Disposal and Demilitarization of Heavy Weapons in Montenegro

SEESAC

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

The **South Eastern and 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 Eastern Europe (SCSP) to further support all international and national stakeholders by strengthening 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 and Eastern Europe.

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Disposal and Demilitarization of Heavy Weapons in Montenegro,
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Acronyms

ACV	Armoured Combat Vehicle
AFV	Armoured Fighting Vehicles
AIFV	Armoured Infantry Fighting Vehicles
APC	Armoured Personnel Carriers
BICC	Bonn International Centre for Conversion
CBA	Cost Benefit Analysis
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)
EUSAC	EU SALW Control (Project)
HACV	Heavy Armament Combat Vehicles
MAF	Montenegro Armed Forces
MBT	Main Battle Tanks
MFA	Ministry of Foreign Affairs
MLRS	Multi Launch Rocket System
MOD	Ministry of Defence
MUP	Ministry of Internal Affairs
NATO	North Atlantic Treaty Organisation
OSCE	Organisation for Security and Co-operation in Europe
PfP	Partnership for Peace (NATO)
PM	Project Manager
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
TOR	Terms of Reference
UN	United Nations
UNDP	United Nations Development Programme
USD	United States Dollars ($)

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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.[3] Although Montenegro was then part of the State Union of SCG, it is assumed that the government supports this SEECP commitment.

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 of SEECP also requested that SEESAC provide its technical and managerial know-how on weapons destruction programmes with international support in order to develop national programmes for the destruction of surplus military weapons and ammunition, with international technical and financial support. Regrettably SEESAC does not have in-house specialist knowledge on the disposal of Air and Sea primary weapon platforms, and therefore this advice is constrained to Land Systems only.[4]

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,[5] and the Agreement on Sub-Regional Arms Control[6] resulted in the identification of large surpluses of heavy weapon systems. In Central and South Eastern Europe and in Central Asia many countries have successfully disposed of large stockpiles of these heavy weapon systems.[7]

In the case of Montenegro, donors should consider international co-operative support[8] for the destruction of heavy weapons, as they are an obstacle to defence reform and armed forces restructuring. The presence of these systems necessarily requires significant numbers of soldiers to operate, maintain and secure them; hence there is a requirement for retaining additional conscript forces. It is also possible that they are still seen as a

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

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

[3] Although there is no international definition of Heavy Weapons, there are CFE-wide definitions for land and air systems which OSCE countries refer to during arms control initiatives. Additionally, there is an OSCE-wide common list of heavy weapons, which includes naval vessels. This is the same as the Global Exchange of Information list, and includes categories of 'Major Weapons and Equipment Systems'.

[4] This advice is based on the contents of Defence Conversion - The Disposal and Demilitarization of Heavy Weapon Systems, SEESAC, 2005.

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

[6] Article IV – Annex 1B – General Framework Agreement for Peace in Bosnia and Herzegovina, 14 June 1996, Florence, Italy.

[7] See Section 6 of Footnote 4 Reference for further details.

[8] Financial support may not be necessary. See later.

strategic national asset by some military officers, rather than the obsolete liability that they undoubtedly are.[9] This obsolescence means that it is highly unlikely that a credible or legitimate end user would be interested in buying these systems, therefore any likely purchaser is likely to be from the 'grey market'.

3 Demilitarization requirement

HEAVY WEAPONS FOR DEMILITARIZATION	QUANTITY
Tanks (T-54 / T–55)	61
Armoured Combat Vehicles BTR 50	5
Armoured Combat Vehicles BRDM 2	2
Howitzers 122mm D30	24
Field Artillery Guns TOP 130mm M-46	46
Field Artillery Guns TOP 100mm T-12	14

Table 1: Heavy weapons (Land Systems) for demilitarization

A recent SEESAC report[10] identifies a range of options for the disposal or demilitarization of heavy weapons systems. In the case of Montenegro it is assessed that demilitarization by dismantling and recycling is the most practical and cost effective option. A significant proportion, if not all, of the operating costs would 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. Moreover, it is the preferred way of the CFE Treaty, since this is the only way that allows for the disposal of large quantities of surplus and is also irreversible.

3.1 Scrap metal issues

The financial viability of heavy weapon demilitarization in Montenegro will be directly related to the value of scrap recovered; and consequently the value of scrap on regional or world markets. Therefore the most cost effective destruction should take place when the scrap market conditions are favourable. It is recognised however, that the costs of storage and maintenance, and political imperative may outweigh this particular factor. This is an issue for consideration by the Government of Montenegro and/or the eventual implementing agency for such a project.

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. At this time (March 2007) the price of scrap is highly favourable to disposal in the immediate future.

3.1.1 Metallurgical concerns [11]

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, niobium 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.

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[9] The combat effectiveness of the systems in the Montenegrin 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.

[10] Defence Conversion - The Disposal and Demilitarization of Heavy Weapon Systems, SEESAC, 2005. (www.seesac.org).

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

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.

4 Demilitarization planning guide for Montenegro

4.1 Demilitarization process flow

This matrix summarises the demilitarization process flow necessary for the demilitarization of heavy weapons by dismantling and recycling. Further guidance, based on the requirements of the CFE treaty is at Annex A.

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, HACV 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.

4.2 Previous regional experiences

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.[12] At the NATO Advanced Research Workshops (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[13]

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

[13] After the scrap recovery costs were accounted for.

This is useful planning data that can be used to develop indicative budgetary costs. Although it must be noted that labour costs in the Czech Republic are significantly higher, and the disposal took place when scrap values were relatively low. The data is included for illustrative purposes, and stakeholders should not extrapolate financial costs purely from this data.

4.3 Indigenous capacity - Zeljezara Niksic AD

The Niksic Steelwork Holding Company has been established as a joint holding company of which 66% is in Australian possession. The Niksic Steelworks was founded in December 1950, and over the years it has been updated to more modern standards to handle an annual capacity of over 180,000 tonnes.

The main metallurgical facilities in operation are:

- Two 60-tonne (30 MW) electric arc furnaces with ladle furnaces, treatment plants and a continuous caster.
- Blooming mill, continuous bar-rod medium and light section mill, cold strip rolling mill.
- Peeling and drawing plants.

Modern laboratory and mill equipment for quality control are present, and the company is ISO 9001-2000 quality certified by RW (TUV) (Germany). In the past the Niksic Steelworks have been involved in the demilitarization of T-55 tanks, and therefore proven indigenous capacity exists. The costs of demilitarization would be subject to contractual negotiations with the company, and should include the preparation costs necessary before the heavy weapons metal could be processed through the furnaces.

The Niksic Steelworks have already indicated that they have the capability to do the work, and would be very interested in opening formal financial and contractual negotiations.

4.4 International financial support

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.[14]

UNDP have yet to develop a strategy concerning defence conversion as part of their Security Sector Reform (SSR) portfolio. Therefore their engagement would be dependent on the views of the Resident Representative in Montenegro.

4.5 Indicative budgetary costs

Informal discussions with potential partners (non-contractual and without commitment) have indicated that the estimated scrap recovery value will more than cover the operational costs of disposal.[15] Therefore at this moment in time, due to relatively good residual scrap values, it is unlikely that international donor support will be required for this activity.

Indeed, the balance of scrap value against operating costs, could be used to partially fund other demilitarization activities in Montenegro, (for example disposal of hazardous chemical waste (Melange and Tonka Fuel)).

[14] OSCE has supported destruction of Heavy Weapons in BiH, and is engaging with ammunition destruction elsewhere under the OSCE Document on Conventional Ammunition.

[15] A more detailed EXCEL template is available from SEESAC for use in the development of any future project proposal.

5 Conclusions and recommendations

The heavy weapons (land systems) demilitarization requirement in Montenegro is manageable. There is an indigenous capacity to deal with the problem at the Niksic Steelworks, should they wish to do the work and be successful in contractual negotiations.

The disposal costs are very much dependent on; 1) the financial value of the steel recovered, which is subject to market fluctuations; and 2) operating costs. At the moment market conditions are favourable, and the recovered scrap value should more than offset operating costs.

There is little opportunity for realistic competitive tendering for this work as; 1) there is no alternative within Montenegro to the Niksic Steelworks; and 2) the costs of transportation for demilitarization outside Montenegro would significantly offset any operational destruction cost savings to be made.

It is recommended that once an implementation agency is determined for this work, that 'non-contractually binding' negotiations should take place with the Niksic Steelworks to refine the budget to obtain a more accurate estimate of destruction costs.

Annex A - 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. Deliberately omitted.

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: ***(Deliberately omitted, as scrap clearance is still required anyway)***.
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: ***(Deliberately omitted, as scrap clearance is still required anyway)***.

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: ***(Deliberately omitted, as scrap clearance is still required anyway)***.

4. Procedure for destruction by explosive demolition of mortars that are not self-propelled: ***(Deliberately omitted, as scrap clearance is still required anyway)***.

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: ***(Deliberately omitted, as scrap clearance is still required anyway).***

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: ***(Deliberately omitted, as scrap clearance is still required anyway).***

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.

Annex B - Submarines

Regrettably SEESAC does not have the specialist knowledge necessary to advise on the decommissioning and disposal of naval vessels. This Annex is therefore restricted to a factual summary of the situation within Montenegro.

Montenegro has stated that there are three submarines available for demilitarization. Additionally one is destined for the Montenegro Naval Museum and two for museums in Slovenia. Further research suggests that the Former Yugoslavia had developed its own submarine construction capability by the mid 1960s. Submarines have been maintained since 1945 at a shipyard in TIVAT, which has the capacity to remove the batteries and dismantle the vessels. Two companies (one each in Serbia and Slovenia) have indicated an interest in taking the batteries for demilitarization.

SUBMARINE TYPE[16]	QUANTITY BUILT[17]	QUANTITY DECLARED[18]	DISPOSAL ROUTE			REMARKS
			DEMILITARI-ZATION	MONTENEGRO MUSEUM	SLOVENIA MUSEUM	
Heroj Class Submarine (SSK) S-821, S-823	3	1	1			▪ Commissioned 1968 - 1970. ▪ S-821 in use until 2004. ▪ S-823 out of use since 1998. ▪ Displacement of 705 0r 1068 Tonnes (Submerged). (Reports differ). ▪ 64.0 x 7.2 x 5.0 metres. ▪ 6 x 533mm Torpedo Tubes ▪ Crew of 55.
Una Class Midget Submarine (S-911, S-912, S913, S-915, S-016[19])	4	4	1	1	2	▪ Built in 1980s. ▪ Displacement of 88 Tonnes (Submerged)
Sava Class Coastal Submarine (SS) (S-831, S832)	2	1	1			▪ Commissioned 1977. ▪ S-831 in use until 2004. ▪ S-832 out of use since 1996 and no engine. ▪ Displacement of 964 Tonnes (Submerged) ▪ 65.8 x 7.0 x 5.5 metres. ▪ Diesel Electric ▪ 6 x 533mm Torpedo Tubes ▪ Crew of 35
Sutjeska Class Coastal Submarine	2	0				▪ Relegated to training missions by the 1990s
TOTALS	11	6	3	1	2	▪
Mala (R-2) Class Swimmer Delivery Vehicle (SDV)	4					▪ Built in 1980s. ▪ Operated from *Una* Class.

[16] Nomenclature data from http://www.hazegray.org/worldnav/europe/yugo.htm and http://www.hri.org/docs/bmf/yugoslavia.html#navy.

[17] Research has identified that the Former Yugoslavia had built the submarines identified in the matrix. Further data on their status is unavailable, other than that included in the table. Source: http://www.theodora.com/wfbcurrent/yugoslavia_former/national_security/yugoslavia_former_national_security_naval_forces.html

[18] This is the quantity declared by the MAF for disposal.

[19] Five 911 Class submarines declared in Drustvo List, 19 February 2007 included S-016. Not confirmed if this is a Sava class as other sources suggest only 4 built.

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