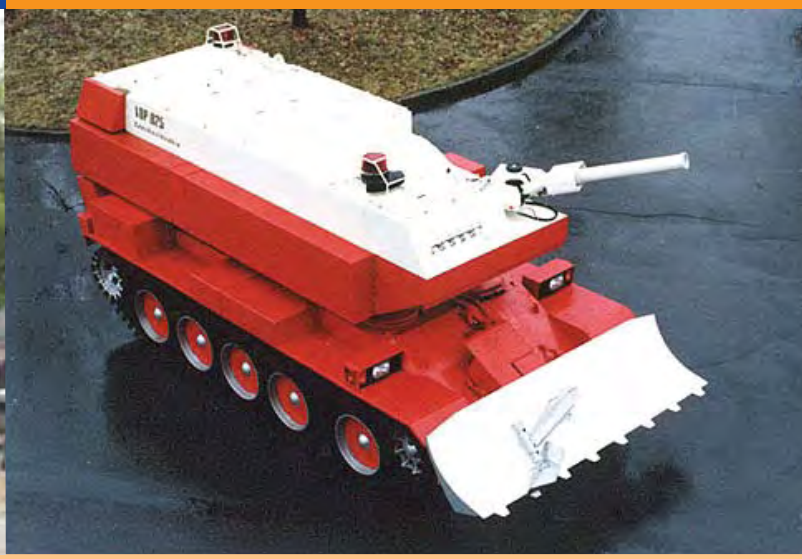
Defence Conversion - The Disposal and Demilitarization of Heavy Weapon Systems



SEESAC

South Eastern and Eastern Europe Clearinghouse
for the Control of Small Arms and Light Weapons

Adrian Wilkinson

Defence Conversion - The Disposal and Demilitarization of Heavy Weapon Systems
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The **South Eastern Europe Clearinghouse for the Control of Small Arms and Light Weapons** (SEESAC) has a mandate from the United Nations Development Programme (UNDP) and the Stability Pact for South East Europe (SPSEE) to further support the Stability Pact Regional Implementation Plan by building national and regional capacity to control and reduce the proliferation and misuse of small arms and light weapons, and thus contribute to enhanced stability, security and development in South Eastern Europe.

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***Defence Conversion - The Disposal and Demilitarization of Heavy Weapon Systems*, SEESAC, 2007**

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Acronyms

AFV	Armoured Fighting Vehicles
AIFV	Armoured Infantry Fighting Vehicles
APC	Armoured Personnel Carriers
BICC	Bonn International Centre for Conversion
CBA	Cost Benefit Analysis
CEDB	Council of Europe Development Bank
CFE	Conventional Forces in Europe Treaty
CSBM	Confidence and Security Building Measures
CSRC	Conflict Studies Research Centre, Defence Academy of the UK
DCAF	Democratic Control of the Armed Forces (Centre)
EBRD	European Bank for Reconstruction and Development
EIB	European Investment Bank
EOD	Explosive Ordnance Disposal
EU CARDS	Community Assistance for Reconstruction Development and Stability in the Balkans
FWF	Former Warring Factions
IISS	International Institute of Strategic Studies
ISO	International Standardization Organization
LAARS	Large Area Artificial Reef Site
MBT	Main Battle Tanks
MFA	Ministry of Foreign Affairs
MOD	Ministry of Defence
MONDEM	Montenegro Demilitarization Programme
NAMSA	NATO Maintenance and Supply Agency
NATO	North Atlantic Treaty Organisation
OGRF	Operational Group of Russian Force
PfP	Partnership for Peace (NATO)
RACVIAC	Regional Arms Control Verification and Implementation Assistance Centre
RHA	Rolled Homogeneous Armour
SALW	Small Arms and Light Weapons
SEECP	South East European Cooperation Process
SEESAC	South Eastern Europe Clearinghouse for the Control of SALW
SSR	Security Sector Reform
UN	United Nations
UNDP	United Nations Development Programme
USD	United States Dollars ($)

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Defence Conversion
The Disposal and Demilitarization of Heavy Weapon Systems

1 Introduction

At the South Eastern Europe Cooperation Process (SEECP)[1] Ministers of Defence meeting in Bucharest on 31 March 2005, the Ministers of Defence reaffirmed[2] their commitment to enhance cooperation and dialogue in SEE, and also with international partners, on specific defense conversion related processes. This included an exchange of views on the conversion of redundant military facilities. A necessary precursor to the conversion of military facilities is the disposal of the equipment contained within those facilities, including heavy weapons.

Heavy Weapons

There is no agreed international definition for the term 'heavy weapons'. For the purposes of this study the term includes:

- Land Systems
  - Main Battle Tanks (MBT)
  - Armoured Infantry Fighting vehicles (AIFV)
  - Armoured Personnel Carriers (APC)
  - Artillery and Heavy Mortars (100mm >)
- Sea Systems
  - Amphibious Landing Ships
  - Fast Patrol Craft / Missile Boats
  - Mine Warfare Vessels
  - Corvettes
  - Frigates
  - Destroyers
  - Submarines
- Air Systems
  - Combat Aircraft
  - Helicopters
  - Training and Transport Aircraft

Large Surface to Air Missile systems, (such as SAM 2), are considered to be ammunition systems for the purposes of this study.

This listing is not intended to be fully comprehensive as certain systems may have been excluded. It is designed to be representative.

The Ministers emphasized that the challenges associated with defense conversion are an integral part of overall Security Sector Reform (SSR) in countries concerned. Defence and Security Sector Reform remains a key component for some countries to move closer towards the EU and NATO. The need for increased regional cooperation on the destruction of redundant stockpiles of major conventional weapon systems was also noted.

The Ministers of Defence also requested that SEESAC provide its technical and managerial know-how on weapons destruction programs with international support in order to develop national programs for the destruction of surplus military weapons and ammunition, with international technical and financial support. The Regional Arms Control Verification and Implementation Assistance Centre (RACVIAC)[3] has been tasked to act as a regional clearinghouse for defence conversion information and has also established three working groups. SEESAC has produced this paper at both the request of the Stability Pact and the UNDP Bureau for Crisis Preventation and Recovery in order to; 1) provide the background information necessary for deeper Stability Pact engagement and support for defence conversion in SEE; and 2) as part of the knowledge generation and management process within UNDP to assist them in their development of Security Sector Reform strategies.

2 Background

The conclusion of the Cold War and the emergence of democracy in Central and South Eastern Europe, combined with the agreement and implementation of the Conventional Forces in Europe (CFE) Treaty,[4] resulted in the identification of large surpluses of heavy weapon systems. In Central Europe many countries successfully disposed of large stockpiles of these heavy weapon systems,[5] but the conflicts of the 1990s in South Eastern Europe meant that virtually no stocks were destroyed in the region, (other than during combat operations).

There are potentially significant security and safety risks[6] posed by the presence of stockpiles of heavy weapons and their associated ammunition and explosives in post-conflict environments, and also those that are surplus

[1] http://www.stabilitypact.org/seecp.

[2] See text of declaration at http://www.stabilitypact.org/wt3/050331-declaration.pdf.

[3] www.racviac.org.

[4] Conventional Forces in Europe (CFE) Treaty, 19 November 1990. (Amended by the Agreement on Adaptation, 19 November 1999).

[5] See Section 6 on Previous Experience for further details.

[6] See Section 3.1.

to the new national security requirements of the region. These risks can adversely affect the local population and the environment, and hamper sustainable development. Additionally, and just as importantly, the possibility of uncontrolled proliferation can have a negative impact on the security of neighbouring regions. Therefore the destruction of these stockpiles of heavy weapon systems should be considered as a significant conflict prevention measure, a confidence and security building measure as well as being a post conflict human security[7] [8] issue.

There is a tendency for donors, implementing agencies and other stakeholders to regard weapons and ammunition as one task area. Yet the reality is that the stockpile management and destruction of heavy weapons is a relatively straightforward, albeit a logistically challenging, task. The stockpile management and destruction of ammunition and explosives requires a much more detailed technical response, as the risks and hazards are greater than for weapons, and the stockpiles are of a much greater logistic scale. The destruction of ammunition falls outside the scope of this study, but details can be found in the 'Biting the Bullet' series of publications.[9]

Definitions

Disposal

In the context of heavy weapons, the term refers to..... the removal of heavy weapons from a stockpile utilising a variety of methods, (that may not necessarily involve destruction).

Destruction

The process of final conversion of heavy weapons into an inert state that can no longer function as designed.

Demilitarization

The complete range of processes that render weapons, ammunition, mines and explosives unfit for their originally intended purpose.

NOTE: Demilitarisation not only involves the final destruction process, but also includes all of the other transport, storage, accounting and pre-processing operations that are equally as critical to achieving the final result.

To date the disposal and demilitarisation of heavy weapons systems within South Eastern Europe has been based on a wide range of factors, which include:

- Compliance with the CFE Treaty limiting the size of national holdings of heavy weapon systems;
- Financial and technical resources available to the Ministry of Defence;
- Disposal and Demilitarization activities to support armed forces restructuring as part of wider Security Sector Reform (SSR);
- The political will within the Ministry of Defence to destroy redundant heavy weapon systems.

It is highly unlikely that the international donor community can fund the destruction of all surplus heavy weapons systems within South Eastern Europe, let alone the larger stockpiles within Central and Eastern Europe. This unfortunate fact means that prioritisation for future demilitarization of some types of heavy weapons[10] is complicated as the hard priorities of available national and donor resources versus threat should be considered. However, recent experience has shown that the disposal of certain heavy weapon types is cost-neutral, or even profitable dependent on the price of steel on the local scrap markets. Immediate international support could include:

- The destruction of heavy weapon systems that are at greatest risk of proliferation or are 'attractive' to warring factions;
- The capacity building of national institutions to continue the longer-term nationally financed, safe, efficient and effective destruction of heavy weapon systems to appropriate technical standards;
- Ensuring the physical security of heavy weapon systems in order to reduce the risks of proliferation until

[7] Defined as 'a concept that challenges the precepts of military security. Instead, democracy, human rights, sustainable development, social equity and the elimination of poverty are seen as essential elements of security'. (www.peace.ca/).

[8] Also aligns itself with the developing UN concept of 'freedom from fear and freedom from want'. In Larger Freedom: Towards Development, Security and Human Rights for All, Report of the UN Secretary General to the UN General Assembly, 21 March 2005.

[9] Biting the Bullet 18 - Ammunition Stocks - Promoting Safe and Secure Storage and Disposal, ISBN: 1898702-63-2, 2005. Available at www.seesac.org.

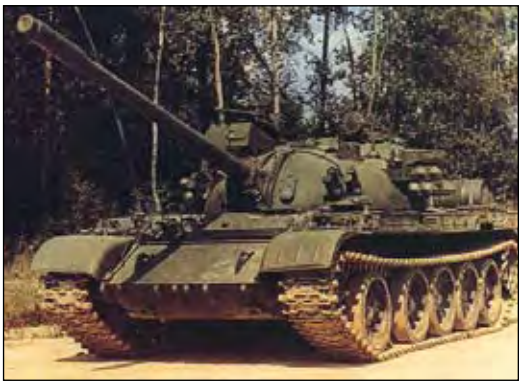
[10] This paper will indicate that the destruction of AFV can be covered by scrap recovery costs. The same may not be true for other systems though.

demilitarization using national resources is possible. (Although the costs of enhanced security at heavy weapon storage sites is very likely to be more costly[11] than the demilitarization costs).

This paper is designed to highlight some of the factors, risks and hazards due to the presence of large heavy weapon stockpiles and the disposal options. It is designed for donors, implementing agencies and other non-technical stakeholders; it is certainly not intended to be a technical solution to the challenge, but rather to explain and clarify the major issues for all stakeholders. It must be recognized that stockpile management and demilitarization is a national responsibility, and States should not expect the international donor community to fund the destruction of their surplus national stockpiles of heavy weapons; the reality is that there are insufficient donor funding resources currently available to make more than a small dent in the regional or global stockpiles, and this is unlikely to change in the near future. At this stage it is a case of educating donors, implementing agencies and other stakeholders of the real issues, and then developing realistic and safe indigenous capacities, rather than expecting an immediate solution.

3 Heavy Weapon Holdings in South Eastern Europe

3.1 General



The presence of large stockpiles of heavy weapons within South Eastern Europe is an issue that has yet to be comprehensively addressed by national governments and the international community. The Stability Pact Defence Conversion initiative is one of the first political processes in this arena. There is little doubt that the large stockpiles of heavy weapons within the region:

- ***Are a significant security risk.*** The standards of security at the heavy weapon storage locations are of variable quality and effectiveness. Large numbers of personnel are required to guard the facilities, and whilst the facilities are required to store heavy weapons they are unavailable for conversion to civilian use. SEESAC has recently conducted a Cost Benefit Analysis study to identify the costs of storage and security versus destruction for SALW; this methodology can equally be applied to heavy weapons.

- ***Pose a serious obstacle to defence reform and armed forces restructuring.*** The presence of the stocks necessarily requires large numbers of soldiers to operate, maintain and secure them; hence providing justification for retaining large conscript forces. They are still seen as a strategic national asset by senior military officers, rather than the obsolete liability that they undoubtedly are.[12]

- ***The fuel and ammunition stocks necessary to support the heavy weapons may be an environmental risk.*** Large underground fuel storage tanks that are poorly maintained result in the egress of fuel into the water table, whereas the risks from accidental explosions in ammunition storage sites are well documented in Biting the Bullet 18.

Identifying accurate data on the exact numbers of heavy weapons within South Eastern Europe has proved to be problematic. Estimates have been obtained from the Institute of International Strategic Studies (IISS) Yearbook 2004, the OSCE CFE Declaration of Holdings for States and a comprehensive web search. The figures that follow are 'best estimates' and should be continually refined as nations are more transparent in the dissemination of data.[13]

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[11] Based on experience from the development of the 2005 OSCE Belarus SALW Stockpile Security project. Security costs will inevitably include new fencing, access control points, intruder detection systems etc. Later in this study information is provided to indicate that Demilitarization costs can be significantly offset by scrap recovery costs.

[12] The combat effectiveness of a large proportion of the regional stockpile is highly debatable. Many of the weapon systems date from the 1950s to 1970s, and are of little practical use on the modern 21st century battlefield. The technical performance of similar systems in Iraq in 1991 and 2003 is a sound indicator of their obsolescence.

[13] SEESAC has a comprehensive more detailed matrix on Heavy Weapons Holdings in South Eastern Europe. This will be updated on a regular

3.2 Land Systems

SER	COUNTRY	MAIN BATTLE TANKS (MBT)	AIFV / APC[14]	ARTILLERY	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)
1	**Albania**	374	123	938	
2	**Bosnia and Herzegovina (BiH)**	325	312	1387	
3	**Bulgaria**	1474	3001	1758	
4	**Croatia**	289	53	966	
5	**FYR Macedonia**	61	218	305	
6	**Moldova**	0	178	148	As reported to OSCE as of 01 January 2005
7	**Romania**	1258	2879	1254	
8	**Serbia and Montenegro (SCG)**	962	813	2293	
9	**TOTALS**	**4743**	**7399**	**8901**	

3.3 Naval Systems

SER	COUNTRY	AMPHIBIOUS SHIPS	PATROL VESSELS / CORVETTES	FRIGATES	DESTROYERS	MINE WARFARE VESSELS	SUBMARINES
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
1	**Albania**	0	13	0	0	6	4
2	**Bosnia and Herzegovina (BiH)**	0	0	0	0	0	0
3	**Bulgaria**	2	27	1	0	40	4
4	**Croatia**	5	8	0	0	1	3
5	**FYR Macedonia**	0	5	0	0	0	0
6	**Moldova**	0	0	0	0	0	0
7	**Romania**	0	45	6	1	23	1
8	**Serbia and Montenegro (SCG)**	23	31	3	0	20	12
9	**TOTALS**	**30**	**129**	**10**	**1**	**90**	**28**

[14] Armoured Infantry Fighting Vehicles (AIFV) and Armoured Personnel Carriers (APC).

3.4 Air Systems

SER	COUNTRY	COMBAT AIRCRAFT	HELICOPTERS	TRANSPORT / TRAINING AIRCRAFT	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)
1	**Albania**	58	8	11	
2	**Bosnia and Herzegovina (BiH)**	19	51	5	
3	**Bulgaria**	177	63	70	
4	**Croatia**	54	36	51	
5	**FYR Macedonia**	4	18	5	
6	**Moldova**	0	0	0	Data from OSCE.
7	**Romania**	604	182	75	
8	**Serbia and Montenegro (SCG)**	293	125	26	
9	**TOTALS**	**1209**	**483**	**243**	

4 Disposal Options (Land and Air Systems)

This section of the study will concentrate on the disposal options for Land and Air Systems. The disposal of Naval Systems follows a similar methodology, but further research is necessary. There are traditionally seven options for the disposal of heavy weapons:

- Sale
- Gift
- Use as Training Targets
- Deep Sea Dumping
- Conversion to Commercial Use
- Demilitarization - Dismantling and Recycling
- Physical Destruction

4.1 Sale or Gift

The sale or gifting of heavy weapon systems is the most cost effective means of disposal, but there are factors that need to be considered:

- Any sale or gift should comply with international export control and transfer best practices;
- The weapon platforms are very likely to be obsolete or obsolescent and therefore unattractive to a 'reputable' end user;
- The quality of the ammunition and explosives necessary to support the weapons platform is also likely to be at the end of its useful shelf life. The quality will not be as high as newly manufactured ammunition and explosives. This makes it unattractive to reputable end users, as it is highly unlikely to meet their performance standards. Any end user wishing to purchase ammunition of this age should be subject to the deepest scrutiny as to why they wish to purchase such ammunition;

- It is strongly discouraged by much of the international community, as in effect it just transfers the problem somewhere else;
- Limited sales to 'military enthusiasts' are possible, but would represent just a few per cent of the total problem, and the financial return would probably only just cover the transportation costs; and
- Sales or gifts of heavy weapons (air systems) require that the airframe complies with international aviation safety requirements and that the appropriate certification accompanies the aircraft. Many nations require airworthiness certification to standards similar to that of the USA Federal Aviation Authority (FAA) [15] or UK Civil Aviation Authority (CAA).[16] Obtaining this certification can be a complex and expensive process that eventually costs more than the alternative destruction costs.

4.2 Use as Training Targets

Surplus heavy weapons (land systems) have often been used as training targets on live firing military ranges. Once they have been used as a target for the first time verification in accordance with the CFE Treaty (Section XI of the Protocol on Procedures)[17] would be necessary to ensure that the appropriate standards for destruction as a useable system have been complied with. It is, however, unlikely that this option would provide a permanent solution as; 1) there are more redundant heavy weapons than could realistically be used as targets; and 2) once their target use is over there is still a substantial amount of scrap to be processed anyway. Cost benefit analysis (CBA) would probably show that once the full life costs of the 'target option' have been established that they are no less than the costs of destruction/demilitarization in the short term.

The CFE Treaty also contains provision for the destruction of aircraft as towed targets or drones (Section VI to the Protocol on Procedures). Conversion of aircraft for this purpose though is very likely to be more costly than destruction or demilitarization by dismantling and recycling.

4.3 Deep Sea Dumping

The dumping of redundant heavy weapon platforms at sea could be subject to international agreements [18] [19] [20] as the weapons may be considered to be either hazardous or industrial waste; a legal interpretation of this is necessary. Any State adopting this approach should expect a very strong negative reaction from international environmental groups; an environmental impact assessment would be necessary to support this option.

Yet this technique has been successfully used as demonstrated by the US Army Reserve deep sea dumping a quantity of M48 and M60 MBT off the coast of Florida (June 2001 and June 2004).[21] This project was designed to protect the area from the effects

[15] Details of the USA FAA Airworthiness Certification process can be found at: http://www.faa.gov/licenses_certificates/aircraft_certification/airworthiness_certification/.

[16] Details of the CAA Airworthiness Certification process can be found at: (http://www.caa.co.uk/default.aspx?categoryid=393&pagetype=90&pageid=2017). Certain CAA Airworthiness Certificates will shortly be replaced by the European Aviation Safety Authority (EASE) Certificates (http://www.easa.eu.int/home/tc_en.html).

[17] Full title is Protocol on Procedures Governing the Reduction of Conventional Armaments and Equipment Limited by the CFE Treaty. Referred to as Protocol on Procedures from this point on.

[18] Oslo Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft, February, 1972 and subsequent amendments.

[19] London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 29 December 1972 and subsequent amendments.

[20] OSPAR Convention, 1998.

[21] http://www.myescambia.com/departments/nesd/documents/ArtificialreeflistJuly05_000.pdf

of erosion and to develop an artificial reef as a fish havens. (Escambia County Large Area Artificial Reef Site (LAARS)). The MBT were steam cleaned, had the hazardous materials removed and then had the hatches welded open.

4.4 Conversion to Commercial Use

There is a limited potential for the conversion of a number of surplus and redundant land heavy weapon systems to commercial use. This is permitted under the CFE Treaty (Section VIII to the Protocol on Procedures). Suggested uses include, among others, mine clearance and flails, non-lethal riot control, fire fighting, ice breaking and support to heavy civil engineering projects.[22] Regrettably this solution will be 'market driven' and future potential sales are unlikely to represent more than a few per cent of the current surplus at best. The resulting systems can be complex, maintenance intensive and are expensive to operate. Companies such as VOP 025 in the Czech Republic are well established already in this 'niche' market, have the market lead and competing with them from a 'start up' position would be a 'high risk' strategy unless a firm market was identified and established. There are complex heavy engineering issues and significant financial investment required for the conversion from tank production and maintenance to this particular market.

Fireflighter-55 developed by VOP 025, Novy Jlcin s.p. (Czech Republic). Based od T55 chassis and has a remote control capability

4.5 Demilitarization - Dismantling and Recycling

The demilitarization option is perhaps the most attractive from a cost recovery and financial perspective as a proportion of the operating costs may be offset against the value of scrap recovered. This technique involves the cleaning, dismantling/cutting of the vehicle followed by scrap processing and recycling of the recovered materials.

4.5.1 Scrap Metal Issues

It is apparent that the financial viability of heavy weapon demilitarization is directly related to the value of scrap recovered; and consequently the value of scrap on regional or world markets. Therefore cost effective destruction can only take place when the scrap market conditions are favourable, and not necessarily when it is politically desirable. Unless operating costs are covered by the government until the market suggests financial viability, then government control over the timing of destruction is weakened.

There is no global central pricing for scrap metal. Prices that can be obtained for a certain kind of scrap metal can vary depending on the country as well as on the dealer or recycling facility. Scrap metal prices also depend on the grade of the respective metal. This makes it difficult to accurately estimate the cost recovery that can be expected from the sale of scrap metal during demilitarization operations. The London Metal Exchange (LME)[23] average official and settlement prices for pure metal are important as these prices act as one of the major aligning factors for the scrap metal market.

[22] See the CURRUS Armoured Vehicle Technique Company of Hungary website for further information on this option. (http://www.currus.hu/angol/index.html). Source: CSRC Report of July 2005.

[23] www.lme.co.uk

[24] http://euro.recycle.net/exchange/index.html

An indicator of scrap values within Europe can be obtained from the European Recyclers Exchange (EUX)[24] Index. This index must, however, be used with caution as the scrap values within South Eastern Europe will undoubtedly be much lower. Although other items such as the optics and communications systems may be recovered for use elsewhere, the majority of the vehicles are only worth their scrap value.

The following matrix estimates the amount of scrap that can be expected to be recovered from a typical Main Battle Tank and indicative scrap values:[25]

SER	MATERIAL	TONNES	LME PURE METAL VALUE[26] (US$ PER TONNE)	SCRAP VALUE (US$ PER TONNE)[27]	TOTAL SCRAP VALUE (US$ PER TONNE)	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	**Ferrous Metal (Steel)**	34.00		118.73	4036.76	Armour.
2	**Aluminium Alloy**	0.50	1,600	81.65	40.82	From auxiliary equipment such as stowage bins, tool boxes etc.
3	**Copper Alloys (Bronze)**	0.12	932	199.58	23.95	From bronze breech components.
4	**Lead**	0.40		77.11	30.84	From radiation protection.
5	**TOTALS**	**35.02**			**US$ 4132.37**	

4.5.2 Metallurgical Concerns [28]

The major metallurgical concern in terms of the value of scrap is that the 'weapons grade' steel necessary for effective Rolled Homogeneous Armour (RHA) is made by alloying steel with chromium, cobalt, manganese, nickel, nobium and other alloying elements. This results in a high-grade steel, (known as low-alloy steel), as opposed to the 'mild steel' more often used in commercial manufacturing processes. Although the low alloy steel required for effective RHA is more expensive to initially buy than mild steel, the converse is true when selling as scrap.

In order for a steel foundry to maximise the financial return from the low alloy steel it needs to know exactly what alloys and impurities are present in the steel. This necessitates metallurgical testing prior to processing in the foundry, and then refining operations to remove impurities. The scrap steel from the heavy weapons will inevitably be melted at the steel foundry to produce a different type of steel, at which time it is likely to be analysed again to determine how its value can be maximised by conversion to a different grade of steel. After melting, the additives of any other necessary alloys and then re-solidification, the resultant material will need to go through a combination of cold rolling, hot rolling and annealing processes. These all come at an operating cost to the steel foundry, hence the relatively low market value of scrap steel from heavy weapons.

It is possible to conduct metallurgical testing on the heavy weapon scrap during the dismantling and cutting operation, but as the steel foundry will undoubtedly test the metal during processing these costs could possibly be wasted. The difference in prices between the various steels may not produce the economies of scale to make on-site metallurgical testing financially viable.

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[25] There is very limited open source information on the exact quantities of material that are used in the production of heavy weapons. The only source SEESAC could find was Utilization of Hardware - Options and Constraints. The NVA Case, Hans-Joachim Gießmann in Conversion: Opportunities for Development and Environment, Anke Brunn, Lutz Baehr und Hans-Jürgen Karpe (Eds.), Berlin/Heidelberg, 1992. Cited in Großes Aufräumen nach dem Wettrüsten, Michael Renner in Zur Lage der Welt - 1994, Lester R. Brown (Eds.), Frankfurt au Main,1994.

[26] LME Cash Mean Price (September 2005).

[27] Based on scrap values obtained from EUX on 19 November 2005. (Less than Truck Load (LTL) (<40,000 lbs) prices taken as worst case). Market fluctuations and transport costs cannot be accounted for.

[28] Information obtained from discussions with Alistair Doig, Consultant Metallurgist, Cranfield University, UK.

What is certainly apparent is that, prior to contracting the demilitarization of significant quantities of heavy weapons, the contracting authority should take professional advice from an independent metallurgical and scrap metal consultant in order to ensure that the cost recovery from the scrap steel can be maximised. Market fluctuations, steel quality and cutting processes will all have an impact on the value of recovered scrap.

4.5.3 Demilitarization Flow Process

The demilitarization process phases for land systems are at Annex A.

4.6 Financial Modelling

Some financial modelling was conducted as part of the research for the CSRC paper during which some major assumptions on economies of scale (5,000 vehicles), scrap recovery value Euro 100 per tonne) and time period (5 years) were made. The results suggested that the costs of demilitarization were in the order of Euro 2,550 per vehicle and after offsetting the costs of scrap recovery a profit margin of 11% was yielded. Regrettably SEESAC was not provided with access to the model as it is only available to the NATO Technical Advisory Group. SEESAC have developed financial models for SALW Destruction and these are currently been amended for Heavy Weapons and will be available in November 2005.

4.7 Physical Destruction

Physical destruction by explosive detonation appears at first site to be a practicable option. The procedures appear at first sight to be simple, relatively low cost and well-established procedures for destruction and verification exist (Annex B). Yet there are environmental hazards from fuels, lubricants, isotopes, battery acids and hydraulic fluids. Any environmentally responsible destruction by detonation methodology would require that these hazards were addressed before the explosive charges were laid and detonated.

Once the heavy weapon system has been destroyed by detonation, then the problem of scrap recovery still exists unless the destroyed vehicle is to be left at the destruction site in permanence. Assuming it is not, then the costs of dealing with the scrap should be approximately the same as the costs of the Demilitarization option; but the value of the scrap is likely to be slightly lower due to its condition after detonation! Full cost benefit analysis should be conducted before this option is selected, and the costs compared to that of demilitarization.

4.8 Summary of Disposal Options

This matrix summarises the various disposal options:

DISPOSAL OPTION	FACTORS			
Sale or Gift	Proliferation risks	Unattractive to reputable End User	Compliance with international arms export 'best practices'	Limited sales to 'military enthusiasts'
Training Targets	Limited market	Environmental impact	Final scrap disposal costs	Final scrap value can be reduced
Deep Sea Dumping	Legal Status of technique requires resolution.	Reaction of environmental lobby	No local deep sea dump sites. Long sea voyage required.	Artificial Reefs Coastal Defences Moorings
Conversion to Commercial Use	Engineering complexity	Market driven Limited market	High initial investment required	High risk strategy
Demilitarization - Dismantling and Recycling	Technique is simple	Maximise cost recovery through scrap sale	Economies of scale apply	Can draw on experience of Central Europe
Destruction	Apparently simple	Environmental factors	Final scrap disposal costs	Final scrap value can be reduced

5 Regional or National Strategies

South Eastern Europe is fortunate in that it can; 1) draw on the experience of Central Europe in the demilitarization of heavy weapons; 2) has the necessary technology to ensure the demilitarization of these systems; and 3) justify their destruction as part of ongoing defence reform processes that are necessary for further euro-atlantic integration. The fundamental challenges remain those of national political will, inertia within Ministries of Defence and a lack of immediately available financial resources.

International donor assistance will be required to initiate worthwhile demilitarization initiatives, as States have other more pressing problems to resolve than the demilitarization of redundant military equipment. Examples are high unemployment, stabilization of the emerging democratic processes, the rebuilding of old failing manufacturing industries, environmental cleanup, the development of new economic opportunities etc. Defence reform and demilitarization, whilst important from the perspective of the Minister of Defence, is not yet a priority for the Minister of Finance, and therefore very limited national funding will continue to be available to support the demobilization of heavy weapons.

Regional political will is necessary, and cooperation during demilitarization operations to achieve 'balanced disarmament' is necessary, but the economies of scale suggest that national programmes in the majority of states is a cost effective option. Regional cooperation on 'lessons learned', effective demilitarization techniques and financial models will also be necessary.

Financial support from international organizations for the demilitarization of heavy weapons is also limited. The NATO PfP Trust Fund does not yet extend to heavy weapons, the OSCE do not have a document or policy to support the demilitarization of heavy weapons and UNDP have yet to develop a strategy concerning defence conversion as part of their Security Sector Reform (SSR) portfolio. International NGOs such as the Bonn International Center for Conversion (BICC) and the Geneva based Centre for Democratic Control of the Armed Forces (DCAF) have engaged in the wider issue of defence conversion, but neither has the technical knowledge or project management experience to engage effectively at the operational level of demilitarization.

NATO – as the Task Force leader of the Stability Pact Initiative on Defence Conversion - focuses on the monitoring of programmes concerning:

- The retraining of redundant military personnel; and
- The conversion of military sites in SEE countries.

NATO also coordinates and contacts international organizations dealing with conversion issues in South Eastern Europe. The recent decision to merging NATO experience and the Stability Pact's facilitating role in the conversion process offers increased potential for coordination and the exchange of information. The Stability Pact and NATO are seeking to mobilise financial support from such international financial institutions as the EU PHARE[29] and CARDS[30] programmes, CEDB,[31] EBRD,[32] EIB,[33] World Bank, EU Small Business Charter and interested bilateral donors.

[29] The PHARE programme is one of the three pre-accession instruments financed by the European Union to assist the applicant countries of Central and Eastern Europe in their preparations for joining the European Union. (Bulgaria and Romania). (http://europa.eu.int/comm/enlargement/pas/phare/).

[30] Community Assistance for Reconstruction Development and Stability in the Balkans. (Albania, Bosnia, Croatia, FYR Macedonia and SCG). (http://europa.eu.int/comm/enlargement/cards/index_en.htm).

[31] Council of Europe Development Bank. (http://www.coebank.org/homeen.htm).

[32] European Bank for Reconstruction and Development. (http://www.ebrd.com/).

[33] European Investment Bank. (http://www.eib.org/).

6 Previous Experience[34]

The experience of the Visegrad countries of Central and Eastern Europe (Czech Republic, Poland, Hungary and Slovakia), which are well-advanced in their SSR programmes, will be important to SEE decision-makers as they approach the defence conversion task in their countries.

6.1 Czech Republic

The Czech Republic outsourced the demilitarization by dismantling and recycling of their surplus heavy weapons (land systems) to a commercial company VOP 025, Novy Jicin s.p.[35] At the NATO Advanced Research Workshop (No 0980919) (October 2004 and February 2005) the following data was presented:

- Vehicle Preparation - 120 Man Hours
- Vehicle Cutting - 40 Man Hours
- Destruction Rate - 50 Vehicles per Month
- Destruction Costs - US$ 2,000 per Vehicle[36]

6.2 Hungary

Hungary also outsourced the demilitarization by dismantling and recycling of their surplus heavy weapons (land systems) to a commercial contractor, Currus RT, albeit a joint stock company with a majority shareholding by the government. Currus RT has conducted the demilitarization of heavy weapons under the terms of the CFE Treaty and is a CFE registered reduction site. Key points raised by Hungary included:

- Heavy Weapon Systems Destroyed (1992 - 2004) - 2,358
- Heavy Weapon Systems taken by 'Enthusiasts' - 1.4%
- Destruction Costs - US$ 2,000 - US$ 4,000 per Vehicle

6.3 Montenegro

As part of the Montenegro Demilitarization (MONDEM) programme, the Government of Montenegro took advantage of local high scrap prices (EURO 173 per tonne) to outsource the destruction of 61 MBT (and other systems) to the local steel foundary. The contract stipulated that the steel foundary was responsible for cutting of the tanks at their base locations and then transporting the steel for reprocessing at the steel foundary. This project is ongoing (September 2007) and it is estimated that it will raise approximately EURO 350,000, which the Government of Montenegro is then donating to the UNDP/OSCE MONDEM programme to cover some of the costs of ammunition demilitarization.

[34] Source: 'The Disposal of Redundant Heavy Weapons', Conflict Studies Research Centre, Defence Academy of the UK, July 2005, (ISBN 1-905058-29-2).

[35] http://www.vop025.cz/php/index_podnik_gb.php3?action=kontaktni_adresa

[36] It was not clear whether this was before or after the scrap recovery costs were accounted for.

6.4 Moldova (2001)

The OSCE provided technical and financial report to the Operational Group of Russian Forces (OGRF) in Transdniestra for the destruction of a range of MBT and ACV between 27 August and 30 Novermber 2001. The following were destroyed at an average cost of US$ 978 per item.

SER	ITEM	QUANTITY	REMARKS
(A)	(B)	(c)	(D)
1	MBT T-64	108	Destroyed in accordance with CFE Treaty by severing with oxy-acetylene. Total Costs = US$ 226,000
2	ACV BMP-1	10	
3	ACV BTR-60	15	
4	ACV BTR-70	66	
5	Artillery D-30	2	
6	Mortar 2S-12	16	
7	MLRS BM-21	14	
8	**TOTALS**	**231**	

The programme continued on a lesser scale from June 2002 to September 2003.

7 Conclusions and Recommendations

- **Full transparency on heavy weapon holdings and likely surpluses after defence reform is necessary in order that the full scale of the problem can be identified.** States should be encouraged to provide more transparency in the provision of the data necessary to estimate the financial aspects of demilitarization. The heavy weapons holdings in the SEESAC matrix should be validated by national governments. Without this it is difficult to prepare a tangible case for international donor support.

- **Demilitarization by Dismantling and Recycling should be the preferred disposal option for the majority of heavy weapon systems.** The market for conversion to civilian use is very limited and strong competition already exists. Sale is a proliferation risk and reputable end users are rare. The risks of diversion to the 'grey' and then 'black' markets are real.

- **The financial viability of Demilitarization is dependent totally on the cost recovery possible from scrap sales**. A full analysis of the regional scrap market, combined with a detailed analysis of the exact types, grades and quantities of scrap that can be recovered by vehicle type is necessary for accurate financial modelling; and hence realistic project development.

- **International donor financial support may be necessary to initiate national demilitarization programmes.** The financial modelling will determine whether these will be necessary in the form of loans from international financial institutions (when operations are potentially profitable) or grants (where operations have a financial shortfall after cost recovery from scrap).

- **There is a range of prior practical experience within Central and South Eastern Europe on the demilitarization of heavy weapons.** States embarking on a heavy weapon destruction programme should consult with other States to identify 'best practices' in order to maximise cost recovery and thereby minimise the financial exposure and risks to the State.

Annex A - Phases of Heavy Weapon (Land Systems) Demilitarization Process

PHASE	PROCESS	REMARKS
Pre-Preparation Phase	Hazard Inspection	Identify and mark all hazardous materials and components for removal.
	Remove Ammunition, Explosives and Explosive Reactive Armour (ERA)	
	Remove all Radiac and Radioactive Sources	
Preparation Phase	Drain Fuels	
	Drain Hydraulic Fluids	
	Remove Batteries	Possibly recyclable.
	Degauss Fuel Tanks	To ensure safety during cutting operations.
Dismantling Phase	Remove Exterior Components	Aluminium storage bins etc.
	Unship Turret	MBT and AIFV only.
	Cutting Operations	Oxy-Acetylene
Scrap Processing	Segregate Scrap by Type	Ferrous, Non-ferrous and Rare Metals
	Pack Scrap into Containers	Waste Skips, Rail Flats or ISO Containers.

Annex B - Extract from CFE Treaty

PROTOCOL ON PROCEDURES GOVERNING THE REDUCTION OF CONVENTIONAL ARMAMENTS AND EQUIPMENT LIMITED BY THE TREATY ON CONVENTIONAL ARMED FORCES IN EUROPE

The States Parties hereby agree upon procedures governing the reduction of conventional armaments and equipment limited by the Treaty as set forth in Article VIII of the Treaty on Conventional Armed Forces in Europe of November 19, 1990, hereinafter referred to as the Treaty.

SECTION I. GENERAL REQUIREMENTS FOR REDUCTION

1. Conventional armaments and equipment limited by the Treaty shall be reduced in accordance with the procedures set forth in this Protocol and the other protocols listed in Article VIII, paragraph 1 of the Treaty. Any one of such procedures shall be deemed sufficient, when conducted in accordance with the provisions of Article VIII of the Treaty or this Protocol, to carry out reduction.

2. Each State Party shall have the right to use any technological means it deems appropriate to implement the procedures for reducing conventional armaments and equipment limited by the Treaty.

3. Each State Party shall have the right to remove, retain and use those components and parts of conventional armaments and equipment limited by the Treaty which are not themselves subject to reduction in accordance with the provisions of Section II of this Protocol, and to dispose of debris.

4. Unless otherwise provided for in this Protocol, conventional armaments and equipment limited by the Treaty shall be reduced so as to preclude their further use or restoration for military purposes.

5. After entry into force of the Treaty, additional procedures for reduction may be proposed by any State Party. Such proposals shall be communicated to all other States Parties and shall provide the details of such procedures in the same format as the procedures set forth in this Protocol. Any such procedures shall be deemed sufficient to carry out the reduction of conventional armaments and equipment limited by the Treaty upon a decision to that effect by the Joint Consultative Group.

SECTION II. STANDARDS FOR PRESENTATION AT REDUCTION SITES

1. Each item of conventional armaments and equipment limited by the Treaty which is to be reduced shall be presented at a reduction site. Each such item shall consist, at a minimum, of the following parts and elements:

   (A) For battle tanks: the hull, turret and integral main armament. For the purposes of this Protocol, an integral main armament of a battle tank shall be deemed to include the gun tube, breech system, trunnions and trunnion mounts;

   (B) For armoured combat vehicles: the hull, turret and integral main armament, if any. For the purposes of this Protocol, an integral main armament of an armoured combat vehicle shall be deemed to include the gun tube, breech system, trunnions and trunnion mounts. For the purposes of this Protocol, an integral main armament shall be deemed not to include machine guns of less than 20 millimetre calibre, all of which may be salvaged;

   (C) For artillery: the tube, breech system, cradle including trunnions and trunnion mounts, trails, if any; or launcher tubes or launcher rails and their bases; or mortar tubes and their base plates. In the case of self-propelled pieces of artillery, the vehicle hull and turret, if any, shall also be presented;

   (D) For combat aircraft: the fuselage; and

   (E) For attack helicopters: the fuselage, including the transmission mounting area.

2. In each case, the item presented at the reduction site in accordance with paragraph 1 of this Section shall consist of a complete assembly.

3. Parts and elements of conventional armaments and equipment limited by the Treaty not specified in paragraph 1 of this Section, as well as parts and elements which are not affected by reduction under the procedures of this Protocol, including the turrets of armoured personnel carriers equipped only with machine guns, may be disposed of as the State Party undertaking the reduction decides.

SECTION III. PROCEDURES FOR REDUCTION OF BATTLE TANKS 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 battle tanks at reduction sites.

2. Procedure for destruction by severing:

(A) Removal of special equipment from the chassis, including detachable equipment, that ensures the operation of on-board armament systems;

(B) Removal of the turret, if any;

(C) For the gun breech system, 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;

(D) Severing of the gun tube into two parts at a distance of no more than 100 millimetres from the breech ring;

(E) Severing of either of the gun trunnions and its trunnion mount in the turret;

(F) Severing of two sections from the perimeter of the hull turret aperture, each constituting a portion of a sector with an angle of no less than 60 degrees and, at a minimum, 200 millimetres in radial axis, centred on the longitudinal axis of the vehicle; and

(G) Severing of sections from both sides of 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.

3. Procedure for destruction by explosive demolition:

(A) Hull, hatches and cornerplates shall be open to maximise venting;

(B) An explosive charge shall be placed inside the gun tube where the trunnions connect to the gun mount or cradle;

(C) An explosive charge shall be placed on the outside of the hull between the second and third road wheels, or between the third and fourth road wheels in a six road wheel configuration, avoiding natural weaknesses such as welds or escape hatches. The charge must be located within the radius of the turret casting. A second charge shall be placed on the inside of the hull on the same side of the tank, offset and opposite to the external charge;

(D) An explosive charge shall be placed on the inside of the turret casting in the area of the main armament mounting; and

(E) All charges shall be fired simultaneously so that the main hull and turret are cracked and distorted; the breech block is stripped from the gun tube, fused or deformed; the gun tube is split or longitudinally cut; the gun mount or cradle is ruptured so as to be unable to mount a gun tube; and damage is caused to the running gear so that at least one of the road wheel stations is destroyed.

4. Procedure for destruction by deformation:

(A) Removal of special equipment from the chassis, including detachable equipment, that ensures the operation of on-board armament systems;

(B) Removal of the turret, if any;

(C) For the gun breech system, 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;

(D) Severing of the gun tube into two parts at a distance of no more than 100 millimetres from the breech ring;

(E) Severing of either of the gun trunnions; and

(F) The hull and turret shall be deformed so that their widths are each reduced by at least 20 percent.

5. Procedure for destruction by smashing:

(A) A heavy steel wrecking ball, or the equivalent, shall be dropped repeatedly onto the hull and turret 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 gun trunnions and its trunnion mount inoperative, and deform visibly the breech ring; and

(C) The gun tube shall be visibly cracked or bent.

SECTION IV. PROCEDURES FOR THE REDUCTION OF ARMOURED COMBAT VEHICLES BY DESTRUCTION

1. Each State Party shall have the right to choose any of the following sets of procedures each time it carries out the destruction of armoured combat vehicles at reduction sites.

2. Procedure for destruction by severing:

(A) For all armoured combat vehicles, removal of special equipment from the chassis, including detachable equipment, that ensures the operation of on-board armament systems;

(B) For tracked armoured combat vehicles, severing of sections from both sides of 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;

(C) For wheeled armoured combat vehicles, severing of sections from both sides of the hull which include the front wheel final gearbox mounting areas by vertical, horizontal and irregular cuts in the side, front, deck and belly plates so that the front wheel final gearbox mounting areas are included in the severed portions at a distance of no less than 100 millimetres from the cuts; and

(D) In addition, for armoured infantry fighting vehicles and heavy armament combat vehicles:

(1) Removal of the turret;

(2) Severing of either of the gun trunnions and its trunnion mount in the turret;

(3) For the gun breech system:

(a) Welding the breech block to the breech ring in at least two places;

(b) Cutting of at least one side of the breech ring along the long axis of the cavity that receives the breech block; or

(c) Severing of the breech casing into two approximately equal parts;

(4) Severing of the gun tube into two parts at a distance of no more than 100 millimetres from the breech ring; and

(5) Severing of two sections from the perimeter of the hull turret aperture, each constituting a portion of a sector with an angle of no less than 60 degrees and, at a minimum, 200 millimetres in radial axis, centred on the longitudinal axis of the vehicle.

3. Procedure for destruction by explosive demolition:

(A) An explosive charge shall be placed on the interior floor at the mid-point of the vehicle;

(B) A second explosive charge shall be placed as follows:

(1) For heavy armament combat vehicles, inside the gun where the trunnions connect to the gun mount or cradle;

(2) For armoured infantry fighting vehicles, on the exterior of the receiver/breech area and lower barrel group;

(C) All hatches shall be secured; and

(D) The charges shall be detonated simultaneously so as to split the sides and top of the hull. For heavy armament combat vehicles and armoured infantry fighting vehicles, damage to the gun system shall be equivalent to that specified in paragraph 2, subparagraph (D) of this Section.

4. Procedure for destruction by smashing:

(A) A heavy steel wrecking ball, or the equivalent, shall be dropped repeatedly onto the hull and the turret, if any, until the hull is cracked in at least three separate places and the turret, if any, in one place;

(B) In addition, for heavy armament combat vehicles:

(1) The hits of the ball on the turret shall render either of the gun trunnions and its trunnion mount inoperative, and shall deform visibly the breech ring; and

(2) The gun tube shall be visibly cracked or bent.

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 millimetres 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 metres 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 mid-point; and

(B) The base plate shall be bent approximately on the centreline 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 millimetres 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.

SECTION VI. PROCEDURES FOR THE REDUCTION OF COMBAT AIRCRAFT 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 combat aircraft at reduction sites.

2. Procedure for destruction by severing:

The fuselage of the aircraft shall be divided into three parts not on assembly joints by severing its nose immediately forward of the cockpit and its tail in the central wing section area so that assembly joints, if there are any in the areas to be severed, shall be contained in the severed portions.

3. Procedure for destruction by deformation:

The fuselage shall be deformed throughout by compression, so that its height, width or length is reduced by at least 30 percent.

4. Procedure for destruction by use as target drones:

   (A) Each State Party shall have the right to reduce by use as target drones no more than 200 combat aircraft during the 40-month reduction period;

   (B) The target drone shall be destroyed in flight by munitions fired by the armed forces of the State Party owning the target drone;

   (C) If the attempt to shoot down the target drone fails and it is subsequently destroyed by a self-destruct mechanism, the procedures of this paragraph shall continue to apply. Otherwise the target drone may be recovered or may be claimed destroyed by accident in accordance with Section IX of this Protocol, depending on the circumstances; and

   (D) Notification of destruction shall be made to all other States Parties. Such notification shall include the type of the destroyed target drone and the location where it was destroyed. Within 90 days of the notification, the State Party claiming such reduction shall send documentary evidence, such as a report of the investigation, to all other States Parties. In the event of ambiguities relating to the destruction of a particular target drone, reduction shall not be considered complete until final resolution of the matter.

SECTION VII. PROCEDURES FOR THE REDUCTION OF ATTACK HELICOPTERS 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 attack helicopters at reduction sites.

2. Procedure for destruction by severing:

   (A) The tail boom or tail part shall be severed from the fuselage so that the assembly joint is contained in the severed portion; and

   (B) At least two transmission mounts on the fuselage shall be severed, fused or deformed.

3. Procedure for destruction by explosive demolition:

   Any type and number of explosives may be used so that, at a minimum, after detonation the fuselage is cut into two pieces through that section of the fuselage that contains the transmission mounting area.

4. Procedure for destruction by deformation:

   The fuselage shall be deformed throughout by compression so that its height, width or length is reduced by at least 30 percent.

SECTION VIII. RULES AND PROCEDURES FOR REDUCTION OF CONVENTIONAL ARMAMENTS AND EQUIPMENT LIMITED BY THE TREATY BY CONVERSION FOR NON-MILITARY PURPOSES

1. Each State Party shall have the right to reduce a certain number of battle tanks and armoured combat vehicles by conversion. The types of vehicles that may be converted are listed in paragraph 3 of this Section and the specific non-military purposes for which they may be converted are listed in paragraph 4 of this Section. Converted vehicles shall not be placed in service with the conventional armed forces of a State Party.

2. Each State Party shall determine the number of battle tanks and armoured combat vehicles it will convert. This number shall not exceed:

   (A) For battle tanks, 5.7 percent (not to exceed 750 battle tanks) of the national ceiling established for that State Party in the Protocol on National Ceilings, or 150 items, whichever is greater; and

   (B) For armoured combat vehicles, 15 percent (not to exceed 3,000 armoured combat vehicles) of the national ceiling established for that State Party in the Protocol on National Ceilings, or 150 items, whichever is greater.

3. The following vehicles may be converted for non-military purposes: T-54, T-55, T-62, T-64, T-72, Leopard 1, BMP-1, BTR-60, OT-64. The States Parties, within the framework of the Joint Consultative Group, may make changes to the list of vehicles which may be converted to non-military purposes. Such changes, pursuant to Article XVI, paragraph 5 of the Treaty shall be deemed improvements to the viability and effectiveness of the Treaty relating only to minor matters of a technical nature.

4. Such vehicles shall be converted for the following specific non-military purposes:

   (A) General purpose prime movers;

   (B) Bulldozers;

   (C) Fire fighting vehicles;

(D) Cranes;

(E) Power unit vehicles;

(F) Mineral fine crushing vehicles;

(G) Quarry vehicles;

(H) Rescue vehicles;

(I) Casualty evacuation vehicles;

(J) Transportation vehicles;

(K) Oil rig vehicles;

(L) Oil and chemical product spill cleaning vehicles;

(M) Tracked ice breaking prime movers;

(N) Environmental vehicles.

The States Parties, within the framework of the Joint Consultative Group, may make changes to the list of specific non-military purposes. Such changes, pursuant to Article XVI, paragraph 5 of the Treaty shall be deemed improvements to the viability and effectiveness of the Treaty relating only to minor matters of a technical nature.

5. On entry into force of the Treaty, each State Party shall notify to all other States Parties the number of battle tanks and armoured combat vehicles that it plans to convert in accordance with the provisions of the Treaty. Notification of a State Party's intention to carry out conversion in accordance with this Section shall be given to all other States Parties at least 15 days in advance in accordance with Section X, paragraph 5 of the Protocol on Inspection. It shall specify the number and types of vehicles to be converted, the starting date and completion date of conversion, as well as the specific non-military purpose vehicles to emerge after conversion.

6. The following procedures shall be carried out before conversion of battle tanks and armoured combat vehicles at reduction sites:

(A) For battle tanks:

(1) Removal of special equipment from the chassis, including detachable equipment, that ensures the operation of on-board armament systems;

(2) Removal of the turret, if any;

(3) For the gun breech system, either:

(a) Welding the breech block to the breech ring in at least two places; or

(b) Cutting of at least one side of the breech ring along the long axis of the cavity that receives the breech block;

(4) Severing of the gun tube into two parts at a distance of no more than 100 millimetres from the breech ring;

(5) Severing of either of the gun trunnions and its trunnion mount in the turret; and

(6) Cutting out and removal of a portion of the hull top armour beginning from the front glacis to the middle of the hull turret aperture, together with the associated portions of the side armour at a height of no less than 200 millimetres (for the T-64 and T-72, no less than 100 millimetres) below the level of the hull top armour, as well as the associated portion of the front glacis plate severed at the same height. The severed portion of this front glacis plate shall consist of no less than the upper third; and

(B) For armoured combat vehicles:

(1) For all armoured combat vehicles, removal of special equipment from the chassis, including detachable equipment, that ensures the operation of on-board armament systems;

(2) For rear-engined vehicles, cutting out and removal of a portion of the hull top armour from the front glacis to the bulkhead of the engine-transmission compartment, together with the associated portions of the side and front armour at a height of no less than 300 millimetres below the level of the top of the assault crew compartment;

(3) For front-engined vehicles, cutting out and removal of a portion of the hull top armour plate from the bulkhead of the engine-transmission compartment to the rear of the vehicle, together with the associated portions of the side armour at a height of no less than 300 millimetres below the level of the top of the assault crew compartment; and

(4) In addition, for armoured infantry fighting vehicles and heavy armament combat vehicles:

(a) Removal of the turret;

(b) Severing of either of the gun trunnions and its trunnion mount in the turret;

(c) For the gun breech system:

(i) Welding the breech block to the breech ring in at least two places;

(ii) Cutting of at least one side of the breech ring along the long axis of the cavity that receives the breech block; or

(iii) Severing of the breech casing into two approximately equal parts; and

(d) Severing of the gun tube into two parts at a distance of no more than 100 millimetres from the breech ring.

7. Battle tanks and armoured combat vehicles being reduced pursuant to paragraph 6 of this Section shall be subject to inspection, without right of refusal, in accordance with Section X of the Protocol on Inspection. Battle tanks and armoured combat vehicles shall be deemed reduced upon completion of the procedures specified in paragraph 6 of this Section and notification in accordance with Section X of the Protocol on Inspection.

8. Vehicles reduced pursuant to paragraph 7 of this Section shall remain subject to notification pursuant to Section IV of the Protocol on Information Exchange until final conversion for non-military purposes has been completed and notification has been made in accordance with Section X, paragraph 12 of the Protocol on Inspection.

9. Vehicles undergoing final conversion for non-military purposes shall also be subject to inspection in accordance with Section X of the Protocol on Inspection, with the following changes:

(A) The process of final conversion at a reduction site shall not be subject to inspection; and

(B) All other States Parties shall have the right to inspect fully converted vehicles, without right of refusal, upon receipt of a notification from the State Party conducting final conversion specifying when final conversion procedures will be completed.

10. If, having completed the procedures specified in paragraph 6 of this Section on a given vehicle, it is decided not to proceed with final conversion, then the vehicle shall be destroyed in accordance with the appropriate procedures set forth elsewhere in this Protocol.

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