when it comes to destroying ammunition. Environmental concerns reduce flexibility and add to costs. Notwithstanding, the costs cannot be deemed as overriding considerations for not destroying the ordnance.

10. **Recycling should be used as a way to reduce the cost of destruction wherever possible.** Scrap recycling is a tenable method of disposal although it has often not been effectively used because infrastructure and quantities hindered cost recovery. Nevertheless, cost recovery should be more vigorously pursued in regions and states where it is feasible.

11. **The co-opting of large munition and even weapons manufacturers into assisting states and regions in ridding themselves of unwanted ammunition and weapons should be pursued.** It is in the manufacturers self-interest to do so, partially because destruction of weapons diminishes supply and thus provides a possible market and partially because it might enhance their public image. Such an approach is not altruistic, thus cynics and purists may not approve, but the fact remains that cheaper used weapons would be taken out of the system; new, more advanced weapons should be subject to tighter controls and might in any case be beyond the financial means of some undesirable, 'would-be' users.

List of Selected Acronyms

BASIC
British American Security Information Council
CFE
Conventional Armed Forces in Europe
CSCE
Conference for Security and Co-operation in Europe (now OSCE)
DOD
United States Department of Defense
DPKO
UN Department of Peacekeeping Operations
FMLN
Frente Farabundo Martí para la Liberación Nacional (El Salvador)
ICRC
International Committee of the Red Cross
MINGUA
UN Human Rights Verification Mission Guatemala
MPCD
Patriotic Movement Against Crime (El Salvador)
NCO
Non-commissioned officer
NGO
Non-governmental organization
NRA
National Rifle Association (United States)
NSW
New South Wales (Australia)
OECD
Organisation for Economic Co-operation and Development
ONUCA
UN Observer Group in Central America
ONUMOZ
UN Operation in Mozambique
ONUSAL
UN Observer Mission in El Salvador
OSCE
Organization for Security and Co-operation in Europe (formely CSCE)
RCMP
Royal Canadian Mounted Police
SOP
Standing Operating Procedure
UNIDIR
United Nations Institute for Disarmament Research
UNTAES
United Nations Transitional Administration for Eastern Slavonia, Baranja and Western Sirmium

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Annex

Treaty on Conventional Armed Forces in Europe, Protocol on Procedures Governing the Reduction of Conventional Armaments and Equipment Limited by the Treaty on Conventional Armed Forces in Europe, Section V: Procedures for the Reduction of Artillery by Destruction

1. Each State Party shall have the right to choose any one of the following sets of procedures each time it carries out the destruction of guns, howitzers, artillery pieces combining the characteristics of guns and howitzers, multiple launch rocket systems or mortars at reduction sites.

2. Procedure for destruction by severing of guns, howitzers, artillery pieces combining the characteristics of guns and howitzers, or mortars, that are not self-propelled:
(A) removal of special equipment, including detachable equipment, that ensures the operation of the gun, howitzer, artillery piece combining the characteristics of guns and howitzers or mortar,
(B) for the breech system, if any, of the gun, howitzer, artillery piece combining the characteristics of guns and howitzers or mortar, either:
(1) welding the breech block to the breech ring in at least two places; or
(2) cutting of at least one side of the breech ring along the long axis of the cavity that receives the breech block;
(C) severing of the tube into two parts at a distance of no more than 100 millimeters from the breech ring;
(D) severing of the left trunnion of the cradle and the mounting area of that trunnion in the upper carriage; and
(E) severing of the trails, or the base plate of the mortar, into two approximately equal parts.

3. Procedure for destruction by explosive demolition of guns, howitzers, or artillery pieces combining the characteristics of guns and howitzers that are not self-propelled:
(A) explosive charges shall be placed in the tube, on one cradle mount in the upper carriage and on the trails, and detonated so that:
(1) the tube is split or longitudinally torn within 1.5 meters of the breech;
(2) the breech block is torn off, deformed or partially melted;
(3) the attachments between the tube and the breech ring and between one of the trunnions of the cradle and the upper carriage are destroyed or sufficiently damaged to make them further inoperative; and
(4) the trails are separated into two approximately equal parts or sufficiently damaged to make them further inoperative.

4. Procedure for destruction by explosive demolition of mortars that are not self-propelled: explosive charges shall be placed in the mortar tube and on the base plate so that, when the charges are detonated, the mortar tube is ruptured in its lower half and the base plate is severed into two approximately equal parts.

5. Procedure for destruction by deformation of mortars that are not self-propelled:
(A) the mortar tube shall be visibly bent approximately at its midpoint; and
(B) the base plate shall be bent approximately on the centerline at an angle of at least 45 degrees.

6. Procedure for destruction by severing of self-propelled guns, howitzers, artillery pieces combining the characteristics of guns and howitzers or mortars:
(A) removal of special equipment, including detachable equipment, that ensures the operation of the gun, howitzer, artillery piece combining the characteristics of guns and howitzers or mortar;
(B) for the breech system, if any, of the gun, howitzer, artillery piece combining the characteristics of guns and howitzers or mortar, either:
  (1) welding the breech block to the breech ring in at least two places; or
  (2) cutting of at least one side of the breech ring along the long axis of the cavity that receives the breech block;
(C) severing of the tube into two parts at a distance of no more than 100 millimeters from the breech ring;
(D) severing of the left trunnion and trunnion mount; and
(E) severing of sections of both sides from the hull which include the final drive apertures, by vertical and horizontal cuts in the side plates and diagonal cuts in the deck or belly plates and front or rear plates, so that the final drive apertures are contained in the severed portions.

7. Procedure for destruction by explosive demolition of self-propelled guns, howitzers, artillery pieces combining the characteristics of guns and howitzers or mortars:
(A) for self-propelled guns, howitzers, artillery pieces combining the characteristics of guns and howitzers or mortars with a turret: the method specified for battle tanks in Section III, paragraph 3 of this Protocol shall be applied in order to achieve results equivalent to those specified in that provision; and
(B) for self-propelled guns, howitzers, artillery pieces combining the characteristics of guns and howitzers or mortars without a turret: an explosive charge shall be placed in the hull under the forward edge of the traversing deck that supports the tube, and detonated so as to separate the deck plate from the hull. For the destruction of the weapon system, the method specified for guns, howitzers, or artillery pieces combining the characteristics of guns and howitzers in paragraph 3 of this Section shall be applied in order to achieve results equivalent to those specified in that provision.

8. Procedure for destruction by smashing of self-propelled guns, howitzers, artillery pieces combining the characteristics of guns and howitzers or mortars:
(A) a heavy steel wrecking ball, or the equivalent, shall be dropped repeatedly onto the hull and turret, if any, until the hull is cracked in at least three separate places and the turret in at least one place;
(B) the hits of the ball on the turret shall render either of the trunnions and its trunnion mount inoperative, and deform visibly the breech ring; and
(C) the tube shall be visibly cracked or bent at approximately its mid-point.

9. Procedure for destruction by severing of multiple launch rocket systems:
(A) removal of special equipment from the multiple launch rocket system, including detachable equipment, that ensures the operation of its combat systems; and
(B) removal of tubes or launch rails, screws (gears) of elevation mechanism sectors, tube bases or launch rail bases and their rotatable parts and severing them into two approximately equal parts in areas that are not assembly joints.

10. Procedure for destruction by explosive demolition of multiple launch rocket systems: a linear shaped charge shall be placed across the tubes or launcher rails, and tube or launcher rail bases. When detonated, the charge shall sever the tubes or launcher rails, tube or launcher rail bases and their rotatable parts, into two approximately equal parts in areas that are not assembly joints.

11. Procedure for destruction by deformation of multiple launch rocket systems: all tubes or launcher rails, tube or launcher rail bases and the sighting system shall be visibly bent at approximately the mid-point.

Source: *http://www.tufts.edu/fletcher/multi/texts/bh980.txt*

BICC yearbook 1998

The end of the Cold War has been accompanied by a drastic reduction in demand for weapons. Defense industries in East and West have had to downsize, restructure, consolidate and convert capacities to civilian use.

Last year's edition of the *conversion survey* gives an overview of the industry's adaptation to lower demand for weapons, government policies to support diversification and regional initiatives to counter the negative effects of arms-industrial downsizing. The major countries are treated in some detail, with numerous examples of individual companies undergoing restructuring.

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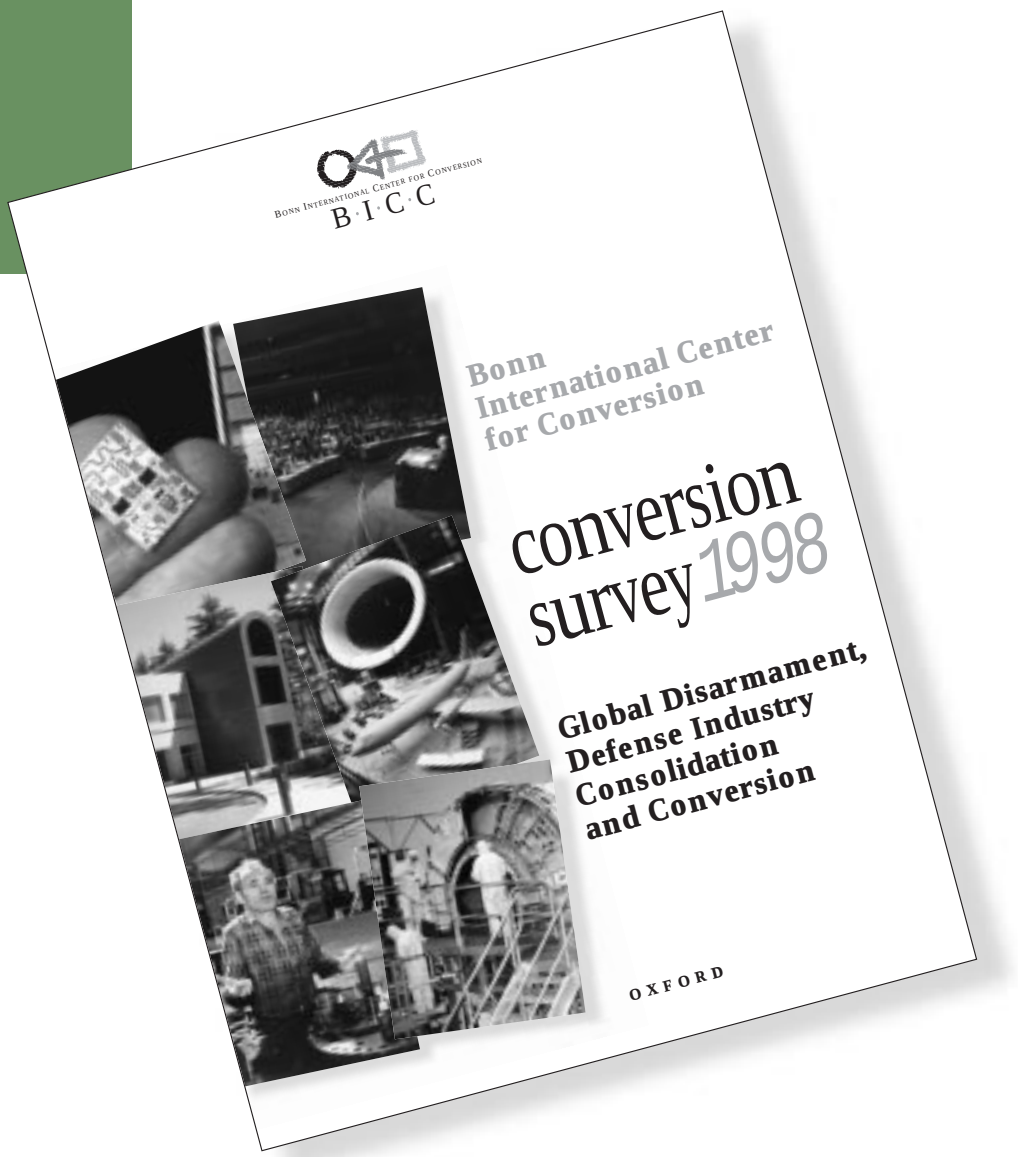

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- Defense expenditures and budget reallocation
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Bonn International Center for Conversion
Director: Dr. Herbert Wulf
Publishing management: Michael Dedek
An der Elisabethkirche 25
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Phone + 49-228-911960
Fax + 49-228-241215
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