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Coping with Surplus Weapons: A Priority for Conversion Research and Policy

June 95

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Coping with Surplus Weapons: A Priority for Conversion Research and Policy

Edited by
Edward J. Laurance and
Herbert Wulf

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Zusammen-fassung

German Summary

Aufgrund von Abrüstungsverträgen wie START und KSE, durch die Beendigung von Kriegen und Friedensverträgen oder wegen der Kürzungen in den Militärhaushalten werden viele Waffen aus dem Inventar der Armee ausgemustert. Einige Waffenkategorien (konventionelle Waffensysteme in Europa) werden in starkem Umfang reduziert, andere Kategorien (so die Chemiewaffen) werden komplett abgerüstet. Erst in den letzten Jahren ist die Frage "wohin mit den überschüssigen Waffen?" zu einem ernsten Problem und damit zu einer Konversionsaufgabe größeren Umfangs geworden.

Bislang ist das gesamte Ausmaß der bereits aufgehäuften Überschußbestände und die in den nächsten Jahren möglicherweise zusätzlich auszumusternden Waffen nicht genau bekannt. Die Regierungen der USA, Westeuropas, Rußlands und anderer CIS-Länder verkaufen, verschenken oder leasen beträchtliche Mengen konvenventioneller Waffensysteme. Vor allem im Bereich der Kleinwaffen sind erhebliche Bestände frei geworden, deren Verbleib oft ungewiß ist und die zum Teil in Kriegs- und Konfliktregionen exportiert werden.

Die Regierungen verfügen über eine Reihe von Möglichkeiten, die Überschußbestände abzubauen: einlagern, exportieren, verschrotten, verrosten lassen, für zivile Zwecke verwenden oder konvertieren usw. Die verschiedenen Strategien zur Entsorgung, Verschrottung oder Verwertung der Überschußbestände haben unterschiedliche Konsequenzen. Der Export der Waffen und anderer militärischer Geräte ist sicherlich die kostengünstigste Möglichkeit eines Staates, sich überschüssiger Waffen zu entledigen. Man spart nicht nur die ansonsten aufzubringenden Kosten für Verschrottung, sondern erzielt sorgar Einnahmen. Doch ist der politische Preis hoch, wenn der Abbau militärischer Potentiale in einer Region mit dem Anheizen des Rüstungswettlaufs in anderen Regionen erkauft wird. Die Gefahren für den Frieden sind offensichtlich, wenn kurzsichtig angelegte Politik, den bequemsten Weg zur "Entsorgung" der überschüssigen Waffen wählt.

Das BICC hat in Kooperation mit dem Monterey Institute for Insternational Studies ein Forschungsprojekt zu dieser Thematik initiiert und im November 1994 ein Expertengespräch in New York durchgeführt. Die dort vorgestellten Papiere sind in diesem *brief* veröffentlicht. Im ersten Kapitel wird das Konzept zur empirischen Erfassung sowie der Gründe zur Entstehung von der "überschüssigen Waffenbeständen" entfaltet. In weiteren Kapiteln werden verschiedene Waffenkategorien untersucht. In einem Beitrag über Chemiewaffen, die nach der verabschiedeten, aber noch nicht ratifizierten Chemiewaffenkonvention komplett zur Vernichtung in den nächsten Jahren anstehen, werden die technischen Möglichkeiten und Schwierigkeiten auf dem Weg zur Verwirklichung der Chemiewaffenkonventionen beschrieben. Rakten werden in einem weiteren Kapitel als besonderer Fall besprochen, weil Rakten sehr häufig sowohl militärisch als auch zivil nutzbar sind und daher im Falle von Rüstungskontroll- und Abrüstungsverträgen der besonderen Kontrolle bedürfen. Da die Raketen für zivile Zwecke oft wirtschaftlich interessant sind und sie militärisch als moderene Waffensysteme gelten, fehlt häufig die Bereitschaft zur Verschrottung dieser Systeme. Ein besonderes Problem verursachen die riesigen Überschußbestände leichter Waffen; es sind die Waffen, die am häufigsten in Kriegen und Konflikten eingesetzt werden und deren Verbleib und Transfer schwer zu kontrollieren ist. Durch das Ende des Kalten Krieges und die Beendigung einer Reihe von Kriegen in Entwicklungsländern (besonders in Afrika) sind große Bestände der Kleinwaffen verfügbar geworden. Es bedarf koordinierter Maßnahmen der internationalen Völkergemeinde (einschließlich "gun-buy-back"-Programmen), um diese Waffenbestände zu kontrollieren. Schließlich wird in einer Fallstudie nachgezeichnet, wie das Erbe der Waffen der Nationalen Volksarmee der ehemaligen DDR verwendet wurden. Immerhin handelte es sich um mehr als 2300 Kampfpanzer, 390 Kampfflugzeuge,
69 Schiffe und riesige Mengen Munition, Lastwagen usw. Die Waffen wurden teils verschrottet, ein großer Teil wurde auch exportiert.

Foreword

During 1994, the Monterey Institute of International Studies (MIIS) and the Bonn International Center for Conversion (BICC) focused some of their research on surplus weapons. BICC and MIIS have started a long-term research and policy analysis project intended to contribute two-fold to addressing and hopefully solving the problem of surplus weapons. The project will produce a global overview of existing and potential future surplus weapons, which requires an intensive empirical research input. Further, it will contribute to the design of new policies (including policy implementation) primarily to avoid the transfer of such weapons into conflicts, but also to identify other (technical and political) means of responsibly reducing the surplus.

The papers in this volume were presented at a workshop at the Joyce Mertz-Gilmore Foundation in November 1994 in New York and are the result of that effort.[1] These papers have several purposes. First, they serve as an introduction to the subject of surplus weapons as a dimension of the overall conversion effort in the post-Cold War period. Since this is a new topic for research and policymaking, it is necessary to develop and communicate to a general audience the magnitude of the problem and the dangers—both potential and real—to the economic well-being and security of states and their citizens. Second, they serve as a set of guidelines for researchers who will document the size and location of surplus weapons stocks. The papers also present concepts and theoretical constructs that may be utilized in order to describe and explain the growth of surplus weapons and the negative economic, military, social and political consequences. Third, they initiate the process of selecting a research agenda based on specific weapons types, disarmament agreements, and specific regions of the world where surplus weapons present a significant conversion challenge. Finally, and perhaps most importantly, the papers introduce the subject to the policymaking community at the local, regional, national and international levels. It is here that the research findings must be applied if the negative consequences of surplus weapons are to be ameliorated and eventually eliminated.

[1] Grants from the Joyce Mertz-Gilmore Foundation and the Volkswagen Foundation made this work possible.

Introduction: Coping with Surplus Weapons Systems: A Priority for Conversion Research and Policy

by
Edward J. Laurance and Herbert Wulf

The program of the Bonn International Center for Conversion (BICC) tries to facilitate the process of conversion by focusing primarily on six conversion areas: reallocation of the financial resources of the military sector to non-military purposes; reorientation of military research and development (R&D) for non-military purposes; downsizing defense industrial overcapacities and reducing dependencies on arms production; demobilization of armed forces; military base closures; and surplus weapons systems.

These areas indicate that, in addressing the issue of conversion, a high priority should be attached to the problem of surplus weapons (weapons that are no longer considered of importance in the armed forces of a nation). In contrast to some of the other areas, only limited research and political action has been directed at solving the problems associated with surplus weapons. The existence and increasing stockpiling of surplus weapons is widely apparent, especially since the end of the East-West conflict and the dissolution of the Soviet Union. At the same time there are considerable surplus stocks of weapons in other regions of the world, such as Central America, Africa, and Asia.

A cursory analysis of the existence of surplus stocks of weapons illustrates various causes that led to stockpiling: international disarmament agreements, unilateral disarmament, the cessation of hostilities, financial constraints on defense budgets, and the modernization of armed forces and replacement of its equipment.

Experiences in different regions have proven how problematic the management of such surplus weapons can be: to mention only three recent examples, the CFE agreement led to cascading of surplus weapons into exports; the equipment of the former East German armed forces (NVA) was partly dismantled but also exported in great quantities; and the stockpiling of equipment after the end of a long-lasting conflict between Ethiopia and Eritrea has been stolen or illicitly transferred into Sudan and Somalia.

The experiences of the past few years also show that the whole range of weapons (from sophisticated nuclear weapons and their delivery systems to all types of conventional weapons) are being made redundant and may thus become available to interested parties.

Different methods of handling surplus weapons may be applied:

- Mothballing of weapons is the simplest method, although these weapons are often kept without appropriate protection against theft. Furthermore, stored weapons may be employed again.
- The export of obsolete weapons is the cheapest but most dangerous method of eliminating superfluous weapons. Large quantities are still for sale today.
- Allowing the weapons to become obsolete over time is a practical consequence of technical and economic difficulties rather than a chosen policy. It involves ecological hazards, and the temptation to export these weapons for economic benefits remains.
- The destruction of weapons is technically feasible, although not without costs and ecological hazards. Disabling weapons—as provided for in treaties—is usually possible within a short span of time and at limited costs. What is costly, time consuming and technically complex is the final disposal of weapons and their components.
- Converting weapons or other military equipment for civilian use is the most constructive approach but is limited in scope. Reuse for civilian purposes is possible only for a limited number of military equipment categories (such as radar, satellites, helicopters and trucks). The limitations are the result of

specific and demanding military performances of weapon systems that are too inefficient, hence costly.
- In rare cases 'demilitarized' weapons might even serve for other military purposes—for example, as simulators, targets or exhibits.

As a general rule one may predict that the two most desirable methods, namely conversion and scrapping of weapons, will either be very limited in scope or will require substantial amounts of investment, although reclamation of raw materials is feasible—as has been proven in the case of munitions.

Since surplus weapons are a new phenomenon, not even the magnitude of existing and potential future surplus is known for all categories of weapons. In most cases, governments confronted with the issue have followed a muddling-through policy in which all of the above-mentioned methods of managing the surplus have been tried.

The dangers for peace, security and the environment of such haphazard policies are obvious. Arms bazaars, smuggling and other illegal methods of trade, dumping of surplus weapons, and environmental degradation are all indicators of a growing problem requiring the attention of governments, NGOs, and research institutions equipped with technical expertise.

Research Design

The first paper in this collection is an attempt to develop a comprehensive list of the concepts and questions which make up the larger research effort. In this piece, the authors tackle the difficult question of how to define a surplus, a reminder that this problem is as political as any other on the conversion agenda —one must initially answer the age-old question of "how much is enough?" As they point out, to the extent that uncertainty and fears of future threats still dominate national agendas, states will be reluctant to part with those weapons that an outsider, operating under different assumptions and perceptions, may deem surplus.

An obvious first step in this project is the gathering of empirical data. The authors have provided the necessary list of indicators to generate data on surplus weapons; when aggregated, this list will form the basic material for a surplus weapons atlas. The research design also addresses the critical question of causality—why are surpluses created in the first place? The ultimate goal of the project, the design and execution of policies to alleviate the problems created by surplus weapons, cannot be achieved without addressing the causes.

The guidelines of the authors are comprehensive and designed to be applicable to all types of weapons in all regions. While these guidelines hold for most major conventional weapons—the biggest problem documented to this point—it is clear that certain commodities create special challenges for conversion. With that in mind, several of the following papers deal with specific types of weapons.

The large inventories of equipment that U.S., European, and Russian forces no longer need, and cannot afford to maintain in inventory, have had a significant impact on the current international defense market. Some of this equipment is finding its way into international markets at bargain prices. This phenomenon began as a result of the Conventional Forces in Europe (CFE) agreement, which limited major platforms for all countries west of the Urals. As a result, a cascade of older equipment from wealthier countries to poorer countries is underway. The end of the Cold War has accelerated this trend.
The U.S. and European countries, for example, are donating or leasing capital ships to a number of countries. The Germans are putting inherited East German equipment on the market. Defense industries in arms suppliers countries are concerned that the availability of such excess equipment displaces potential orders for new equipment, or at least depresses prices and decreases the bargaining leverage of sellers. Obviously, the U.S. would like to limit the ability of agressive countries to obtain weapons, particularly if U.S. forces might one day have to deal with those countries. This is all the more important in today's world, where the U.S. will increasingly find itself called upon to act as world policeman, or at least referee. But such a policy is easier to enunciate than to carry out in practice.

Source: Strategic Assessment 1995, U.S. Security Challenges in Transition, Institute for National Strategic Studies, S. 142

Central Estimates for Plutonium and HEU in Unsafeguarded Inventories in Tons (1994)[a)]

	Total weapon grade plutonium inventory	*Weapon-grade plutonium in operational weapons*	*Total HEU inventory*	*HEU in active weapons*
Russia	125	50	1000	230
United States	110	33	700	160
France	6	2	15	7.5
United Kingdom	2.6	0.8	13	3
China	3	1.8	15	7
Israel	0.35	0.3	—	—
India	0.36	0.3	—	—
Pakistan	—	—	0.2	?
TOTAL	**230**	**90**	**1940**	**410**

Notes:
a) Estimates of inventories were made in a number of cases. For details, see original source.

Source:
Reprinted from Frans Berkhout, Oleg Bukharin, Harold Feiveson, and Marvin Miller, "A Cutoff in the Production of Fissile Material," International Security, Winter 1994/95 (Vol. 19, No. 3), p. 167

Weapons-Specific Concerns and Issues

Although this collection of papers does not address nuclear weapons surplus, it is a multi-dimensional problem which is of political concern at the highest level—e.g., the nuclear heritage of the former Soviet Union. Foremost is the issue of what to do with surplus fissile material—plutonium and highly enriched uranium. According to a recent study, large amounts of surplus weapon-grade material are released during the process of eliminating the tens of thousands of nuclear warheads.

The dangers and highly technical solutions to this problem make it one which requires special treatment. An additional unique feature of the surplus nuclear weapons issue is the presence of a nuclear nonproliferation regime—a Nonproliferation Treaty (NPT) and an international organization dedicated to policing fissile materials, the International Atomic Energy Agency (IAEA). For example, it is illegal to export nuclear weapons and the transfer of fissile materials is tightly controlled at the international level. Unlike conventional weapons, there is an international legal framework within which solutions may be developed. Another issue unique to these weapons—the surplus of nuclear scientists who, lacking other alternatives, have the potential to sell their 'surplus' services to the highest-bidding would-be nuclear state—must be addressed.

This collection addresses other categories of weapons with specific characteristics. Thus, chemical weapons have their own set of peculiarities that shape policies designed to alleviate the surplus. As with nuclear weapons, a nonproliferation regime is emerging, based on the newly signed Chemical Weapons Convention (CWC). Unlike nuclear weapons, all chemical weapons have been outlawed, which at least in theory makes the issue of surplus somewhat simpler. Exporting surplus is less of a concern, not only because it is now illegal but also because it is rather easy to produce such weapons. Since under the CWC all existing chemical weapons are to be destroyed, this will be the principal focus of research and policy development.

UK goes up for sale

The UK MoD's Defence Sales Agency is being viewed internationally as a role for selling surplus military equipment.

The sale of surplus military equipment has become big buisness for the UK MoD's disposals organization, the Defence Sales Agency (DSA). With successes last year including the export of six former Royal Navy Type 21 frigates to Pakistan, four minesweepers to Bangladesh and, in November, four Broadsword class Type 22 Batch 1 frigates and three River class minesweepers to Brazil, DSA sales are beginning to expand. Next on the auctionblock are the RN's four Upholder class SSKs with Canada tipped as the likely customer. According to DSAofficials, the success of the UK's military disposal sales agency cn be gauged by the extent for foreign interest in the organization. The former Directorate of Sales (Disposals) recently hosted teams of intersted observers from the USA, Belgium, Spain, Singapore, Czech Republik and Russia, all aiming to establish or improve their own disposals sales organizations along similar lines to the MoD operation.

Source: *Jane's Defence Weekly, Vol. 23, No. 5 (4.02.95)*

Missiles have been singled out for special treatment for several reasons. First, in signing the 1987 agreement to establish the Missile Technology Control Regime, the major producers of missiles recognized that although missiles are delivery systems for nuclear weapons, they are not covered under the nuclear nonproliferation regime. Second, their characteristics—e.g., high speed and no known defense—make them a particularly destabilizing commodity, as was seen most recently in the Gulf War. This quality makes them a highly sought commodity in the international arms market, thus generating a disincentive to dismantle or destroy them. Missiles also have a potentially dangerous capability to be 'mixed and matched'—creating a disincentive to destroy such weapons if they can be dismantled and used for another purpose for which a state does not have a surplus, by whatever definition used. Finally, missiles are unique in that they can be used as space launch vehicles (SLVs), a civilian purpose that has great economic potential, at least in the eyes of the states concerned.

Light weapons also have unique features that significantly affect the development of solutions. In one sense these weapons are the opposite of nuclear weapons, in that a single one cannot compare with a nuclear weapon in destructive power. Yet it is light weapons that throughout the Cold War—and even more so today —were responsible for most of the killing of both combatants and civilians. Due to a breakdown of export controls in the former Soviet Union and the concomitant continued production of light weapons, the international market has been flooded with very cheap, hard-to-detect, and lethal light weapons. The ending of wars not associated with the Cold War has also contributed significantly to this surplus, which has found its way into all of the bloody ethnic conflicts now raging. Because of the low cost, size, availability, and lack of accountability of these weapons, solutions other than those used for larger weapons will be necessary. Some of these might include increased publicity of negative consequences to develop norms against their use (e.g., the campaign to ban anti-personnel land mines), buy-back programs, transparency regimes at the regional level, the development of consultative mechanisms, and the further development of disarmament schemes as part of United Nations peacekeeping operations.

Brief 3

Conventional arms constitute the majority of surplus stocks in most countries. For example, experience of the CFE arms reduction in Europe and the results of unification in Germany provide an interesting empirical basis for the implementation of policies regarding surplus weapons. In the German case, the weaponry of a complete army (the former East German Nationale Volksarmee, NVA) in 1990 became surplus, including more than 2,300 battle tanks, 390 fighter aircraft and 69 fighting ships. These conventional weapons were partly scrapped, but also exported—thus adding to the flow of internationally traded arms—and partly integrated into the West German armed forces. The last paper in this collection details what has happened to the NVA material over the last four years. It is a case study encompassing all the above methods for handling surplus weapons that may be applied.

Belgium initiates 3-year sell-off

Belgium is to sell large quantities of armour and artillery over the next three years, officials in Brussels have confirmed. Reducing in size from a corps to a reinforced division, the Belgian Army is divesting itself of the following equipment:

- 202 Leopard 1 MBTs (keeping 132);
- 54 Gepard 35 mm selfpropelled anti-aircraft guns (keeping none);
- 319 CVR(T) family SFVs (keeping 339)
- 60 M109A2/A3 155mm howitzers (keeping 108);
- 11 Alouette II liaison helicopters (keeping 33);
- 10 Epervier reconnaissance drones (keeping 20);
- 5 M48 bridgelaying tanks (keeping 9);
- 12 Matenin mine laying systems (keeping 15);
- 34 107 mm mortars (keeping 90;
- 24 HAWK SAM launchers (retaining none).

These weapons will be sold in government-to-government contracts, while in some cases the original manufacturer may play an intermediary role. Proceeds will be used exclusively to pay for new defence procurements.

Source: *Jane's Defence Weekly, Vol. 23, No. 4 (28.01.95)*

Researching Surplus Weapons: Guidelines, Methods andTopics

by
Susanne Kopte
and Peter Wilke

Developing a framework for research on surplus weapons

The existence of surplus weapons, defined as those which are no longer needed in the national context for maintaining or securing peace (state of non-war), is widely accepted. The end of the East-West conflict and the break-down of Soviet hegemony has led to a systematic decline in defense budgets and inventories of equipment, especially in Europe. At the same time, there are considerable stocks of unnecessary weapons in other regions of the world, created with the cessation of fighting or abatement of wars not necessarily associated with the Cold War. In Central America, Africa, Asia and the Far East, the stock of weapons is often higher than that needed for national security, if one assumes the adequacy of a defensive doctrine. International disarmament agreements and economic realities have increasingly led to a reduction of national arsenals since 1990, with further reductions to follow over the next ten years.

What are surplus weapons? How can they be defined? The characterization of military capacities and weapon stocks as surplus presupposes that there are normative criteria for necessary stocks. Since security doctrines vary widely—between a conservative security policy and a peace utopia—any definition of stocks as surplus will always be controversial. Therefore an appropriate starting point is a discussion of possible criteria for defining surplus weapons. This exercise cannot be avoided, since documenting existing surplus stocks, their types and their regional distribution, will be a central task prior to analysis and policy implementation. This categorization is necessarily multi-dimensional, taking into account the origin of the weapons involved, conflict categories, regional distribution, weapon categories and disarmament effects.

Having described and documented surplus weapons, one must assess the possible explanations for surplus stocks. The solutions put forth to deal with surplus weapons—the disarmament steps inclusive of destroying the weapons—will depend critically on how they became surplus in the first place. The surplus of nuclear-armed intercontinental weapons in the United States and Russia can hardly be compared with a possible surplus of small arms and light infantry weapons after ceasefires and the resolution of conflicts in the Far East and Africa. In essence, the approach can be described as a stock and flow analysis. The stock analysis concentrates on the question of how much surplus exists, while the flow analysis reports the causes of and reasons for the emergence of surplus weapons. The overall objective is to collect material for a world-wide disarmament and conversion atlas, which will give an up-to-date overview of surplus weapon stocks and disarmament agreements, as well as an assessment of conversion which has already transpired.

The question of varying practical approaches to disarmament related to surpluses completes this analysis. The aim is to describe the surplus of weapons in each particular case, in an international, national and regional context, and then evaluate the economic costs and the technical problems, leading finally to policy recommendations.

Definition of surplus: which criteria are meaningful?

Without some semblance of a consensus on what 'surplus' means, its elimination in a specific context is not likely. For example, a definition of surplus that includes only weapons systems eliminated due to international agreements is not adequate. Weapons must be discussed in the context of military capacities, e.g., not only weapons stocks but also arms production capacities. The criterion for defining a surplus must be laid down openly, and must differentiate between surplus and necessary military capacities. The criterion for defining a surplus must be laid down openly, and must differentiate between surplus and necessary military capacities.

When seeking a useful analytical definition of military surplus, three general levels should be distinguished:

- a surplus of military capacities—soldiers, weapon systems and military facilities
- a surplus of weapons and equipment

- a surplus of industrial capacities for weapon production

The initial decision must therefore determine which of these analytical levels to apply when defining a surplus. In designing specific disarmament requirements, it seems most useful to use the wider definition, which takes into account overall military capacities including: military-used infrastructure, soldiers, weapon systems, industrial capacities for the production of weapons, and servicing and maintenance capacities.

The question remains: for the evaluation of military capacities (and for particular weapons), who defines—and by what criteria—which capacities (weapons) are surplus and no longer needed? The answer to this "how much is enough?" question depends on complex evaluations of security policy and possible threats, which fluctuate over time. Objective evaluation criteria do not normally exist. In military worst-case thinking, absurd dangers are taken into account. For example, the military armaments competition in the East-West conflict created accepted scenarios and possible courses of war that encouraged the belief that, in terms of the military, one can never have enough. This security logic led to a well-documented, excessive buildup of stocks in all categories of weapons, a buildup that has now created the need for sensible and practical approaches to a build-down.

The spectrum of possible definitions is set by two extremes:

- On the one hand, the definition can be based strictly on disarmament agreements and national military definitions. Surplus is then that part of military capacities and weapons which, when compared to the previous state (before the disarmament agreement), is now too much. Even in the course of this very restricted surplus term, a considerable world-wide surplus of weapons, soldiers, military infrastructure and weapon production capacities does exist.

- On the other hand, the surplus concept could be considerably expanded and only recognize those capacities which are legitimate and seem to be necessary for a defensive security policy. In this case, the problems of evaluation increase, and logically, so do the stocks defined as surplus.

Because the above definitional dilemma is political in nature with no obvious solution, practicality demands the use of a relatively empirical concept of surplus, one restricted to weapons and direct military capacities. This means soldiers and military infrastructure will normally not be taken into account. Industrial, research and development capacities will only be utilized to the extent they are necessary for the use of weapons or the understanding of the development of surplus.

The basic surplus concept used here is mainly descriptive and distinguishes between a stock and a flow analysis. The stock analysis is necessarily normative and depends on the valuation issues raised above. It accepts governments as the surplus-defining authority. The flow analysis supplements the stock analysis with a description of causes. This is necessary, both for understanding the different phases (production of weapons, being fit for duty, cause of surplus, use or reduction of surplus) and to show that weapons must not always remain in the status of surplus (for example, they can be exported or new security doctrines can emerge). This approach is also a starting point for an investigation of regional distribution patterns of surplus.

The acceptance of official governmental statistics does not mean that a critical analysis cannot be carried out for concrete cases, which might show at least the possibility of a different assessment regarding the chances for disarmament. One outcome of research in this area may well be the development of a middle way between official statistics and a totally independent definition of surplus stocks.

How does a surplus of military capacities and weapons arise?

A first look at military surplus and weapon stocks generated by disarmament reveals different causes and starting points for surplus weapons. An analysis of the reasons for surplus is therefore necessary. Basically, surplus results from the following situations: unilateral or international (at least bilateral) disarmament initiatives; the end of a war or limited regional conflict; a modernization decision; and/or financial constraints on defense budgets.

One hypothesis is that only surplus resulting from spectacular changes (e.g., the end of an army—such as that of East Germany—resulting from the end of the Cold War) can force actual conversion and disarmament strategies. All cases below this level are dealt with by such cost-minimizing or profit-making strategies as mothballing or weapon exports, producing financial as well as political profit. The generation of surplus, of course, depends to a large extent on the various national laws and export regulations as well as provisions in disarmament treaties requiring destruction of weapons.

Case studies on disarmament and conversion comparing the phenomenon of decommissioning old-fashioned systems (e.g., MIG fighter aircraft of the NVA) while simultaneously modernizing (e.g., purchasing the Eurofighter 2000), illustrate that disarmament is not a linear trend of arms reduction.

Surplus weapons—how many and where? The stock analysis

The quantity and distribution of surplus weapons is the central point of attention for disarmament and conversion policy. The stock analysis includes all nations and produces profile of existing weapon stocks. The overview lists weapon systems and their regional distribution, and sets the research and policy agenda. Important are several factors:

- criteria for registration and counting
- presentation methods (diagrams, graphs, etc.)
- grade of differentiation (according to type of weapons)
- surplus potential (possible 'disarmament reserves')
- weapon production capacities and the resulting 'oversupply' of weapons, research and development capacities.

The stock analysis should take into account the number and quality of weapons in the various categories remaining after the surplus is declared and determined. This means providing information on specific categories: (1) military goods in the stock of the armed forces declared as surplus but still usable for military purposes, presently stockpiled, intended for export, intended for civil use (conversion), or intended for scrapping; (2) military goods in the stock of the armed forces no longer militarily usable or forbidden by disarmament agreements, intended for scrapping/destruction or intended for civil use; (3) weapons partly destroyed in wars, mines left behind, and other 'remnants of wars;' (4) weapons captured in wars which will not be used in national armed forces; (5) military goods being stored or used illegally, and not officially part of the stock of the armed forces; and (6) newly produced goods which have not been sold.

Regional distribution

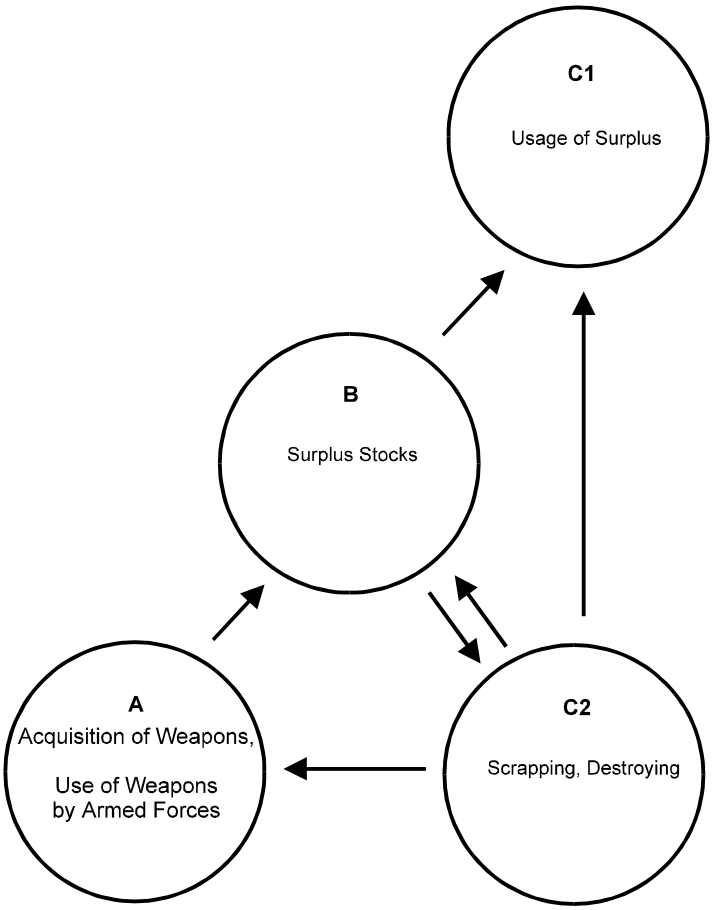
A preliminary assessment of regional distribution patterns demonstrates that high surpluses occur most frequently in the industrial countries. Further, the purely quantitative weapon stocks of the former Warsaw Pact states seem to be higher than those of the West. Concurrently, these Eastern states are undergoing a crisis in economic transformation. As a result, they continue to produce armaments and increase the level of surplus weapons; the arms production capacities appear twice as heavy in Eastern Europe and the former Soviet Union than in Western Europe. It should be noted that such regional concentrations can also be found in Western Europe and the United States, which may lead to major problems as well.

In addition to these problems produced by the East-West conflict, other regional surplus cases exist in the Third World, and tendencies to continue arming exist in some parts of the world. A critical question is the extent of the relationship between the regional reduction of surplus (by export) and a resulting increase of military capacities in other countries.

The stock analysis should focus on the following regions:

- the CIS—because of the START agreements, the chemical weapons convention, a strong stockpiling policy in the past and regional changes in stationing forces
- the United States—because of START, the chemical weapons convention and a rapid modernization policy
- Europe—because of CFE
- Germany—due to the unification and the end of the NVA
- regions of recent war and conflict—Central America, Southern Africa (Angola, Mozambique), Somalia, Sudan, Iraq, Afghanistan, Cambodia, Vietnam, etc.
- captured weapons, especially in Israel and Vietnam (very old), the United States (smaller numbers from Iraq, Grenada, etc.), Southern Africa (Angola)
- weapons produced for stockpiling, especially in Central and Eastern Europe

Suggestions for a flow analysis of surplus stocks



In addition to the purely quantitative documentation of surplus stocks, a flow analysis may be made —preferably in case studies—analyzing the origin of surplus. One initially assumes that the acquisition of weapons (by production or import) does not necessarily lead to a surplus, but to a use of these weapons as planned (situation A).

By analyzing surplus in a flow analysis, one may then distinguish several factors:

- Causes of surplus (situation B): removal from service because of wear and tear, but generally usable; removal from service for technological reasons, i.e., because of modernization; removal from service due to changes of doctrine; removal from service because of unilateral disarmament; reduction in inventory because of agreements; disposal of used weapons (very often in war regions) because the costs of continuing to use them are too high (i.e., mines, US weapons after the Gulf War); capturing of weapons during wars which do not fit into domestic armed forces; and/or excess created by over-purchasing and stockpiling of weapons.

- Usage of surplus (situation C1): sending usable surplus to A as exports, thus starting the cycle again; sending to surplus stocks at B; taking from surplus stocks by sending weapons back to A (in the case of a crisis), B because of age, or C; civil use; and/or scrapping or destroying them (situation C2).

Viewing surplus as a flow variable instead of simply a stock variable has many analytical advantages. It becomes obvious that surplus is a temporary phenomenon, depending on such factors as a doctrine encouraging stockpiling of old weapon goods (especially in the former Soviet Army, but common to all armed forces); agreements on destruction/reduction over a period of time; the financial background of the armed forces—the more money it possesses, the faster it will be modernized and a surplus created, the easier old equipment can be sold, and the more money is available for carrying out expensive destruction; and the state of the international weapons market in general (i.e., demand for used weapons).

Second, it becomes apparent that the same good (weapon) can go through more than one phase of surplus and non-surplus. For example, through export the process becomes circular when a state acquires surplus equipment (A). However, surplus may also be created in the course of changing threat perceptions, where weapons once declared surplus will be used again. This was the philosophy behind the high weapon stocks of the Soviet Army. Goods which are 'civilianized' may theoretically be used again for military purposes (for example, trucks in the situation of a crisis).

Third, the relationship between new production and the removal of weapons from service—for example, because of technical developments or export interests—has become clear. In France, Mirage-3s are taken out of stock and exported in favor of Rafales. In the United States, the suggestion has been made to export the older F-16s in order to finance newer models.

The stages of the flow analysis are also suitable for a regional study. Referring again to the Figure, **A** (as production) normally and preferably takes place in the industrial countries; **B** (build-up of surplus stocks) initially occurs primarily in the industrial countries, then—after export—in Third World countries; **C** occurs in the industrial countries, mainly in the former Soviet Union, because there is minimal use for the surplus, especially in the Third World countries.

Exports of surplus weapons generally occurs between the North and South, with areas of crisis and war as major customers.

From surplus to disarmament: what capacities are necessary for disarmament? What economic and technical problems arise?

As can be seen by the variety of responses to surplus weapons, it is certainly possible that a surplus (military capacities) remains and is only reduced to a small extent. In what cases does surplus turn into disarmament? In these cases, are there similarities in the forms of behavior? If so, such an analysis has direct relevance in designing conversion strategies and policies.

After identifying and counting surplus stocks, one must ascertain the disarmament capacities necessary for coping with these problems. What strategies exist for the stockpiling, destruction and conversion of weapons and armament capacities? The possibilities are strongly influenced by the available technical and economic means; an evaluation of cases of surplus will enable the elaboration of technical solutions and economic costs.

Research Questions

In conclusion, a set of key questions emerge to guide research in the area of surplus weapons.

- What is defined as surplus?
- What problems exist with national (official) figures?
- How many surplus stocks do exist?
- Of what is the surplus composed?
- Where does the surplus exist?
- How does the surplus arise?
- What factors determine disarmament and conversion options?
- What strategies for handling surplus exist?
- For what economic and technical problems (arising in the course of surplus) must solutions be found?
- What is the legal framework concerning contracts and laws—both international disarmament agreements and their provisions for the destruction of weapons as well as national export regulations?

The Disposal of Surplus Chemical Weapons

by
Maria Bowers

Introduction

It is somewhat misleading to consider chemical weapons within the context of surplus weapons stocks in the post-Cold War era. This is due to the January 1993 signing of *The Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction*, commonly referred to as the Chemical Weapons Convention (CWC). Unlike the nuclear Non-Proliferation Treaty (NPT), the CWC is non-discriminatory; all the participants have the same rights and obligations. The conclusion of the CWC was a true landmark achievement in the field of disarmament, in that it bans not only the production, stockpiling, development and use of chemical weapons, but also the retention and transfer (sale) of chemical weapons. The CWC also calls for the destruction of all chemical weapons owned or possessed by states parties, and requires the destruction of all old and abandoned chemical weapons.

The CWC defines "Old Chemical Weapons" as "(a) Chemical weapons which were produced before 1925; or (b) Chemical weapons produced in the period between 1925 and 1946 that have deteriorated to such extent that they can no longer be used as chemical weapons." The CWC defines "Abandoned Chemical Weapons" as "Chemical weapons, including old chemical weapons, abandoned by a State after 1 January 1925 on the territory of another State without consent of the latter."

The international organization that will oversee the implementation of the CWC is the Organisation for the Prohibition of Chemical Weapons (OPCW) located in The Hague, the Netherlands. As of fall 1994, 158 countries had signed the CWC and 16 had ratified it. It will enter into force upon the 65th ratification, an event which is likely to occur in the not-so-distant future. Most major states are party to the agreement; the two countries with the largest stockpiles of chemical weapons today, the United States and Russia, are signatories. Nevertheless, there are a number of countries that are not signatories, some of which are likely possessors of chemical weapons. Although several Arab states have stated that they refuse to sign the CWC until Israel signs the NPT, there remains a possibility that these states will eventually join the CWC.

In essence, the CWC places all chemical weapons in the class of surplus weapons. Moreover, it prohibits commonly used destruction techniques, namely dumping in any body of water, land burial and open-pit burning. Former methods of disposing of surplus chemical weapons stocks are thus no longer an option today. The CWC mandates a deadline for the destruction of all chemical weapons of no later than ten years after the CWC enters into force. This deadline may be extended by five years in special circumstances, upon approval of the Conference of States Parties to the CWC.

It is a challenge to discover methods of disposal that are ecologically safe and acceptable to both governments and the local population where chemical weapons are currently stored. The difficult task often gives rise to controversy and heated debates. The following discussion will provide a brief overview of the technical, political, environmental and economic problems nations face in the destruction of surplus chemical weapons stocks.

Properties of Chemical Agents and Munitions

In order to grasp the problems associated with the destruction of chemical weapons, it is necessary to recognize that not all chemical weapons or chemical weapons agents (the poisonous substance inside a chemical weapon) are the same. These differences must be perceived, as different destruction techniques are more or less suitable depending upon the agent involved and whether or not that agent is weaponized.

The CWC considers bulk agents—chemical agents that are not weaponized—as chemical weapons, which therefore must be destroyed in accordance with the CWC. A chemical agent is considered to be a bulk agent when it is stored in a tank, drum or other container that is not suitable for battlefield employment. In most cases, it is much easier to destroy a chemical agent when it is in bulk than when it is in a munition. The destruction and disposal of weaponized agents presents a variety of problems. Chemical agents are considered to be weaponized when they are in a munition, whether it be a bomb, mortar round, artillery shell, grenade, mine or any other dispersal mechanism. The risks involved in destruction are heightened if the chemical is in a munition; a fused munition has an increased possibility of exploding during the destruction process or during transport to a destruction site.

There are literally thousands of chemical substances that are poisonous to humans. Over the last century, however, only about 70 different chemical agents have been used in the manufacture of chemical weapons (Compton, 1992). Only the most common agents will be addressed in this study. There are a number of ways to classify chemical agents based on their specific properties. When the average person thinks about chemical weapons, the first image that usually comes to mind is poison gas. Chemical warfare agents, however, can be found in a variety of forms besides gas, including liquid, solid or aerosol (suspended particle).

- *Nerve agents* are the most lethal of the chemical agents. Chemically, nerve agents belong to the group of *organo-phosphorus compounds*, along with many modern pesticides. Once a person comes in contact with a nerve agent—whether through inhalation, ingestion or contact with the skin—the toxic properties of the agent begin to take effect.

- *Blister agents, or vesicants,* are less toxic than nerve agents, but can be deadly nonetheless. The most common blister agents are mustard agents, first developed as a chemical weapon in World War I. Blister agents react on humans by destroying tissue, causing burns and blisters when they come into contact with the skin and damage to internal organs if inhaled or ingested—sometimes resulting in death.

- *Blood agents* are lethal and block the flow of oxygen to the blood, causing oxygen starvation of body tissues, termed anoxia. Cyanogen chloride and hydrogen cyanide are blood agents.

- *Choking agents* attack the respiratory system, and they can be lethal. One of the most common choking agents is chlorine, which was the first chemical agent used in World War I.

- *Harassing agents* are usually not lethal unless inhaled in large quantities. Harassing agents can be further broken down into tearing, sneezing or vomiting agents. Many of these agents were developed in World War I and are obsolete today, while others (such as CS, commonly called tear gas) are used by modern police forces for riot control.

- *Psychological agents* impair rational thinking in humans. Large doses can be lethal. LSD and BZ are the most well known psychological agents.

Another method of chemical agent classification is whether they are *persistent* or *non-persistent* . Persistency is used to describe how long an area remains contaminated at a level of toxicity dangerous to humans after a chemical agent has been employed. Thus, an agent is said to be *persistent* if the area in which it was used remains contaminated for about a day or more. On the other hand, a *non-persistent* or *volatile* agent disperses quickly, sometimes in a matter of minutes or hours. Lewisite, tearing agents, Sarin, Tabun and Soman are non-persistent agents. To make a non-persistent agent persistent, thickeners can be added. As a result of the additional chemical additive, it becomes more complicated to destroy the agent by certain means.

A further definition helpful in understanding the properties of chemical weapons is that of *binary weapons.* Binary chemical weapons are those in which two, separate, relatively non-toxic chemicals are

located in the same munition. Upon firing the munition, the seal separating the two chemicals breaks, allowing the chemicals to mix in flight and creating a chemical agent.

Former Methods of Destruction

There have been methods of destroying surplus chemical weapons for almost as long as there have been chemical weapons. Historically, chemical weapons fell into the category of surplus for a variety of reasons. Many chemical weapons were confiscated and destroyed at the end of wars, most notably those in the arsenals of Japan and Germany at the end of World War II and those owned by Iraq at the end of the 1990 Gulf War. Chemical weapons were also disposed of when their technology became obsolete, due to the development of newer and more toxic agents. Also, as chemical munitions are filled with chemicals that sometimes have a corrosive effect on the shell, usability of chemical weapons may decrease more rapidly than that of conventional weapons. Leaking chemical munitions were also eliminated, as they could not be used without the threat of injury to one's own forces.

Previously the most common disposal methods for chemical weapons were land burial, sea dumping, detonation (firing or exploding the munitions) and open-pit burning. These methods may have been thought to be quite clever at the time (out of sight, out of mind), but their danger has since become starkly apparent.

In 1991, for example, real estate developers unearthed a number of World War I chemical munitions buried in Washington, DC. The munitions were extremely corroded—some were still fused and it was not clear what agents they contained. Munitions of that age and condition are very unstable, and great care had to be taken in their removal. There were no records of what agents were in the munitions; indeed, there was no record of the munitions burial there. The area was evacuated during the clean up and no one was injured, but the real estate value of the area understandably dropped. This single incident is illustrative of a number of incidents that have occurred in various countries where chemical munitions have been disposed of by burial.

According to the CWC, chemical munitions that were buried before 1 January 1977 do not have to be destroyed, if they stay buried. Once the munitions are unearthed, be it intentionally or by accident, they are defined as chemical weapons and must be destroyed. This precept of the CWC could lead to costly results for a number of countries, in that land burial was a common method of disposal of chemical stockpiles that were deployed on foreign territory. If these buried munitions are unearthed today, they will likely come under the category of abandoned chemical weapons and legal and financial responsibility for their destruction will fall on the abandoning state, if the abandoning state can be established. If the abandoning state cannot be identified, the responsibility for destruction must be assumed by the State Party. In such cases, the State Party may request assistance from the OPCW.

Buried munitions also pose problems environmentally. Once the munitions begin to corrode and leak, the agents can contaminate the surrounding soil and even get into water sources. The extent of contamination depends on the volatility of the agent, and while some agents breakdown and become non-toxic quickly, others remain in the soil for longer periods of time. As a result of heightened environmental awareness in today's world, buried munitions are now often unearthed intentionally, in order to be disposed of in an environmentally safe manner.

Sea dumping of chemical munitions is another method of disposal that has caused a number of problems. Every ocean, from the Indian to the Arctic, has been a dumping ground for thousands of tons of chemical weapons. Major dumping operations, many in very deep water, took place after World War II when the allies disposed of large quantities of Japanese and German chemical weapons, as well as large surplus stocks of their own. Some argue that there is no danger when chemical munitions are dumped in very deep water, and a number of studies conducted corroborate this view. These deep water dumpings have, for the most part, not caused incident. Other dumping operations, however, occurred in relatively shallow water in the Baltic Sea and off the coast of Japan. In both of these regions, dumped chemical weapons caused serious problems for the fishing industry. Fishermen in the Baltic and off the coast of Japan still haul old chemical weapons up in their nets, and are sometimes exposed to still-active agents. Certain areas have been marked off limits to

fishing vessels for fear of future incidents. In addition, sea-dumped chemical munitions do not always stay in the sea, and a number of countries—including France, Australia and Poland, to name a few—have had chemical munitions wash up on their beaches. There have also been unconfirmed reports that chunks of polymerized mustard have washed up on beaches in the Baltic region.

Sea-dumped chemical munitions react differently in water depending on the agent they contain. The munition shell may break open during the dumping operation or may corrode over time, allowing the agent to leak out. Nerve agents and many other agents hydrolyze, or break down and dissolve once they come into contact with water, and are therefore rendered harmless in a relatively short amount of time. Mustard, however, is insoluble in water. When mustard comes into contact with water the surface oxidizes, forming a skin or protective shell around the agent, which remains active inside. Most injuries that have occurred when fishermen come into contact with sea-dumped chemical munitions have resulted from mustard.

Dumping has occurred not only in oceans, but also in lakes, ponds and rivers (such as the Mississippi River). This practice was less frequent than ocean dumping, but may be even more dangerous—these areas are often closer to population centers, making contamination of the water supply a real possibility.

The impact of sea-dumped chemical munitions on marine life is still a matter of debate. For the most part studies have been inconclusive, but some have determined that it is best to leave most sea-dumped chemical munitions where they lie, rather than trying to recover them for re-disposal. Nevertheless, chemical munitions sea dumped in shallow water will remain an environmental problem for some time to come.

Today, not only the CWC, but also the London Convention on sea dumping prohibits this method of disposal. Thus, even if it can be proven that sea dumping in deep water is a safe method of disposal, it is no longer an option due to these two conventions.

Destruction by open-pit burning and detonation have also had their share of problems. In some historical cases, when a large quantity of munitions was destroyed in one place, not all of the weapons detonated; additionally, lax monitoring of the operations allowed unexploded munitions to remain at the site. Furthermore, the toxic effluents released into the atmosphere by these methods of destruction exceed most national limits imposed by environmental legislation. Thus, national environmental legislation often prohibits these procedures. However, in other cases, detonation remains the only viable option for destruction of certain chemical munitions. Some munitions deteriorate to such a point that they cannot be moved without extreme danger of accidental detonation, making it wiser to destroy the munition in place. This was true of Iraq's chemical weapons, and the method of detonation termed instantaneous thermodegredation—involving the generation of a full-air explosion around the munition—was used. Under this technique, munitions were placed upon a tray of fuel oil and sharpel charges. The resulting fireball generated such an intense heat that any contamination from the munition was vaporized. One may also use a large amount of high explosives to achieve the same effect.

Destruction Methods of Today

There are two major confirmed technologies for destroying chemical weapons acceptable under the CWC limits today, incineration and chemical degradation. However, there are dozens of alternative technologies, and the number is growing.

There are many variants of the incineration process which have proven to be environmentally and technologically sound. Germany has built an incineration facility near the city of Munster, to destroy old chemical weapons and contaminated soil left over from World War I and World War II chemical weapon stockpiles in the area. The success and safety rates of this facility are very high. The United States has also chosen incineration as its destruction method of choice, terming it 'Baseline Incineration Technology.' Although the US incineration process is not identical to other incineration technologies—such as those used by Germany or Canada—it is similar. For the purposes of this study, the US Baseline method is the most worthy of further explanation, in that it is the proposed method of destruction for a very large number of chemical weapons, namely the entire US chemical weapon arsenal.

Under the Baseline incineration process, chemical weapons are first taken to the demilitarization facility, where the chemical agent is removed from the munitions or bulk containers by automated equipment. This puts the workers at the demilitarization plant at a very low risk of contamination. There are basically four products that result from the demilitarization process: chemical agents; explosives and propellants; contaminated metal parts and containers (i.e. shells and drums); and dunnage (potentially contaminated packaging materials). These four products or 'streams' are then fed into incinerators. The agent is

initially collected in storage tanks and then fed into an incinerator that burns the agent at 2700° F (1482°C). The effluents from this incinerator proceed to a second incinerator, or afterburner, which ensures the destruction of any trace amounts of the agent that may remain from the first incineration process. The effluents from the afterburner pass through a pollution abatement system which cools the flue gas, scrubs the acid gases and removes any particulate matter. The result is less toxic than effluents released from the average commercial chemical plant or found above an expressway in Los Angeles during rush hour. As for the other three 'streams,' a thick-walled rotary kiln is used to incinerate the explosives, a roller hearth furnace for the metal parts, and a stationary furnace for the dunnage. The resulting solids pass through a pollution abatement system and the now relatively harmless materials are disposed of in an environmentally safe manner.

Chemical degradation (or chemical neutralization) technologies also take many different forms. There are a number of chemicals, namely alkalis and oxidants, which reduce and often negate the toxicity of chemical agents. One method is to feed the chemical agent into an aqueous solution where the reactive chemicals are given time to neutralize the agent. Munition parts and containers can also be immersed in the solution and decontaminated. In many cases the resulting product of the chemical degradation process—*hydrolysate*—is relatively non-toxic and may be eliminated by incineration, sea disposal or concentration into a solid form followed by deposit in land fills. Chemical degradation is often more practical than other destruction methods when agents are stored in bulk, as the process may be quicker than other methods. One variant of chemical degradation technology consists of detonating the entire chemical munition in a tank containing a solution, simultaneously neutralizing the agent and parts. Other technologies allow for removal of certain elements for reuse in industry.

There is a large group of other destruction technologies in various states of research and development. These technologies are only listed briefly here, as some of the methods are highly technical and a full explanation would go beyond the scope of this study (US National Research Council, 1993; US Office of Technology Assessment, July 1992; Picardi, Johnston and Stringer, 1991; Lohs, Lundin and Stock, 1990). Some methods involve converting the chemical agents into combustible gases which are then burned and processed through a pollution abatement system. Three examples of potential methods of converting the agents into combustible gases are a molten metal process, stream reforming gasification and a plasma arc process. Other methods currently under consideration propose oxidation of neutralized or partially neutralized agents, including biological oxidation, electrochemical oxidation, wet air oxidation and supercritical water oxidation. Biological treatment methods are being studied carefully as a way of decontaminating soil that has been polluted by chemical agents. A destruction method which has been used with certain less harmful agents entails mixing the agent with concrete, thereby rendering it unusable. Some of the more interesting proposals for the destruction of chemical agents include using underground nuclear explosions and air dropping munitions into active volcanoes.

The Chemical Weapons Destruction Challenge

While the technologies for destroying chemical weapons do exist, in practice there are many factors that may come into conflict when the destruction process is carried out. The issues that must be considered include the high costs of destruction, safety, and environmental, legal and political factors.

Certain methods of destruction obviously have a greater impact on the environment than others. Past destruction practices have shown the problems that can be encountered when environmental concerns are not addressed. Therefore destruction methods must be thoroughly verified before they are adopted. Nevertheless, many chemical weapons stockpiled today need to be destroyed as quickly as possible as they become increasingly unstable with age. Although environmentalist groups have legitimate concerns that the weapons be disposed of in an environmentally safe manner, weapons experts generally agree that it is environmentally much more dangerous for the weapons to remain in storage for the additional years required to develop alternative methods of destruction.

Safety must also be carefully considered in the destruction of chemical weapons. This entails precautions and regulations that protect not only employees working in the destruction facility, but also the civilian population surrounding the facility. Highly sensitive monitoring equipment must be used in order to ensure there is no leakage of toxic agents.

The United States claims it has 12,000 tons of chemical agents in munitions and another 19,000 tons in bulk storage. Russia, the sole inheritor of the former Soviet Union's chemical weapon stockpile, officially reports its stockpile to be 40,000 tons. These two countries are the only signatories to the CWC that have admitted to possessing chemical weapons. In 1994, the United Nations Special Commission on Iraq (UNSCOM) declared that Iraqi chemical weapons capabilities had been destroyed, leaving Iraq with no surplus (or any) chemical weapons stocks. The destruction of Iraq's chemical weapons arsenal and production facilities was relatively rapid, and the process added to the knowledge of how to manage the destruction of captured chemical weapons stocks in the future. Nonetheless, a large number of old and abandoned chemical weapons exist in a number of countries. The total amount of chemical weapons and old and abandoned chemical weapons that must be destroyed worldwide is daunting.

The United States currently operates two incineration destruction facilities. One is located at Tooele, Utah, with over 40 percent of the US chemical weapons stockpile. The second facility is on Johnston Atoll, about 600 miles southwest of Hawaii. The United States plans to build destruction facilities at the seven other locations in the continental United States where chemical agents are presently stored. The arrangement of US destruction and storage facilities is due in part to the actual danger of transporting these munitions, many of which have aged considerably, and in part to the state legislation that often prevents transit across state lines of such dangerous materials. The US stockpile chiefly consists of munitions and bulk containers with VX, Sarin or mustard agents. The original 1985 cost estimate for the destruction of the US chemical weapon stockpile was US $1.7 billion. Today, the estimated cost of destruction is about US $9 billion and growing.

This expense could expand considerably if the government is forced by public opinion and special interest groups to study methods of destruction other than incineration. This is a strong possibility—Greenpeace strongly opposes incineration as a means of disposal and has a very vocal lobby presenting its case. In addition, many local activist groups in the areas surrounding current US storage facilities are opposed to the Baseline incineration method. The amount of money that would have to be allocated to the research and testing of alternative methods is great, but many of these groups believe that the additional cost would be offset by what they perceive as the reduced risks of rejecting the incineration method.

Russia, on the other hand, has no large scale destruction facility in operation. Russia does have a mobile destruction facility called 'Kuasi,' which was constructed to destroy leaking and defective munitions, but this method is not feasible for the destruction of large quantities of chemical agents. Russia is still considering a number of alternative methods of destruction. The country is showing great interest in those destruction technologies which enable the retrieval of certain chemicals in the agents, such as arsenic from Lewisite—an agent which Russia possesses in large quantities. Arsenic is extremely expensive on the world market (about $2000–3000 per kilogram) and is used in the microchip and semiconductor industry. Understandably, the thought of earning hard currency in this time of economic crisis in Russia makes the extraction method extremely attractive. Unfortunately, the proposed extraction method is slow, expensive and relatively inefficient in destroying the toxicity of the agents. In addition, the process produces toxic waste that is a disposal problem in itself. Furthermore, it is questionable if the large quantities of arsenic produced would be sold.

Russia cannot destroy its stockpile within the time allotted by the CWC without outside assistance. The United States pledged US $55 million in destruction assistance to Russia in 1993. Germany has promised sizable monetary and technical contributions to the Russian chemical weapons destruction effort, while other countries have also pledged assistance. When one considers the cost of the US destruction program, however, these outside contributions fall short of the sums needed for Russia to destroy its chemical weapons arsenal.

Other countries have the costly problem of destroying old or abandoned chemical munitions. Japan abandoned a large number of chemical weapons in China in the 1940s and now, according to the CWC, Japan must pay for the destruction and cleanup of these weapons. Many other countries abandoned or improperly disposed of chemical weapons on former territories and colonies. The bilateral negotiations between the territorial state and the abandoning state in such cases are by no means an easy task, and include such issues as costs and whether or not the munitions should be destroyed in place or returned to the country from which they originated.

One must also consider the threat of proliferation when it comes to reducing arsenals. In the case of chemical weapons, the threat of proliferation is much smaller than that of nuclear or conventional weapons. This is true for several reasons. First of all, many of the chemical weapons of today's arsenals are aging and dangerous to transport. Second, it would be cheaper in most cases for a country desiring chemical weapons to produce them than to try to buy them on the illegal arms trade market. Third, the quantity of chemical weapons needed to pose a significant threat is large, especially when compared to nuclear weapons. An illegal transfer of a significant quantity of chemical weapons would be very difficult to hide. Finally, a country would not want to import chemical weapons unless it had a sufficient chemical protection gear and training for its own forces, a costly undertaking. Unfortunately, virtually every country has the technology to produce some of the simple agents used during World War I. In sum, if a country really wants a chemical weapons arsenal, it would be easier to build one itself rather than to import stocks.

Once the CWC enters into force, the OPCW will be responsible for the verification of destruction of chemical weapons stockpiles. States parties must declare their chemical weapons storage and destruction facilities. Inspection teams from the OPCW will continually monitor these facilities until the weapons contained therein have been destroyed.

The destruction of chemical weapon stocks is neither an easy task nor a new issue. The long history of destruction—nearly 100 years, or as long as chemical weapons have existed—has resulted in the high degree of sophistication of many modern destruction techniques. Nations have learned from their past mistakes, sometimes painfully. They have realized that safety and environmental concerns cannot be ignored.

The completion of destruction will be a great achievement, the first relatively universal destruction of an entire category of weapons of mass destruction found in today's arsenals. Unfortunately, the non-participation of some chemical weapon possessor states in the CWC implies the world may not be entirely free of chemical weapons. One may hope, however, that these countries will eventually participate in the CWC, bringing about the long sought-after world without chemical weapons.

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Disposal of Surplus Missiles: Technical Difficulties and Commercial Interests

by
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Introduction

Missiles are one of the key defense systems dominating the tactical and strategic arena since World War II, and have therefore acquired great political and military significance. The capability of hitting military and civilian targets from long 'stand-off' distances makes them extremely attractive delivery mechanisms for both conventional and mass destruction weapons. This is especially the case for ballistic missiles, against which no effective defenses have yet been developed. Even old, unsophisticated, inaccurate and relatively cheap systems can still seriously threaten large civilian targets when armed with nuclear or chemical warheads.

At the cutting edge of ballistic missiles technological development, the effects of the non-existence of effective countermeasures against ballistic missiles led to a peculiar kind of technological race: instead of observing the traditional measure-countermeasure dynamics among competing military systems, ballistic missiles in the opposing NATO and Warsaw Pact blocks became the target of each other. Instead of developing counter-measures against missile attack, each side responded by threatening the other side's silos with increasingly accurate missiles; the only defense possible became making the launchers more difficult to strike (through silo hardening and missile mobility measures) and the proliferation of missiles and missile launchers to multiply the targets confronting the enemy. This led to ever-larger stocks of increasingly accurate nuclear missiles and harder-to-hit missile launchers (either in submarines, hardened silos or mobile launchers).

Dismantling a portion of these systems under such arms reduction agreements as START and INF did highlight some of the problems the disposal of missiles may cause. Most apparent were the logistic and technical difficulties implicit in the necessity of destroying such large stocks of weapons, as well as the ensuing economic costs. The problems of disposal of surplus missiles are not limited to the destruction of the large, sophisticated arsenals of the superpowers. Proliferation of medium-range missile systems, usually based on mature 1950s and 1960s technologies, is increasingly becoming a matter of international concern. Whenever countries with medium- and long-range missile procurement decide (or are compelled) to dismantle their missiles and missile production facilities, a series of similar problems will arise.

Nevertheless, the direct technical problems emerging through the process of dismantlement are not the only dilemmas to be faced. This paper argues that there are two major reasons why supervision poses peculiar problems in the missile field: (1) the 'modularity' of missile systems means that subsystems and components can often be applied with relative ease to other missiles for which they were not initially designed; and (2) many missile subsystems, components, and even the whole delivery system may have civil applications. Two principal practical consequences follow:

- Special care must be taken to prevent diversion of components and sub-systems back into new missile systems.
- Countries may lay legitimate claims to retain components, subsystems, and production facilities for civilian use.

This paper will focus on long-range missiles. The Missile Technology Control Regime (MTCR) targets systems with ranges over 300 kilometers, and it is these that are the main subject of today's proliferation concerns. Most systems over this range are ballistic missiles, but modern long-range cruise missiles are also capable of reaching targets at distances beyond the MTCR limit. The problems posed by the disposal of smaller, shorter-range tactical missiles—often designed for use against single major weapons platforms (like anti-ship, surface-to-air, and air-to-air missiles)—will not be discussed here in detail. Nonetheless, it should be noted that certain characteristics of 'big' missiles, including their modularity, are shared by their smaller siblings. At the same time, there are no significant qualitative leaps setting MTCR-controlled missiles in a category apart from

other, shorter-range systems—the 300 kilometer boundary is, from the technological point of view, an arbitrary one. Components from conventional missiles that, thus far, have not raised much of a proliferation concern may be applied to more powerful systems, or may help a developing industry construct longer-range missiles. Similarly, it is possible to improve or modify systems so that their range and payload grow into the 'proliferation concern' area. Therefore, although we will concentrate on long-range missiles, our discussion will refer occasionally to the implications for missile disposal of the technological continuum across different kinds of missiles.

Missile modularity: Implications for missile disposal

Interchangeable payloads: The missile as a multiple-use system

It is common for authors and policymakers dealing with proliferation problems to bundle together long-range missiles with weapons of mass destruction. The MTCR arose from the concern raised by nuclear proliferation: denying the means of delivering nuclear warheads at long distances was seen as a further tool to control and reduce the dangers posed by nuclear proliferation. Yet there is an obvious and important difference between missiles and nuclear, chemical and biological weapons—missiles are delivery vehicles and are therefore able to carry, with few modifications, a variety of payloads, including conventional warheads and weapons of mass destruction as well as non-military payloads. A consequence of this flexibility is that missiles do not fit easily into weapon categories. Specifically, the distinction between 'weapons of mass destruction' (or nuclear, chemical and biological weapons) and conventional arms is ill suited for categorizing missile systems. In addition to housing several dual-use components, missiles are peculiar in that their duality extends to the major sub-systems (rocket stages) and eventually to the whole system. Compare this to main battle tanks or fighter aircraft—they may have dual-use components, but they are almost useless for civilian applications.

The dual-use character of missile systems has important implications for their disposal. Because missiles can easily be turned into Space Launch Vehicles (SLVs), countries dismantling their missile forces may feel entitled to resist the destruction of the delivery vehicle, arguing that it can be put to profitable civilian uses. These issues have historically emerged in most of the limited instances in which countries have embarked upon the process of missile dismantlement.

Two examples will illustrate the problems that must be faced. The first is related to an alleged contravention of the START Treaty when the former Soviet Union launched at least one SS-19 missile using encoded telemetry, an operation explicitly forbidden by the START Treaty. Responding to US questions on the incident, Russia claimed the launch aimed at testing space launch capability. The second example refers to the vociferous domestic opposition that accompanied the dismantlement of the never-completed Argentinean Condor 2 missile program. In May 1991 the Argentinean Defense Minister stated his intention to "deactivate, dismantle, reconvert and/or render unusable" the Condor 2 missile. Although he urged that the whole project (personnel and materials) be transferred to the space research program (Milavnews, June 1991, p.2), opposition politicians criticized the Government's decision. Prominent among their arguments was the contention that destroying the Condor missile would obliterate Argentinean capabilities in the field of satellite launchers. US experts insisted that the Condor-2 could not be transformed into a SLV. Eventually, the Condor missiles were destroyed (in Spain) and the production and research facilities were apparently dismantled.

Although Argentina ultimately yielded to US pressure, it is not a foregone conclusion that, in the future, countries that have embarked on long-range ballistic missile development and production will agree to the missiles' destruction; rather, they may try to follow the example of the big superpowers. Both the United States and the countries of the former Soviet Union (FSU) have carefully studied the possibilities of recycling the missiles to be destroyed under the START treaty, and have used recycled missiles as boosters for space-launch vehicles. The Soviet Union often utilized withdrawn SS-5 and SS-6 missiles as space boosters. The US Department of Defense has also used converted ICBMs (Titan II) in this way, and routinely transfers missile stages and components to SLVs. Thus, most of the sounding rockets used by NASA include components from one or more surplus missiles and most rockets used by the DoD to launch research experiments into space incorporate motors from missiles.

At the same time, the START Treaty explicitly allows the use of missiles to deliver payloads into the upper atmosphere. Such a conversion of an ICBM into a SLV must be publicly announced, but this

obligation does not extend to the details of the procedure—although certain controls and locational constraints apply. Such converted missiles are counted as 'non-deployed missiles' (NDMs). START does not establish any limits on the number of NDMs that may be retained by the signatories, with the exception of converted MX missiles.

The United States, with its sizable space industry, views the potential recycling of large numbers of missiles with mixed feelings. As Ralph M. Hall, chairman of the Sub-committee on Space of the US House of Representatives, put it:

"At first glance the removal of a thousand or so strategic missiles from our arsenal appears to be an opportunity to, so-called, beat the swords into ploughshares by using these rockets in our space program. A deeper look at the issue shows that while these missiles may turn out to be very useful, we must also be very careful that use of these missiles by the US Government, or their release outside the Government as surplus assets, does not harm commercial companies or discourage private investments in new launch vehicles" (US Congress, House, 1992, p.1).

In the FSU, economic hardships seem to be making the recycling of old missiles more of an attractive proposition despite the already large aerospace industrial base.

Mixed feelings are less likely in countries with less-developed aerospace production infrastructures. The dual-use nature of missile systems is bound to fuel attempts by countries with fledgling ballistic missile forces pending withdrawal to keep missiles as civilian systems. Nonproliferation policies will have to deal with this potential strategy within the framework of a missile conversion program, possibly through final-use verification measures.

If verifying the final use of a missile is difficult, the problem of missile production facilities is even thornier. A missile production facility also provides a technological base for the production of space launch vehicles; therefore, missile plants cannot be considered as specialized military production facilities. Under these circumstances, any definition of weapon surplus which includes arms production capacity becomes extremely difficult—if not impossible—to implement. Any country that has invested substantially in such facilities will be very reluctant to dismantle them. The reputation of the aerospace sector as a high-technology field generating multiple spin-offs for the rest of the economy has often encouraged countries to enter it. It is understandable that countries considering their entrance in the missile-space field now regard with skepticism US literature which argues the development of space launch capabilities does not make any economic sense for newcomers to the field (Chow, 1993).

One must therefore expect that developing countries will try to retain their missile-capable research and production facilities, even after they have withdrawn from missile production. Some authors have argued in favor of a regime similar to that of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) (Nolan, 1991). This regime would promote and assist research on launch and space technologies among member countries in exchange for guarantees that these technologies would not be diverted to military use; to this end, a system of safeguards and intrusive inspections would have to be established.

More implications of missile modularity: Missiles as 'mix and match' systems

It is often possible to interchange the sub-systems of a missile with relative ease, without restructuring the whole design of the missile. The modularity of missiles extends far beyond their capacity to accommodate different kinds of payloads. Thus, it is possible to mix stages from different missiles, creating new power plants from the same common rocket. For instance, the first stage of the Soviet SS-25 intercontinental missile is almost identical to the first stage of the intermediate range SS-20 missile. As the SS-25 missile was not covered by the INF treaty such similarity appeared to some observers to be undermining the validity of the whole treaty (US Congress, Senate, 1986, p. 112). Sharing common stage rockets is also customary in smaller tactical missiles; for example, the French-designed Aster surface-to-air missile has two variants (Aster15 and Aster30) with different ranges (maximums of 15 and 30 kilometers, respectively) and different boosters, but common second stages. Such interchangeability is even more common in other major subsystems, such as guidance sets. The seeker for the short-range surface-to-air AS30 missile was planned to equip the ASMP-C long-range (400 kilometer) cruise missile, a French project which is basically a conventional version of the nuclear-armed ASMP. In its anti-ship version, the ASMP-C would sport another final guidance assembly, a radar seeker shared this time with the MICA air-to-air missile and the Kormoran anti-ship cruise missile. Materials like fuel are common to a wide range of missiles; thus, both the surface-to-air SA-2 missile and the SCUDs use the same type of fuel. This coincidence has led to problems for UN inspectors in Iraq, as Iraq claimed its continued fuel production to be for SA-2 missiles rather than the forbidden SCUDs.

Not only is there a commonality of sub-systems and components across missile systems with very different ranges and technical characteristics, but there are also many components with dual military-civilian applications. 'Dual-use' extends even to some very specialized sub-systems; for instance, Inertial Guidance Systems may be applied both to missiles and to civil aeronautic applications. In fact, there are cases of gyro technologies developed initially for ballistic missiles that have been applied to Inertial Navigation Systems for transport aircraft (Hughes and Mecham, 1991).

Because of such modular design, new missiles may be developed by 'mixing and matching' different subsystems, many of which are extracted from earlier missiles. Indeed, it is difficult to find a single missile whose major sub-systems have all been purposely developed and built. It is easier to modify a missile by changing some of its major subsystems and components than it is to interchange major sub-systems in other complex weapons systems. In a fighter aircraft or a main battle tank, the substitution of a major subsystem usually requires major adjustments in the rest of the platform; the platform is the result of a finely balanced combination of sub-systems which may be upset if altered even slightly. It is our hypothesis here that, in contrast, missiles are more adaptable—it is often possible to substitute a major sub-system without introducing significant changes in the rest of the weapon. If this hypothesis holds true, the modularity and 'mix and match' character of missile systems may be perceived as a peculiarity with important implications for the disposal and conversion of missile systems.

Two principal sets of problems result. First, because isolated components can be matched to other missiles, it becomes necessary to accurately track the final destination of the individual sub-systems or parts from converted or disabled missiles. Second, because a missile's major sub-systems can be rearranged in different ways, it becomes very difficult to isolate classes of missiles for the purposes of arms control, export control and arms reduction.

The importance of components

The interchangeability of missile sub-systems allows relatively easy upgrades through the addition of single, new components into an existing missile design or system. If controlled components then become available, potential proliferators may incorporate such components into their systems to obtain performance increases or assemble additional systems. It is even conceivable to build a whole missile by reassembling its component parts. When a SS-20 (one of the missiles to be destroyed under the INF agreement) of mysterious origin appeared in 1993 in a military parade in the republic of Chechnya, one possible explanation proposed was that the missile had been reassembled from components by Chechen missile technicians (*Moscow News*, 17 September 1993, quoted in IMP database at MIIS).

Although this may appear far-fetched, it is nevertheless possible for countries with a certain degree of technological capacity to rebuild missiles from their component parts or by using 'recycled' components. This makes verification of missile destruction difficult, and provides reluctant participants in missile reduction agreements a range of opportunities to dodge their obligations. It has been suggested that, after the Gulf War, the Iraqis disassembled a number of missiles and hid the main components in separate sites (Washington Times, 11 June 1992, p. A7). A similar strategy would not be possible with a fighter aircraft.

Such a diversion or hiding of component parts during the process of disposal becomes more relevant in the missile field than in other weapons systems. This was illustrated by the series of events following the decision to dismantle the Argentinean Condor II missile. Because components can be stripped down and matched to other systems, the destination of some of the Condor's most important components raised considerable concern (Wolfsthal, 1993). The missile was shipped to Spain where it was disassembled, the missile body was crushed and the propellant was sent to the United States for disposal. Special interest was raised by the Condor guidance sets allegedly lost in the process. Although Argentina claimed the missile lacked this essential part, there have been persistent rumors in the press that the components either remained in Argentina or ended up in Spanish hands. This incident demonstrated both the difficulty and the importance of controlling missile components in any missile disposal process.

The obstacles involved in monitoring the final destination of missile components will increase in cases where the number of missiles to be destroyed is high. Nevertheless, even when dealing with a few missiles as in the Condor case, the destination of some components may be highly contentious—particularly because of the dual (military-civilian) use of most missile components. A country can claim a legitimate right to keep some of the missile components and sub-systems for civilian use. Although such application may initially be verifiable, future uses of these components will be much more difficult to control.

Defining missile classes: where are the limits?

Another consequence of modularity is the emergence of patterns of gradual change in missile development and production: it is possible to match existing designs with newly acquired sub-systems, thus improving and/or modifying the initial performance characteristics of the system. It then becomes difficult to straight-jacket missiles into separate groups. A missile type can be transformed into a different use, as the South Koreans transformed their US-supplier Nike SAMs into surface-to-surface missiles. This capacity is not limited to countries with a relatively strong industrial base; some have claimed that Azerbaijan transformed SA-5 Gammon SAMs into ballistic surface-to-surface missile to be used against Armenia (Beaver, 1993). Other missile types continue to be adapted for applications different from those initially intended—the AMRAAM air-to-air missile is being converted into a SAM system for use by the Norwegian armed forces, and British Aerospace has just offered a new air-to-surface anti-tank missile derived from its ASRAAM air-to-air system.

This poses several complications for non-proliferation policies and any concerted attempt to dismantle certain categories of missile systems. Because different combinations of payload, motor stages, propellant, and guidance systems will result in different missile specifications, any attempt at fencing off missile groups is apt to be disputed. In addition, the prohibition of development and production of certain missile types is likely to have limited influence. For example, the INF Treaty prohibits the production or flight testing of intermediate-range missiles, stages, or launchers of such missiles; further, it requires the elimination of all support structures, including production and repair facilities. Yet because few, if any, facilities are limited to the manufacture and support of such a particular class of missiles, the elimination of support structures will refer only to those facilities specifically planned to provide direct support for deployed missiles as is explained in article 11 of the Memorandum of Understanding accompanying the INF Treaty. In other words, the INF Treaty does not affect production capabilities—the industrial infrastructure of missile production is unlikely to be affected by such an agreement.

In short, the technological continuity linking different kinds of missiles makes it difficult if not impossible to clearly 'frame in' missile types to be controlled or dismantled, and—even more important—production facilities will usually be exempted from any attempt at regulating the deployment of certain categories of missiles. This becomes more relevant in the context of proposals to extend the INF Treaty to a world-wide agreement. Such a measure would provide a tool to control missile deployment, but it would not be effective in the regulation of missile production facilities. Although such production facilities may remain underemployed, most countries will strive to maintain them—both as insurance against future eventualities and as industrial capacities that may be used in the production of unregulated missiles and for civilian applications. This is one of the reasons why the proposal of an international space agency (modeled on the IAEA) monitoring the use of space technologies has been advanced as a possible measure to accompany an INF-like global missile treaty (Bailey, 1991). As a consequence of technological continuity, surplus reduction measures in one area of missile production affect the capabilities in the other missile fields; therefore a coherent and comprehensive approach to the study of missile surplus problems is required.

The Missile 'system'

Thus far we have implicitly referred to missiles as powered, unmanned, guided projectiles, and have not considered the whole missile system, which includes launchers, radar, and testing and support equipment.

The missile 'system' reproduces the modular characteristics of the missile projectile. For instance, it is often possible to launch different kinds of missiles from the same platform, thus sharing surveillance, tracking and targeting systems. Launchers are often designed to be able to eject different kinds of missiles, and missiles can be adapted to be launched from different platforms. As a consequence, any missile that has reached some degree of success will soon appear in several versions capable of being launched from a variety of platforms. A platform able to launch missiles may therefore increase its capabilities just by improving the missiles it carries, and the performance of old missiles may be enhanced by better platform-based surveillance and guidance equipment. To sum up, the 'mix and match' process we have described for the missile extends to the whole missile system, including command and control systems, launchers and support equipment.

All missile-related arms control agreements deal with both missiles and their launchers and support equipment. Although this situation is unavoidable, the variety of system configurations (real and potential) creates serious headaches for arms negotiators dealing with missile issues. Whenever a surplus of missiles exists, so likely will a surplus of launchers and support equipment. Because of system modularity, any measures aimed at identifying and reducing a missile surplus must affect the complete missile systems, multiplying the problems discussed above. First, countries may strive to retain launchers capable of launching missiles not affected by arms control agreements, or may argue that a surplus in missiles is not translated into a similar surplus in launchers. Second, the process of disposal must include both missiles and launchers, thus increasing the dismantlement targets. In the limited missile disposal experience, launchers have often posed their own problems; for instance, it was claimed that the Iraqis were welding together previously destroyed missile launchers.

This section has dealt with disposal problems arising mainly from a peculiar structural characteristic of missile systems which we have described as modularity. Although all weapon systems will display certain modular elements, missiles present an extreme case of modular flexibility. Countries and organizations directly involved in missile dismantlement must also address technical difficulties that may emerge during the process of disposal once an agreement has been reached on the reduction of missile surplus, and certain operational procedures have been established.

Dismantling missiles: Technical difficulties

A question of sheer numbers

Some missiles that have been or may be the object of disposal have been produced and deployed in large numbers. The missile as a guided projectile (rather that the whole system including launching facilities) has even equaled munitions at times: because they are dispensable, they are often mass-manufactured and many can be fired from a single launcher-system. Although this is especially true for smaller tactical missiles, even large ballistic systems have at times been produced and deployed in large numbers. A noticeable example can be found in the proliferation of SCUD missiles—different sources estimate that between 5,000 and 10,000 SCUDs have been produced, mainly in the former Soviet Union but also in such countries as Egypt, Iraq, North Korea and Iran. Although this is an extreme case, the sheer number of missiles produced and deployed may present too great a challenge to the organizations that must dismantle a rather complex and dangerous munition. Furthermore, as demonstrated in the FSU, the contraction or downright elimination of missile research and production facilities may paradoxically reduce the country's capacity to dismantle these weapons systems. The case of missiles shows how the goals of weapons dismantlement and of reduction of weapons production capabilities may conflict. These difficulties are compounded by other technical problems that make disposal increasingly difficult if not tackled with some speed.

Decay: rockets do not age well

It is quite safe to leave a tank to rust. The elimination of a tank surplus does not have to be subjected to excessive time pressures; if budgetary or industrial constraints impose a slow pace of weapons destruction, the major problem will be the management of large stocks of rusting tanks awaiting disposal. In the case of missiles the problem is much more involved. Insufficient maintenance of both solid and liquid rockets and propellants may lead to nasty outcomes. Liquid propellants are notoriously difficult to handle; they are usually stored close to launching sites to enable a rapid filling of the missile tanks prior to launch. Proper (and expensive) maintenance of the fuel tanks is required whether or not the system is operational. Thus, waiting for disposal is in itself costly. If proper maintenance procedures are not followed, such problems as rusting fuel tanks (liquid fuels are highly corrosive) and leaks may make the dismantlement process more hazardous as well as expensive.

The principal problem for solid propellants arises from the deterioration of the propellant grain. To keep the missile operational, it is necessary to apply a schedule of rocket maintenance procedures, and at certain intervals the whole rocket motor must be recast. In the absence of proper maintenance, not only may the engine become unreliable and eventually unusable (not much of a problem if we are talking of 'withdrawn' systems), but also its dismantlement may become more hazardous. Although the propellant grain may be recycled, extraction from the rocket is a dangerous operation that requires specialized personnel and facilities.

Environmental issues and handling difficulties

The environmental problems caused by missile disposal or recycling originate for the most part in missile propellants. In particular, some liquid propellants—the heptyl (used in Soviet SS-18 and SS-19 missiles), for example—are highly contaminant and notoriously difficult to handle. Even the gas released upon a missile launch is highly toxic, and the unburned fuel contained in the spent first stage falling back to Earth could contaminate the area within a five kilometer radius. Therefore, destroying missiles by launching them would cause serious contamination over large areas (FBIS, 1992). No safe method for heptyl destruction has been developed—in the former Soviet Union, the fuel (which with time becomes unusable) was drained for distillation and then reused, but it remains unclear how heptyl fuel will be stored after disposal (FBIS, 1992). Solid propellants are also dangerous to recycle (which may involve recasting) or dismantle.

Such technical difficulties impose strict requirements on the facilities used for missile disposal. The technical capabilities required for the dismantlement of rockets are very similar to those required for their production. This leads to the aforementioned effect of reduction of missile production capacities simultaneously reducing the potential for weapons disposal. At the same time, countries maintaining missiles but lacking an adequate industrial infrastructure for their disposal may have to transfer them to other countries to be dismantled. A government may resist attempts to transfer 'their' missiles abroad, however; an example is provided by the Ukrainian demand to dismantle nuclear missiles (including warheads) on its own territory. Such a demand, labeled as "impractical and unreasonable" by US sources, was triggered by Ukrainian misgivings about the final destination of the systems Ukraine was transferring to Russia for disposal (*Washington Times*, 11 June 1992, p.A7).

Transport problems

Because rockets and propellants are very dangerous to handle, missiles often must be transported to special facilities for their dismantlement. Adequate precautions must be taken for transport, as it was demonstrated by the transfer of the Argentinean Condor 2 missiles to Spain for dismantlement. In February 1993, 14 engines and 30 fuselages were transported by land from their base and Falda del Carmen to the Navy's port of Bahía San Blas, and from there were shipped to Spain. The necessary precautions taken resulted in a slow travel speed. The paramount issue was avoiding frictional movement that could cause the engines' sealant to overheat (Olmo y Losada, 1993).

Problems have also surfaced during the transport of liquid rocket engines. While transporting a liquid rocket to a base in Krasnoyarsk for dismantlement and recycling, a train's temperature control systems failed to operate. Although this failure could have caused the casing seals to break and the heptyl fuel to leak, Russian sources denied that a leak or a rumored explosion ever occurred. Be that as it may, both cases illustrate the difficulties of transporting both liquid and solid missile rockets.

Conclusions: Questions for further research

This paper has distinguished two principal groups of problems associated with missile disposal and recycling: the organizational difficulties derived from the special modular and dual-use nature of most missile-related technologies, and the direct technical problems that arise during the dismantlement process. While the former affect most missile sub-systems and components, the latter concern primarily the rocket motor and propellants. The technical difficulties involved in the process of rocket dismantlement and disposal have attracted the most press attention, but we have argued here that the nature of missile technology presents a set of organizational difficulties that must be addressed.

It is important that any missile disposal initiative heed the legitimate concerns of industrializing countries over their ability to develop capabilities in the aerospace sector. As a consequence, further study of missile surplus assessment and disposal must be accompanied by an understanding of the local conditions for the development of a domestic aerospace industry (specifically of space launch capabilities) and must address the control of dual-use, missile-related technologies.

This paper has also argued that there is a technological continuity—and therefore a certain technological commonality—among different kinds of missiles. Although subject to different production dynamics, medium- and long-range ballistic missiles and their smaller relatives share some common technologies, components and general characteristics (especially their modular character). Although most attention

has thus far been directed towards relatively large ballistic missiles, the proliferation of smaller tactical missiles will have to be addressed. As small tactical missiles become more attractive to both armies and paramilitary groups, their proliferation will likely gain relevance as a political problem. Small, tactical missiles can pose substantial threats to all kinds of targets, from 'soft' objectives in terror campaigns to sophisticated weapons platforms. For instance, there has already been some concern over the implications of cruise missile proliferation and the chances that shorter-range anti-ship cruise missiles may soon become vehicles for the long-range delivery of mass-destruction weapons. Even smaller systems, such as Stinger manportable SAMs, have recently posed serious proliferation concerns. As revealed by the distribution of Stinger missiles among the Afghan forces, even unsophisticated armies can use the new systems to devastating effect—a fact that will not pass unnoticed elsewhere in the world.

Once the genie is out of the bottle, little can be done to prevent the systems' spread to 'undesirable' hands. In short, the study of strategies to deal with surplus weapons must be extended beyond the present concentration on larger, long-range, mostly ballistic systems to small tactical missiles, and must consider the technological continuity among the different kinds of missiles.

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Surplus Light Weapons as a Conversion Problem: Unique characteristics and solutions

by
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The rise of surplus light weapons

One of the newer commodities to be made surplus is the category increasingly referred to as light weapons. By all accounts, the export of surplus light weapons—small arms, land mines, mortars, man-portable missiles—has increased significantly in the post-Cold War era (Karp, 1993; Karp, 1994; *The Economist*, 1994). The end of the Cold War has unleashed ethnic conflicts long dormant and controlled by the logic of the Cold War and the concept of client states. Ironically, this growth in the export of surplus light weapons, and the accompanying negative consequences, is made increasingly visible due to the greater use of UN peacekeeping and peacemaking operations, which bring along with them mass media coverage. It has always been the case that in armed conflict it is the light weapons which do most of the killing, and there can be no question that an escalating number of such weapons are getting into the hands of an increasing number of soldiers, paramilitary forces, non-state actors and civilians involved in ethnic conflicts which will not be resolved for a long time to come.

While it is clear from all accounts that there has been a reduction in arms trade in major conventional weapons since the end of the Cold War, there are some obvious reasons why there is an increase in the export of light weapons. This is a subject worthy of separate treatment, but a summary of key factors is important in developing appropriate measures for dealing with this type of surplus commodity.

- The disintegration of the former Soviet Union (FSU) has resulted in the sudden availability of massive amounts of new and surplus light weapons. This is due to the military nature of the former Soviet industrial base, the collapse of export control systems in the FSU, and their need for hard currency. In 1991 and 1992 it is generally agreed that a brisk trade in light weapons existed in Russia, Belarus, Ukraine, Georgia and other countries where light weapons manufacturing facilities were prominent, and was uncontrolled by any central government. Exporters included commanders of army units and plant managers who were suddenly faced with no money to pay their troops or workers. Given a market for these commodities and no governmental controls, the proliferation was significant and unreported.
- The FSU is not the only country finding itself with surplus stocks of light weapons. Europe, China and many developing countries find these weapons surplus, given the end of the Cold War. These weapons are usually not considered as surplus needing to be scrapped. On the contrary, given the long life of some of these light weapons, they are a heavily traded commodity. As many have pointed out, these weapons have not been the subject of formal post-Cold War concern (e.g., CFE, the UN Register) and have found their way into the hands of legitimate and illegitimate arms dealers throughout the world. A case which illustrates this reality is the conflict in Rwanda (Human Rights Watch, 1994; Goose and Smyth, 1994).
- The breakup of Yugoslavia and ethnic conflicts in the FSU are indicative of the loss of control by major powers over these conflicts. Despite the major powers increasingly turning to the UN as their replacement, the long-dormant UN is not yet equipped to control either the outbreak, conduct or termination of most of these conflicts. The surplus of light weapons, whose export was controlled by private parties, had little difficulty finding its way into zones of ethnic and regional conflict. These conflicts do not need the high-technology weapons so dominant in the Cold War arms trade. While some of the more repugnant atrocities were committed by tanks and

[2] This analysis is based on Edward J. Laurance, "Addressing the Negative Consequences of Light Weapons Trafficking: Opportunities for Transparency and Restraint," in *Lethal Commerce, The Global Trade in Small Arms and Light Weapons*, ed. Jeffrey Boutwell, Michael T. Klare and Laura W. Reed (Cambridge, MA: American Academy of Arts and Sciences, 1995), pp. 140-157.

heavy mortars, most were promulgated using lighter weapons which went undetected both by governments and by the news media covering these conflicts.

- Finally, the world economic system is transforming into one characterized by both more legitimate free trade and the development of illicit networks that foster the trade in light weapons as well as in drugs and laundered money.

The unique nature of light weapons

The growing quantity of the surplus and subsequent export of light weapons, as indicated above, creates significant challenges to the control of its negative consequences. Equally important in devising mechanisms to deal with surplus light weapons are qualitative factors, such as the characteristics of this trade and the nature of the commodities involved. First, light implies small and less visible, meaning that satellites are inadequate for detection and verification. This also signifies that monitoring and control efforts by national governmental officials, from desk officers down to customs officials, is inherently more demanding, whether it is part of a conversion effort or one involving export controls. This creates a situation where, even if states do begin to practice cooperative security in the post-Cold War era, the implementation phase of their arms control and conversion policies may be seriously hampered by an inherent inability to verify the stocks or exports, even on the part of national governments. The challenge for any multilateral control schemes would be even greater.

Second, these weapons are not very expensive, especially given the trends noted above regarding their availability. This means that many more types of participants can be and are active in the trade. During the Cold War, private arms dealers were all but non-existent (Laurance, 1992). Based on the most cursory reading of the defense trade literature and on media coverage of conflicts in which weapons are supposedly embargoed, that is clearly not the case now. Additionally, the low cost of these weapons means that the current methods set up to track financial flows for illegal drug and gun deals are proving inadequate. As a result financial transactions are open to less scrutiny by independent analysts and non-governmental organizations such as SIPRI, which track and publicize the arms trade. Such organizations are basically unable to perform the valuable function of transparency when it comes to this class of weapons.

Consequences of the surplus and subsequent export of light weapons

It is now clear that private dealers abound and have a huge surplus to market. In such an environment there is little risk of political consequences for either the supplier (assuming it is a state) or a recipient. The embargo on the former Yugoslavia is a case in point. True, the arms being imported into and used in this region have a clear impact on the conflict. There is periodic pressure on the combatants to move weapons out of range of certain locations. But since there are multiple sources of these imported weapons, to date the suppliers have escaped suffering any negative consequences. The political consequences are diffused to a point where a focus on the importing of these weapons has drawn minimal attention.

In the post-Iraq environment, where wars are fought with mainly light weapons, linkages between arms buildups and military consequences are much harder to depict. The former Yugoslavia again provides a good illustration. Small arms and mines are so plentiful that their control would seem to have little effect. For larger weapons such as mortars and tanks, actions by the UN peacekeeping forces to control their use indicates that a linkage does exist between the arms themselves and military consequences. However, when such weapons are indigenously produced—as is the case with the Bosnian Serbs—it is difficult to develop any kind of control or restraint instruments.

The case of light weapons reveals minimal economic consequences, due to low prices and great availability. Although the human casualties in the conflict in the former Yugoslavia are often cited—between 100,000 and 200,000—rarely do we see an economic cost cited, especially one directly related to the

conduct of the war. This is due to the fact that conducting such conflicts with light weapons and little in the way of sophisticated infrastructure is cheap, in direct contrast to the Gulf War, which was very expensive to conduct (about $100 billion by some estimates). The arms suppliers to Iraq could relate their behavior directly to an economic cost, not to mention the significant losses they incurred in arms transferred to Iraq for which they did not receive payment. Such economic consequences create pressure for arms control, a pressure rarely there when wars are fought with light weapons.

On the other hand, with the surge in light weapons traffic and the increase in conflicts featuring clear abuses of human rights, humanitarian consequences have gained more attention. The most notable case is that of anti-personnel land mines. The United States has placed a ban on the export of these systems and has led the way in the United Nations for an international ban.

A first look at some solutions

Creation of an International Norm on Negative Consequences

As can be seen in the long debate on gun control in the United States, nothing happens as long as the 'recipients' can make the argument that possession of such weapons adds to stability and is defensive in nature. I would submit that the legislation outlawing semi-automatic weapons in many states in the United States occurred only when a majority of the public concluded that the guns themselves were a major factor in the killings taking place. In regard to the international transfer of light weapons, this may be difficult to achieve even at the national level, although many states have well-established norms against the possession of and trade in these types of weapons. But as noted above, the surfeit of such weapons in the aftermath of the Cold War makes the problem at a minimum regional in nature and more likely international. The COCOM solution, that of exporting expertise and assistance to states in developing export control systems, seems much more daunting in the case of light weapons.

The campaign led by human rights and development NGOs to ban anti-personnel land mines serves as an excellent example of what can be done to establish such a norm (Human Rights Watch, 1993). In this age of Internet and CNN, much more could be done to change world opinion regarding the negative consequences of trade in light weapons. The key is to emphasize specific negative consequences—in an age of increasingly brutal ethnic conflicts, a blanket ban on weapons perceived to be needed by recipients for survival is a non-starter.

Gun Buy-Back Programs

With the growth of a norm against the unlimited possession of guns in the United States, especially semi-automatic and automatic weapons, it has been possible to begin experimenting with so called gun 'buy-back' programs. The idea is to get citizens to sell their guns to local or state authorities, which then destroy them. As with any new approach some programs have been successful and others have failed. For example, some failures occurred (i.e., few guns were turned in) because the government price was far below that of the black market. Nevertheless, enough of these programs have been conducted to make a program evaluation imperative, in order to produce policy-relevant theory which may further develop this solution.

It should also be noted that gun buy-back programs exist outside the United States, and these programs also need to be evaluated. For example, many recent peacekeeping operations have experimented with this approach. Nicaragua implemented such a program—although it has not been very successful—as have the US forces in Haiti. This approach has great potential, especially in conjunction with the promotion of norms against the possession and use of this class of weapons.

Transparency

The first step in making light weapons transparent might be adding them, especially land mines, into the current United Nations Register of Conventional Arms. The European Union has formally called for the integration of land mine data into the Register, as has the Under Secretary-General for Humanitarian Affairs of the United Nations. However, the 1994 group of experts tasked with the expansion of the Register chose not to recommend such an inclusion.

"The Group recognized the terrible suffering, injuries and deaths caused by the misuse of anti-personnel mines, but felt that the Register was not the appropriate mechanism to deal with this problem. The Register is designed as a confidence-building measure to contribute to the efforts aimed at preventing destabilizing accumulations of major conventional weapons beyond the quantity needed for legitimate self-defense. The Group's view was that the issue of anti-personnel mines is largely one of international legal regulation" (United Nation General Assembly, 1994).

It is important to consider the rationale for transparency in these types of armaments. In the case of the seven categories currently covered by the Register—major conventional arms—a consensus existed that they are potentially destabilizing in a regional conflict context. A critical aspect is that the Register focuses mainly on one type of negative consequence or effect of excessive arms accumulations—the outbreak of armed conflict across international borders. The Register is in essence a 'Never another Iraq' tool. It is also a confidence-building mechanism. The key to including any additional systems to the UN Register will be to demonstrate that land mines or other types of light weapons meet these criteria.

No other 'light' weapons were discussed by the Group for inclusion in the UN Register. This does not mean there are no cases where accumulations of light weapons can be destabilizing. The Human Rights Watch study on Rwanda is an excellent example of just such a situation. Rather, the point is that the UN Register is universal in scope and it will be difficult to make the case that light weapons *inter alia* can be destabilizing. It may be possible to include such weapons if the Register evolves into regional variants.

A better approach to transparency will be to utilize international transparency instruments other than the UN Register. If the UN Register continues to develop, it will have paved the way for such efforts. In the case of land mines, there exists an agreed-upon but moribund *Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to be Excessively Injurious or to Have Indiscriminate Effects.* Protocol II deals directly with land mines and is currently being examined by a UN group of experts for possible revision and strengthening. The essence of this approach is to take advantage of the breakthrough achieved by the Register and develop a similar system for land mines and other light weapons. If it was possible to concentrate on one weapon system at a time—such as man-portable air defense missiles, in which emphasizing the terrorist threat eventually led to a norm against their transfer—transparency measures would naturally follow.

A third approach to transparency is that of regional registers. From the beginning of the Register exercise in February 1992 it was clear to the member states of the panel that areas such as Africa would be marginal to the effort, largely because of the weapons categories. Smaller and lighter weapons *do* matter. NGOs and academic analysts may play an important role as these regional registers develop, since they are often in a good position to observe the negative consequences. There is already some movement in the regional register area. The OAS has a proposal on the table to set up a Latin American register, and the idea has come up in ASEAN deliberations. The 1994 Group report on the UN Register contains an entire section entitled "Regional Aspects," which concludes that participation varied significantly by region due to: "*differences in security environments and concerns of states in various regions . . . The Group noted the problem of some types of conventional weapons, including small arms, not covered by the categories of the Register, is referred to by some states as one of the reasons for the lack of participation. The Group considered that such a specific problem should primarily be addressed among states in the regions or subregions concerned*" (United Nations General Assembly, 1994).

Whatever transparency approach is adopted, it will be much harder to put into practice than the current UN Register, which has proven troublesome for many states. Agreeing to register land mine and mortar production and exports will be a major and arduous political feat. Implementation will be even more difficult, especially given the well-documented lack of national control over these light weapons.

Creating a register for certain light weapons where a norm against their production, use or transfer has been established (e.g., anti-personnel land mines) but cannot be implemented may be worse than no register at all. The political forces at work against transparency are significant and they will seize upon any such failures to invoke the "I told you so" theorem. This is one of the reasons that some of the states involved in the UN Register exercise have moved so slowly, although others simply think the idea of transparency and national security don't mix very well.

Using the Data That Have Been Made Transparent

Pressure by NGOs on National Governments

Now that the Gulf War has moved conventional weapons comparatively to the forefront of the international agenda, both national and international NGOs concerned with the negative consequences of the arms trade are called upon to step up their pressure on national policy. Much of this pressure will be in the form of gathering and publicizing the data on these negative consequences that have become more available in the post-Cold War global system. The land mine campaign serves as a good example—the information on casualties to innocent civilians is simply not available to governments. It comes as no surprise that these NGOs have played a major role in influencing policy not only in the United States but also in the United Nations. The issue of human rights serves as a good analogy. For valid reasons, most of the data on human rights abuses went unreported for many years. States guilty of such abuses had no interest in revealing such information. Therefore most of the action on the international human rights front was due to pressure from NGOs such as Human Rights Watch and Amnesty International. In the case of light weapons and their consequences, NGOs can increasingly focus on the weapons themselves. Continued access by the media to the ongoing ethnic conflicts will be critical to this effort.

Develop Consultative Mechanisms

As for light weapons, if a transparency mechanism can be developed, it would provide the impetus for states to air grievances when negative consequences can be determined. In this regard transparency may go beyond registration of weapons to include development of an 'incidents' register, especially when it comes to land mines.

Activists trying to shape national and international agendas need a readily available database to employ when faced with the inevitable challenge: "guns don't kill people, people kill people." If those favoring control of light weapons cannot bring forth supporting examples—and lots of them—little can be accomplished. What is needed is not a database of weapons exports and imports, as in the case of the UN Register. Rather, the policymakers need to be constantly shown, in case after case, how accumulations and misuse of light weapons may have serious negative consequences.

Increase the Role of the UN in micro-disarmament

While it is clear that the United States has backed off from its initial enthusiasm for using the United Nations to solve international security problems, it and the other major powers certainly have the competence to improve the United Nations' capabilities in this area. In those cases where the United Nations has been involved, there has been an increasing emphasis on the role of the guns themselves as a cause of the conflict and a major factor in its termination. In the war in El Salvador, the conflict settlement included a disarmament component which has helped considerably in preventing a reoccurrence of the level of conflict which raged for a decade. In contrast, the war in Angola continued for a long time—despite UN involvement and ceasefires—because such a disarmament component has not been implemented. The UN Secretary-General and his Under Secretary-General for Political Affairs Marrack Goulding have increasingly tied the transparency of the UN Register to its use in preventive diplomacy. If transparency measures can be developed for mines and other light weapons, a more active United Nations may be more effective. Conversely, a more active United Nations will create a demand for transparency, since it is unlikely that any sort of UN intelligence agency will be developed soon.

The United Nations' Secretary-General, Boutros Boutros-Ghali, has called for control of light weapons under the term 'micro-disarmament' (United Nations, 1995). In micro-disarmament the targets of the policies used are individuals and small groups, not states or well-organized sub-national military groups normally associated with the traditional disarmament characterizing many UN operations. Dealing with such situations requires an integrated, multi-method strategy employing a variety of policy approaches which address not only the root economic and social causes of the violence, but also the weapons which raise the costs in economic and human terms.

Typically countries employ a range of techniques to control the negative consequences of excessive weapons in the hands of their citizens. These first include improving the overall security of the country through strengthening police forces, normally a part of most traditional disarmament to end civil wars. Improving security is the best approach since it decreases the citizens' need to illegally arm themselves. In many post-Cold War cases, however, the sources of instability have caused crime and violence to rise faster than the development of such security forces. As a result, states have had to focus on the weapons themselves, by enacting weapons registration laws, imposing penalties for the unauthorized possession of weapons, and in some cases targeting individuals and groups for forceful seizure of illegal weapons.

Although evidence is still being accumulated for the buy-back programs utilized in Haiti by the United States under United Nations auspices and in other international cases, such programs have been used in US cities for many years. Faced with social and economic situations not unlike those of developing countries in post-civil war environments, gun buy-back programs have accel-.erated in popularity, and much has been learned about how they work and why they fail.

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An Army Surplus—The NVA's Heritage

by
Otfried Nassauer[3]

Introduction

The fall of the Berlin wall and the succeeding German reunification left the Federal Republic of Germany's Bundeswehr with an additional, inherited army, the former East German National Peoples Army (NVA). The personnel, infrastructure, weapons, ammunition and all other types of equipment of the former East German armed forces—supplemented by weaponry formerly owned by the East German Intelligence and internal Security Services (Stasi), the border troops and other armed units—ended up under Bundeswehr ownership, custody and responsibility. Later, the stocks of the East German arms trade company 'IMES' . Thus *inter alia* more than 20,000 additional submachine guns came under Bundeswehr custody about one year after unification (Deutscher Bundestag, Document 12/1448, p.21).

The Bundeswehr halted attempts of the newly elected democratic German Democratic Republic (GDR) government to sell large quantities of these weapons, ammunition and equipment under 44 last-minute contracts with foreign governments and international arms traders for extremely low prices between August and October 1990, by arguing that many of these systems might be incorporated into the armed forces of the unified Germany. However, soon after reunification increasing amounts of former East German weapon systems and military equipment came to be seen as a 'surplus' no longer necessary for the Bundeswehr.

Today the net results have become visible: except for a few weapon systems which will be used for a short period of time—24 modern Mig-29 fighter aircraft and larger quantities of low-tech, general purpose equipment—all of the former NVA stockpiles became surplus.

This paper looks into several aspects of the NVA case:

- the availability and reliability of data about the NVA—i.e., the size of the heritage
- the system of decision-making concerning the future of NVA equipment
- the exports from surplus stocks
- the German obligations under the CFE Treaty.

The paper presents an overview by concentrating on the major categories of weapons and military equipment. It looks at weapon systems rather than military dual-use equipment, and on weapons exported or scrapped rather than those destined for static displays at exhibitions.

Defining the Size of the NVA Heritage

The answer to the fundamental question of how much and what exactly the Bundeswehr inherited from the NVA is surprising: although both armed forces were 'German' armies—thus reflecting a specific understanding about the necessity for bureaucratic correctness—there seem to be no reliable or conclusive books of record. It is therefore impossible to compile a comprehensive set of data on how many of which systems and items were available on 3 October 1990, when the Bundeswehr officially took command over the former NVA. Developing a clear understanding of the destiny of many of the inherited weapons has also proven to be extremely difficult.

While some of differences have been sufficiently explained in open or closed sessions of parliament, it is highly unlikely that this is true for all—the Bundeswehr has argued that this task would be too complicated and time consuming. In principle, difficulties in keeping a clear record for transportable items may be imagined due to the circumstances under which bookkeepers had to work after reunification (i.e., lack of experienced and specialized personnel, layoffs in personnel, substantial relocations, exports, sales and constant changes); nevertheless, there are good reasons for a more skeptical approach. Most of the excuses for mistakes in accounting for transportable goods are not reasonable for immobile items. The German Ministry of Defense (MoD) provided parliament with varying figures regarding the total number of installations it took over in the former GDR—between May 1991 and May 1994 *inter alia* the following figures were given officially: 2,250, 3,320, 2,280, 2,235 and 2,288. Other aspects support a skeptical point of view; although the MoD produces regular reports for parliament on NVA military equipment,

[3] This article reflects data as available in late 1994, i.e., as of 31 December 1993. The author is especially indebted to a number of jounalists and research colleagues who allowed him to analyse materials they used for their stories. Among them, colleagues of *Der Spiegel*, *Berliner Zeitung* and *Süddeutsche Zeitung* were especially helpful. Research colleagues Erich Schmidt-Eenboom and Hans-Joachim Gießmann, who authored a major book on the NVA in transition (*Das unliebsame Erbe*, Baden-Baden, 1992), also provided substantial assistance.

it has not yet succeeded in producing them in a standard format that allows detailed comparison. From the author's point of view, an intentional lack of transparency exists. Even with extensive sources available, therefore, there will be no clear and comprehensive set of data from which to start, when investigating the fate of surplus weapons from the former GDR stockpiles.

Indeed, the differences between the available data are large enough to encourage much speculation, including assumptions about stocks not justified, illegally exported or used for purposes of operational foreign policy.

This situation is due in part to a lack of political control over the armed forces during the unification process. The German Bundestag only lately decided to execute tougher control over the administration's decisions and behavior with respect to the former NVA equipment. Other topics were perceived as more important by the newly elected parliamentarians during most of 1991. More detailed parliamentary control was executed only when in October 1991 the Hamburg harbor police seized a clandestine delivery of 14 military items to Israel, including two complete Schilka ZSU 23/4 air defense systems declared to be 'agricultural machines.' In the aftermath of parliamentary investigations, many other exports came to parliamentary attention (Deutscher Bundestag, 2 December 1991). As a consequence the Ministry of Defense was tasked in spring 1992 to regularly report on its activities with respect to the former NVA equipment.

"Going out of business sales" of the former GDR

In several last-minute contracts, signed as late as 1–2 October 1990, huge amounts of weapon systems were sold by the GDR Ministry of Disarmament and Defense at very low prices.

Major contracts included:

MoD of Poland, DM 207.9 million, to include 2700 Fagott AT-missiles; 11 Mig-29s; 152mm ammunition; air-to-air missiles, etc.

MoD of Hungary, approximately DM 100 million, to include 200 T-72 MBTs for DM 180,000 each; 130,000 AT mines for DM 10 each; 50,000 AK-74 submachine guns for DM 60 each; and many other weapons as well as spare parts

CIC International Ltd (USA), DM 275.5 million or US $349 million, to include 3 ships project 151 for US $10 million per copy; 12 ships project 205 for US $100,000 per copy; Mig-21s and Mig-23s; 58 BM-21 and 100 RM-70 rocket launchers; 5,000 Sagger AT missiles for US $800 each; 1,200 T-55 for US $10,000 per copy; 200 T-72 MBTs for US $200,000 each

Beij-MA Military District (Belgium), DM 62.5 million, to include inter alia 32 Mi-24 helicopters for DM 300,000 per copy; 100 T-72 tanks for DM 180,000 per copy; 9mm pistols for DM 10 per copy including ammunition; light machine guns for DM 75 per copy; RPG-18 light assault weapons for DM 85 each; 100,000 anti-personnel mines for DM 25 each

OEG SUMER Handels- und Service Gesellschaft, different contracts regarding NBC equipment and decontamination materials for export to Saudi Arabia (export licensed by FRG)

Harlacher small arms and ammunition for DM 317,746

Heckler & Koch ammunition for DM 144,700

ALTKAM (USSR), DM 498,420 for vehicles

MAWIA GmbH, one demilitarized ship, later illegally exported to Guinea

Königsberg-Foundation, DM 1.5 million for three L-410 transport aircraft

The two large contracts with arms traders included a paragraph allowing both sides to withdraw from their obligations if the necessary official licenses, allowances, etc. could not be gained; thus, it is likely no actual transfers have been made. Whether and to what extent the contracts with Poland and Hungary were fulfilled is not publicly known.

Sources:
Letter by which the Bundeswehr's liaison group at the GDR Ministry of Disarmament and Defense asked to withhold the systems listed in an Annex from the GDR's list of weapons for sale: Bundesministerium der Verteidigung/Ministerium für Abrüstung und Verteidigung (DDR), 6 September 1990; Vielain, 1991; Bauer, 1993, p. IV.2-1; author's archives.

Estimated Holdings of the NVA

Main Battle Tanks	2,342
ACV/IFV	6,639
Artillery	2,465
Helicopters (attack)	87
Fighter Aircraft (incl. L-39 trainer)	394
Fighting Ships	69
Vehicles (incl. trailers)	100,000
Fire Arms	ca 1,200,000
Ammunition (metric tons)	ca 300,000

Source: *Deutscher Bundestag, 11 May 1992, pp. 5+. For details, see Annex 1.*

Bookkeeping

The GDR Ministry of Defense and Disarmament maintained a list of weapon systems and major items held by the NVA. After taking possession, the Bundeswehr argued repeatedly that this listing was by no means correct or complete since the NVA did not keep reliable statistics on its holdings. Surprisingly the Bundeswehr never referred to an extensive database of the former NVA, which was run at the GDR MoD and contained data on the NVA military installations and their local weapon and equipment stockpiles.

A new computerized accounting and management system for a broader range of items was established by the Bundeswehr, but no comprehensive comparison of both accounting systems has been published. Nevertheless, in January 1992 the Bundeswehr reprinted large parts of the former NVA listing and preliminary figures on the differences between this list and the new accounting system. In trying to explain these differences, the Bundeswehr argued *inter alia* that the NVA normally updated its listing every two years; the latest completed update occurred in 1987, and therefore did not contain more recent changes. The 1989 update was allegedly canceled due to the political developments. Parts of the NVA list available to the author and representing a 30 June 1990 printout from the GDR MoD computer system, however, clearly show that an update including many 1989–1990 changes must have been accomplished by the NVA. A comparison with the list reprinted by the German MoD in 1992 reveals that the reprinted version lists data of 1989 and 1990 origin without attributing them to a post-1987 entry . Both listings reflect the same totals for most or all systems listed in both. The major difference between the two sources is that the printout in the author's archive lists the weapon systems by age, thus establishing when they were added to the NVA inventory. Additions to inventory up to 1990 are listed. Thus, the argument that no update was made since 1987 cannot be accepted.

The data published by the FRG government and given to German Parliament committees from both sources differ widely. Detailed comparisons between the figures also reveal differences between data published from the new Bundeswehr system at different times. Astonishingly enough, the new Bundeswehr accounting system figures have been corrected in many cases and in that way came much closer to the original NVA figures (see Annexes 1 and 2).

Sources:
Deutscher Bundestag, Verteidigungsausschuß, 19 December 1991, p.19; Wehrdienst 1303/1992, p.2; Deutscher Bundestag, Document 12/2026; Deutscher Bundestag, Document 12/2026, Attachment 1; printout from the GDR's MoD computer, 30 June 1990.

Decisionmaking System Regarding the Future of NVA Weapons and Materials

During the early months after reunification, the Bundeswehr laid primary emphasis on ensuring control over the NVA's material heritage. Thousands of major weapons and thousands of tons of equipment were relocated and brought under a more centralized, easier-to-guard storage system. Thousands of military installations—often containing weapons, ammunitions or other dangerous goods—had to be guarded, despite a serious lack of personnel.

Because of the amount of weapons and items to be handled, the Bundeswehr established a specific selection system to make decisions about the future of these items. Three different categories of items were created:

- Category 1: service with the Bundeswehr for the foreseeable future
- Category 2: further evaluation or continued interim service with the Bundeswehr
- Category 3: immediately in excess

A typical example of a category 1 weapon is the modern Mig-29 fighter aircraft, which the Bundeswehr will use beyond the year 2000. Other examples are two Tupolev aircraft converted into the German 'Open Skies' airplane. The Mi-24 attack helicopters and Mi-8 transport helicopters are good examples of category 2 material that was further used or evaluated and is or will be retired from service. The bulk of the major weapon systems—e.g., all other fighter and fighter bomber aircraft, 98 percent of the main battle tanks, 95 percent of the armored cavalry vehicles and 95 percent of the artillery systems and mortars—were decided to be in excess early in the process. About 80 percent of the non-weapon systems and major types of equipment were similarly resolved as early as 1991. Additional weapons and materials from categories 1 and 2 have since been recategorized to category 3. Among the weapons first considered for use with the Bundeswehr were the D-30 howitzers, the RM-70 missile launchers, the BTR-70 APCs and others. They were recategorized, as were 892 BMP-1, 2 SAM systems SA-5, 163,039 AK 74 submachine guns, 24 Mi-24 helicopters and many others (Schulte, 1990, p. 873; Deutscher Bundestag, 11 May 1992, p.5). Although recent official figures on which and how much of the former NVA equipment is still in use are unavailable, it is no longer very much. In addition to those arguments used in public for phasing out most NVA weapon systems (dependence on Russian spares, incompatibility with German technical standards, etc.) one argument may have also contributed to these decisions: the more weapons from the NVA the Bundeswehr continued to operate, the more NVA specialists it would have to continue to employ.

Category 3 weapons and materials were collected and stored in special depots. They have been used for one the following purposes:

- service with another German Federal Ministry, e.g. the Ministry of Interior
- service with the new Länder or community authorities to strengthen the buildup of infrastructure
- export sales from government to government
- foreign military aid programs
- technical intelligence exchange programs
- humanitarian aid programs
- takeover by the government-controlled company VEBEG for scrapping or selling after partial or complete demilitarization
- takeover by the Bundeswehr for technical intelligence purposes
- use by the Bundeswehr as live targets on training sites
- use as static displays in national as well as foreign exhibitions *(Wehrdienst*, 15 November 1993, pp.2–3).

Special interest was immediately given to those categories of weapons subject to the CFE regulations (Hartmann, et al., 1992; Zellner, 1994; Crawford, 1991; Institute for Defense and Disarmament Studies). The CFE Treaty, signed November 1990 in Paris, continued to be applicable in the new political situation when Germany accepted all limitations for the unified Germany that were originally intended for West Germany. This decision made Germany the country with the second largest obligations for reductions under the treaty. Nevertheless, the treaty allowed each signatory a period of time for corrections to its original notification figures. It allowed the earmarking of Treaty Limited Equipment (TLEs) as intended for export according to Article III regulations. Some types of TLEs could also be recategorized under the treaty regulations by making specific changes to their construction. As the CFE Treaty entered into force no earlier than November 1992, there was sufficient time to use those provisions that allowed reductions to the costs associated with fulfilling the signatories obligations to scrap weapon systems. There was also sufficient time to export treaty-limited weapons. Indeed, German government officials informed members of parliament that exports would become

more difficult after ratification (Deutscher Bundestag, September 1991, pp.12+). Comparing Germany's 1990 assumptions about how many TLEs it would have to scrap with those given since shows that Germany has taken advantage of these regulations—it will have to destroy much less weapons than it had assumed in 1990.

Exports became a major means of ridding the Bundeswehr of the NVA's heritage. A number of factors contributed to this development. When the Bundeswehr took command of the NVA, no specialized dismantling facilities were available to immediately begin to destroy NVA weapons, ammunitions and toxic materials in accordance with environmental regulations. Although many environmental laws were suspended in the five new Länder for several years, only a few small or experimental facilities were available to immediately start the destruction of military equipment. During the time necessary to build up specialized facilities, only small amounts of the most dangerous types of ammunitions and weapons could be destroyed, e.g., liquid fuel missile types. The bulk of all weapons and equipment had to be guarded and stored. For months this caused serious complications for the Bundeswehr; they tried to implement a centralized and categorized storage system, but soon it was argued that these tasks would divert the armed forces for years from their normal defense, training and military tasks. An informal consensus was reached—the sooner reductions of these surplus stocks took place, the lower the costs of handling the NVA's heritage would be. It was simply cheaper and faster to transport a weapon to another country that paid for the transfer and maybe even for the weapon, than to first pay for storing it and then for destroying it.

To help the Bundeswehr win time for its military tasks, a newly established subsidiary of the government-owned company VEBEG, the MSDG (Material-Service-Depot-Gesellschaft), was assigned with guarding and operating those depots in which material was awaiting delivery for future in-country use, export or destruction.

German Exports of Major Weapon Systems 1992-93

(according to origin)

Category	*1992–93 Exports*	*FRG Systems*	*FRG surplus*	*GDR surplus*	*Percentage GDR*	*Type of GDR Weapon Systems Included*
MBT	382	243	242	139	36.4	T-72, T-55
ACV/IFV	525	278	187	247	47.0	BMP-1, BTR-60/70, MT-LB, PTS*
Artillery	459	—	—	459	100.0	SPH 122 and 152mm
Attack Helicopters	2	1	—	1	50.0	Mi-24
Combat Aircraft	106	93	93	13	12.3	Su-22,Mig-21/23

** This ACV/IFV was not identified clearly; although no equipment of West German origin is known to be designated PTS, it is accounted for in the NVA share.*

This table also makes clear that most of the exports from Bundeswehr stocks are surplus weapons. The tanks exported were Leopard 1s, the aircraft were Alpha Jets and F-4 Phantoms, and the 187 IFVs were M-113s.

Source: *United Nations General Assembly, 1992 and 1993.*

Exports

Exports from former NVA stocks largely contribute to Germany's rank as the second (or third) most important supplier of major weapon systems according to the 1992 and 1993 UN Registers of Conventional Arms. Substantial numbers of weapon systems as well as other military items have been exported.

In general, the rules for handling excess Bundeswehr items had to be applied for all surplus items of the former NVA; no special regulations were created with respect to German arms trade and export laws (Heyden, 1990, p.62). Indeed, during a meeting of the German Federal Security Council on 27 February 1991, it was decided that all exports should be handled in accordance with normal West German procedures as well as the 1982 political guidelines for arms exports (Deutscher Bundestag, 2 December 1991, p.26). The seizure of the covert delivery to Israel led on 23 December 1991 to a policy within the MoD of tighter control of the political leadership (*Wehrdienst*, 1300/1992, p.II).

Nevertheless, the process of preparing for these deliveries had started much earlier. Only two days after the March 1990 elections in the former GDR—which brought a CDU-led Eastern German government into power—a meeting took place within the West German Ministry of Defense to discuss when and with whom the inherited military equipment would be shared.

Many countries made requests for former NVA equipment; some of them did so even before reunification. In November 1991, a list was published naming a total of 44 countries that had requested NVA weapons (not including requests for humanitarian aid purposes). Among them were NATO allies Belgium, Denmark, France, Greece, Turkey, the United Kingdom and the United States as well as Italy, Spain, Canada and Holland. A wide range of non-NATO countries from Europe and other parts of the world was listed as well: Finland, Austria, Switzerland, Sweden, Bulgaria, Estonia, Poland, Romania, Hungary, the USSR, Egypt, Algeria, Botswana, Ecuador, Israel, India, Saudi Arabia, Peru, Tunisia, Singapore and many others (Bundesministerium der Verteidigung, Parlamentarischer Staatssekretär, 21 November 1991).

Exports to the Gulf War Allies

Preparations for the Gulf War partly coincided with the process of German reunification. Since Iraqi forces operated mainly Soviet types of military equipment, the United States, the United Kingdom and—outside of the Gulf alliance—Israel approached the German government early on for various types of military equipment with which they might be confronted. Requests were mainly driven by 'technical intelligence' needs, i.e., testing and evaluation purposes. Therefore only small numbers of individual systems were necessary.

Germany, because of internal policy reasons and constitutional problems, could not contribute troops to the war. It therefore decided to give financial support and to supply military equipment in order to avoid increasing political pressure from its allies. This compensation strategy proved to be costly, totaling some DM 17–18 billion, or roughly US $10 billion at the time (*Wehrdienst*, 1258/1991, p.1). NVA equipment, at cost estimated by the German government, made up a significant part. This policy largely contributed to early and major exports of NVA weapons. The Commander of the Bundeswehr Command East at the time, Jörg Schönbohm, later wrote: "I have witnessed former NVA soldiers to be laid off by 1st of January 1991, working over the Christmas Holidays of 1990, to ensure that material for our allies operating in the Persian Gulf could be provided timely" (Schönbohm, 1992, p.43).

While the United States received a wide range of weapons for technical evaluation and larger numbers of different trucks, logistics and medical supplies for operational purposes, France obtained mine clearance and mine laying equipment. Egypt secured 30 NBC reconnaissance vehicles and a 250-ton spares package in October 1992 (Deutscher Bundestag, Document 12/1999, p.15). Israel received NBC decontamination equipment, firefighting equipment and other dual-use supplies. Turkey was the only country that showed interest in obtaining substantial numbers and a wider range of actual weapon systems. Supplies to Turkey ultimately led to the necessity of similar deliveries to Greece, thus creating a new military aid program for both countries (see extra section below).

*Examples of NVA-Equipment Delivered to the Gulf-War Allies**

Type of Equipment	*Designation*	*Number Delivered**	*Recipient Country*
Engineering Equipment	T 130	25	USA
Trucks	Tatra 813 8x8	151	USA
Trucks	Tatra 815 6x8	208	USA
Trucks	Tatra 815 8x8	62	USA
Trucks (POL)	Tatra 815 CAPL 16	104	USA
Trucks (POL)	Tatra 815 CA 18	17	USA
Trucks	Tatra 815 VI	129	USA
Trailers for Tatra 815 VI	—	128	USA
Trucks (POL, 5,000 l)	Ural	48	USA
Trucks Maintenance	Ural 375C	48	USA
Heavy Load Trailers	P 50 and P 80	189	USA
Trailer (Water)		220	USA
Trailer (POL)		294	USA
Medical Cars	LO 2002 A/C	47	USA
Trucks with Showers	W50 LA/A/C	604	USA
Water Bottles		18,000	USA
Containers (20 ft.)		724	USA
Tents (8x15 m)		200	USA
NBC protection masks		100,000	USA
Mine Clearance Equip.	KMT 5	10	FR
Mine Clearance Equip.	KMT 6M 2	10	FR
Mine Laying Equip.	MLG 60M	4	FR
Trucks	Tatra 815 6x6	40	CSFR
Heavy Load Trailers	P50/80	40	CSFR
NBC equipment	various		Israel
SPW-40 NBC rec. veh.		30	Egypt
Spares Package	250 tons spares	1	Egypt

** This table is deliberately incomplete, as it does not include exports covered in other sections. Excluded are deliveries to the United States for testing and evaluation as well as for training purposes; deliveries to Turkey; and deliveries for technical intelligence purposes to Israel. Israel also requested other NVA equipment but detailed and official figures are not publicly known.*

Source: *Bundesministerium der Verteidigung, 22 February 1991.*

Exports for Technical Intelligence

Former NVA weapons were given as loans or as gifts to foreign countries for technical intelligence, i.e., testing and evaluation purposes. These types of exports were said to be limited to the NATO countries and Israel. Other countries—"several Arab countries"—may also have benefited from such exports (Deutscher Bundestag, 2 December 1991, p.5). While such deliveries were implemented on a regular basis according to agreed NATO guidelines with the United States, the United Kingdom and France, each delivery to Israel was decided on a case-by-case basis (for details, see Annex 4).

The deliveries of former NVA equipment to the United States are somewhat unique in this context. On the one hand, they covered a broader number of types of equipment than deliveries to any other country. In fact, the United States is the only country that received large numbers of complete major weapon systems. On the other hand, the United States is the only country that received substantial numbers of weapons from the former NVA for training purposes. The US military maintains complete 'red flag' units, equipped with Soviet/Russian weapons, in order to conduct its military training as realistically as possible. The opportunity to equip these units with more modern equipment from NVA stocks was not passed up. It can not be clearly determined in all cases whether deliveries of NVA equipment to the United States served technical intelligence or training purposes.

According to official statements, Israel is the only country outside of NATO participating in this exchange; several clandestine operations were set up by the West German Foreign Intelligence Service to secretly transport NVA weapons to Israel in cooperation with the Mossad.

Israel (Deutscher Bundestag, 2 December 1991; Deutscher Bundestag, Verteidigungsausschuß, 10 December 1991; Kolbow/ Stoltenberg, 1992) was one of the first countries to informally show interest in NVA equipment. Based on a 1967 general agreement and case-by-case cooperation between the armed forces of Israel, the German Bundeswehr and the two countries' foreign intelligence services, this type of cooperation already had some practice. Historically, the FRG had benefited greatly from cooperation, since Israel had provided the FRG with some complete major weapon systems captured during the wars in the Near East, including an AA-2 air-to-air missile and a BMP-2. The German side did not have much hardware to give in return. Even before the unification date, however, the Israeli military attaché in Bonn had tabled preliminary requests for weapon systems of interest to the Mossad and the Israeli armed forces. In mid-1991, the Israeli list contained 274 positions, of which the German government had fulfilled some 68 positions by December 1991 and was preparing to fulfill an unknown number of additional ones (it had also turned down an unknown number of wishes). The weapons seized in Hamburg (14 positions) were finally delivered in October 1992. Examples of deliveries to Israel can be found in Annex 4.

While in public it was argued that these deliveries occurred as part of the German Gulf War effort and as part of the normal, intra-alliance cooperation, one possible additional motive must be mentioned. With Germany no longer a front-line state and thus having significantly less-valuable COMINT, ELINT and other intelligence information to share, transferring relatively modern, Eastern-style weaponry and equipment from NVA stocks was clearly a possibility for interim compensation.

From what is known about exports, loans and deliveries for technical intelligence purposes, a few conclusions may be drawn.

- Much of the equipment requested and received by the United States, France, the United Kingdom and Israel was identical. All countries were obviously looking for a number of the same items, which seem not to have been well known to the Western world. Ship-to-ship missiles of the P21 and P22 'Styx' types are good examples, as are modern air-to-air missiles.

- There was some reluctance in the FRG about giving Israel complete weapon systems or large numbers of the same item, while the United Kingdom and the United States obtained complete major weapons if requested.

- Israel and the United States both were obviously interested in landmine technologies used by the NVA.

- Only the United States looked into many major weapons systems, such as different types of aircraft (Su-22M4, Mig-23 and Mig-29), different tanks or a complete fighting ship, such as the Tarantul class missile corvette. The United States also seems to be the only country with the resources necessary to operate complete 'red flag' type military units.

- From what is known publicly, the recipient countries appear to have had only limited interest in electronic counter-measure (ECM) or electronic counter-counter-measure (ECCM) equipment from NVA stocks. This is either due to the assumption that these items were not very capable or is an indication that relevant information has been withheld from the public for secrecy reasons.

Since cooperation in technical intelligence is normally subject to intense secrecy, the seizure of the Hamburg weapons for Israel caused investigations that allowed a first glimpse of German practices as well as of some of its partners' behaviors in this field. To the author's knowledge, this case is unique. The size and the wide range of the deliveries discussed during the investigations clearly raise the question of whether more transparency in this field could make a unique contribution to confidence building.

Arming Allies and Fueling a Regional Conflict

Turkey and Greece are among the largest recipients of former NVA weapon systems. As noted above, supplies to these two countries originated from the Turkish requests in the Gulf War context. Both countries contracted for new, large, military aid packages (Materialhilfe III), consisting of a wide mixture of surplus NVA and Bundeswehr weapons to be delivered until 1994/1995. Thus, these programs became rather independent from the Gulf War.

Greece received *inter alia* 21,675 RPG-18, more than 7,000 guided anti-tank missiles, 3 OSA air defense missile systems (12 launchers with 924 missiles), 306 ZSU23 air defense guns, 501 BMP-1 armored personnel carriers plus 158 RM-70 rocket launchers (including some 205,000 rockets). At one point the country, pressed by its debts, had to delay deliveries as it could no longer pay for the transport (Deutscher Bundestag, 21 January 1994, p.12).

Deliveries to Turkey are similarly impressive: 4,996 RPG-7 light assault weapons were exported together with 197,139 rounds of ammunition; 303,934 Kalashnikov rifles with at least 83 million rounds of ammunition, more than 2,500 machine guns, and 300 BTR-60 armored personnel carriers including large stocks of ammunition were also delivered. In addition, both countries received other military equipment. Parts I and II of Annex 3 show the major exports from NVA stocks; in addition, major deliveries from Bundeswehr surplus stocks within the same aid package are listed in parts III and IV of that annex.

Both countries are the major recipients of military aid within NATO. They are seen by their allies as important factors of stability in the Eastern Mediterranean and with respect to the Muslim world—Volker Rühe, the German Minister of Defense, has argued, "since the end of the east-west confrontation Turkey and Greece are growing into the role of stabilizing regional powers bordering crisis areas" (Bundesminister der Verteidigung, 7 March 1994)—and they have received substantial amounts of surplus weapons for decades. German military aid programs for Turkey totaled DM 6.243 billion for the 1964–1994 timeframe; German programs in support of Greece totaled DM 2.572 billion (Bundesministerium der Verteidigung, RüT II 1, 5 October 1991; *Wehrdienst*, 13/1993, p.2).

While deliveries before the ratification of the CFE Treaty were normal military exports, later transfers had to be made under the treaty provisions which allow 'cascading.' Within this program, the more modern armed forces with troops deployed at the former Central Front—i.e., in Germany—are allowed to transfer substantial amounts of destined-to-be-destroyed equipment to the countries at NATO's flanks, thus modernizing the equipment standard of their allies within the agreed equipment limits for these countries. If these deliveries cause the recipient country to exceed the agreed holdings in a CFE category, the respective country is also obliged to destroy older TLEs of the same category to meet its treaty commitments. Since not all these limits were met prior to the cascading, this process could lead to substantial increases in national holdings in some cases.

Deliveries to both countries are accompanied by the risk of fueling an arms race among poor NATO allies, who have a wide range of potentially conflicting interests (Aegis, Cyprus, Balkans) and whose governments have regularly used foreign policy disputes to overcome internal difficulties. Therefore the main suppliers, Germany and the United States, both apply a policy in which delivered equipment is carefully divided between Greece and Turkey on a proportional basis.

The supply of huge amounts of small weapons and ammunition to Turkey may well contribute to Turkey's war in the Kurdish provinces as well as to severe human rights violations. While the German government argues that Turkey committed itself to not using these weapons for purposes other than NATO defense, the Turkish government has repeatedly pointed out that fighting the Kurdish PKK guerrilla is well within the common tasks of all NATO countries, since they agreed to cooperate in fighting terrorism.

Although the bilateral treaties between Turkey and Germany on the military aid programs clearly state that Turkey is not authorized to re-export weapons received from Germany without Germany's written approval (Bundesministerium der Verteidigung, RüZII 2, 11 November 1993; Bundesministerium der Verteidigung/Ministerium für Nationale Verteidigung der Republik Türkei, 1994, Art. 7, para. 2.), it is possible that Turkey supplied Iraqi Kurds with small arms from former NVA stockpiles.

Conversations of the author with humanitarian relief workers, who worked in Iraqi Kurdistan for several years, led to the conclusion that AK-47s in use with Kurdish militias in Northern Iraq originate from NVA stocks. NVA ammunition also has turned up with Northern Iraq Kurdish units. It cannot completely be excluded that Turkey also used deliveries from the former NVA stocks to covertly supply Azerbaijan in its conflicts with Armenia.

Exports to promote exports

Several of the exports of NVA equipment were intertwined with procurement programs of the recipient country from German arms industry. Sweden and Indonesia serve as examples.

In 1994, the German arms industry won a major competition. Sweden, searching for its future main battle tank, evaluated the newest versions of the German Leopard 2, the US M1A2 Abrams, the French Leclerc and the British Challenger tanks. After a lengthy process Sweden finally contracted with German industry for 120 new production tanks for DM 1.2 billion (*Wehrdienst* 4/1994, p.3), with a possible second lot of 90 vehicles to follow. The choice was allegedly made on the basis of the conditions Germany had offered. The Swedish arms industry would participate in the tank production, and Germany would buy additional equipment from Sweden. Finally—but never directly mentioned—Sweden contracted for cheap surplus weapons of German origin as well. Sweden had already gained an additional 160 ex-German Leopard 2 tanks (out of 200) under a favorable contract in 1994. Roughly 800 of the NVA's MB-LT multi-purpose armored vehicles to the country for an extraordinarily low price; Sweden will also receive spares from the cannibalization of 228 2S1 self-propelled howitzers (Björck, 1994, p.268; Bundesministerium der Verteidigung, 6 April 1994; Foss, 1995, p.13).

Indonesia is another example—39 former East German Navy vessels were sold to Indonesia by January 1993 in a deal very controversial for human rights reasons. The remarkably low price of some US $13 million for all these ships was accompanied by a commitment to partial demilitarization and refurbishment in a German yard—at a cost of US $314 million—and the German company Ferrostahl training 1660 Indonesian naval soldiers. The World Bank criticized the deal, noting that the total costs of the project for Indonesia would be even higher, since remilitarization of the ships at an Indonesian yard would cost another $339 million. The Indonesian yard itself had to be modernized for that purpose at the expense of approximately US $119 million and a new harbor had to be built for US $179 million for operating the ships (Deutscher Bundestag, Document 12/6512; *Wehrtechnik*, June 1993; Ziller, 1994; Dudde, 1994; *Der Spiegel*, 27 September 1993; Dauth, 1993; Dohnany, 1993; Schmalz, 1992).

Despite the process of demilitarization, on four ships the launchers for modern air-defense missiles were 'accidentally' left aboard, and a 5,000 ton spares and ammunition package accompanied the deal.The Indonesian government also decided to order three new submarines from the German company, Howaldt Deutsche Werk AG, that normally cooperates with Ferrostahl when selling submarines abroad.

Similarly, both Turkey and Greece are long-established and well-known customers of the FRG's arms industries, especially naval industries.

The massive exports from German surplus stocks are somewhat double-edged from a German arms industry perspective. While the German government on the one hand is a cheap competitor for its own arms industries, it also supports the export sales of German industries with cheap, additional equipment. Sometimes this surplus equipment needs to be upgraded or brought up to the recipient country's technology standards by German companies before delivery (Heckmann, 1989, pp.49-50). From an industry perspective, deliveries of very modern equipment may also be perceived as creating a need for next-generation weaponry by the German Bundeswehr earlier than otherwise anticipated.

Examples of additional exports are given in combination with exports supporting actual sales in Annex 5.

Spare parts deliveries (selection)

* 38 spare tubes AK-230 (30mm naval air defense gun)
* 51 tubes AK-725 (naval AD-gun)
* 3 30mm AD-guns AK-230 A
* 2 30mm AD-guns training
* 2 30mm AD-guns AK-230 B
* 7320 link for 30mm ammunition
* 44 spare tubes AK-725
* 34 spare tubes AK 230
* 3 gun mounts for 30mm AK-230 A
* 2 gun mounts for 30mm AK-230 B

Source: *Marinekommando Rostock, 1993, p.3.*

Exports for Humanitarian Aid

Large parts of the dual-purpose equipment of the NVA have been exported for civilian or humanitarian use. Trucks, maintenance equipment, clothes, telecommunications or medical and NBC equipment, food and tents have been delivered since 1990. A wide range of countries requested and received former NVA equipment as humanitarian aid—most of the successor states of the former Soviet Union plus 34 other countries and hundreds of organizations from the private sector were listed by the German government in answering parliamentary questions during 1991 and 1992 (Bundesministerium der Verteidigung, Parlamentarischer Staatssekretär, 21 November 1991). In addition to the positive aspects, it must be mentioned that in some cases humanitarian aid was delivered together with the trucks transporting it, simply because the costs of destruction for the trucks according to German laws would be relatively high.

CFE Obligations

Reductions in Treaty Limited Equipment under the CFE categories are occurring through both export and destruction. Thus, the unified Germany continues to fulfill its treaty obligations. By the end of 1993 it was expected that all weapons to be dismantled could be scrapped before 16 November 1995, the deadline by which the CFE signatory countries are committed to completing their reductions.

CFE limits would have allowed the unified Germany to keep some additional TLEs, since the stocks in the former West Germany were below the upper limits allowed for aircraft and attack helicopters. Some last-minute exports and recategorizations contributed to reduced needs for expensive destruction as well. It is not officially known whether exports of former West German TLEs (e.g., Leopard tanks to Turkey, Greece, Sweden, Denmark and Norway; RF-4 aircraft to Greece and Turkey; Alpha Jets to Portugal) have also been used to further reduce the number of weapon systems to be destroyed. As no intention exists to operate the additional weapon systems allowed and therefore even more former West German weapon systems are destined for surplus—of some 2054 Leopard 1, 2124 Leopard 2 and 648 M48A2G tanks available to the Bundeswehr in 1991, it will need only 672 Leopard 1 and 1712 Leopard 2 tanks for the new Army Structure Five (without war reserve stocks) (Bundesrepublik Deutschland, 1994, Attachment 7)—the German government may store at least some valuable surplus NVA equipment for possible future export and has primarily scrapped older NVA weapons in each category to meet its commitments. Originally the destruction of substantial numbers of modern GDR equipment had been planned (*Wehrdienst*, 1322/1992, p.4).

Combat aircraft serve as a good example. Under CFE, Germany had to scrap about 140 aircraft and contracted with a subsidiary of DASA, Elbe-Flugzeugwerke in Dresden. The destruction has since then been completed. All aircraft destroyed were older Mig-21 models; not one Mig-23, Su-22 or even Mig-29 has been scheduled for destruction. At the end of 1993, 24 Mig-29s were kept in service with the Bundeswehr, while more than 139 aircraft were either scheduled for export or awaiting a decision. These included most of the later-production Mig-21s as well as all available Mig-23s and SU-22 fighter bombers.

The same procedure can be demonstrated in other areas. CFE obligations are met by destroying the older systems first: T-54s and T-55s instead of T-72s; BTR-152s, BTR-40s and BTR-50s instead of BMP-1s or BMP-2s; 120mm mortars HM and HD-30 howitzers instead of the more capable HD-20, 2S3, RM-70 or BM-21 rocket launchers. It is not yet known wether these more modern systems will be dismantled later. The NVA's Mi-24 attack helicopters will also not be scrapped but probably exported, since there is no commitment to destroy them under CFE limits (Zellner, 1994; Bundesministerium der Verteidigung, 6 April 1994; *Wehrdienst* 3/1994, p.4).

One reason for the decision to scrap the older technology systems may have been the lower expense; another reason surely was that newer technology weapons are easier to sell. Thus, only relatively small numbers of TLEs with higher military value may have to be destroyed during the final stages of the destruction period. Consequently the budget proposal for 1995 contains a reduced allocation of DM 219 million for CFE destructions (Deutscher Bundestag, Document 13/50, Einzelplan 14, p.105; *Wehrdienst* 17/1994, p.1).

While it is not yet clear whether inheriting the NVA has led to a restructuring of Germany's plans to reduce its stockpiles according to CFE, it is possible that a decision to retain some older Western equipment and instead destroy Eastern technology weapons has been made.

Other Methods of Demilitarization

Some TLEs from the former NVA have been rendered useless in other ways. During the early months of reunification, a number of major weapon systems were converted into firefighting equipment and other heavy duty civil machinery in former GDR armaments industry facilities for testing purposes. Several aircraft, tanks and other types of equipment have been demilitarized for static display in exhibitions in Germany and other countries (*Wehrdienst* 13/1993 p.3; Bundesministerium der Verteidigung, 6 April 1994, p.13). This includes individual sales to private collections, as well.

Some weapon systems may be used as targets on Bundeswehr training ranges. In some cases, this will affect substantial numbers; for example, 104 T-72 MBTs, 86 PT-76s and 50 2S1 self-propelled howitzers were allocated for use as live targets by the end of 1993 (Bundesministerium der Verteidigung, 6 April 1994, p.13).

Ammunition

Roughly 300,000 tons of ammunition were inherited from the NVA by the Bundeswehr. While government and media reports concentrate on successful new technologies for dismantling ammunition, analysis shows that at least one-third and maybe more than 40 percent of the former NVA's ammunition stocks have already been exported or are designated for export. The munitions available at the time of unification were listed by the NVA as belonging to the categories in the table below.

The future of roughly 280,000 tons of ammunition had to be decided. The larger portion of this ammunition has been dismantled, while the smaller part has been exported—as a general rule, exports took place in combination with deliveries of the weapons for which the ammunition was intended. Examples of such deliveries can be found throughout the tables and annexes of this paper. Not listed in these tables are the exports of ammunition (e.g., torpedoes) to Sweden, where they

CFE Related Destruction of Weapon Systems (1993)

CFE Category	Holdings notified 1990	Holdings notified 1992	Reduction Commitment calculated	Reduction Commitment notified*	CFE Limit for FRG 1993**	Scrapped by 31 December	Remarks
MBT	7,000	7,170	3,004	2,834 (2,834)	4,166	956 / 1,432	959 additional MBTs contracted
ACV/IFV	8,920	9,099	5,653	5,304 (5,474)	3,446	2,074/ 2,087	2014 additional ACV/IFVs contracted
Artillery	4,602	4,735	2,030	2,006 (1,897)	2,705	814 / 842	290 additional contracted
Attack Helicopter	258	256	—	—	306	—	
Aircraft	1,018	1,040	140	140 (118)	900	140 / 140	140 Mig-21, none contracted

* *Notified reduction commitments are given in two ways*
a) as reported by Hartmann (1994)
b) as calculated by the author by comparing holdings in 1990 and FRG limits. The latter is shown in brackets.

*** It is astonishing that two widely different sets of figures were given to Parliament in early 1994 about the numbers of weapons destroyed by the end of 1993: Deutscher Bundestag, Verteidigungsausschuß, 6 April 1994 is in direct contradiction to Deutscher Bundestag, 8 February 1994, p.3. The figure for tanks in that letter was corrected in April 1994. These data are different from those listed by Crawford, 1991. The official figures from the Bundeswehr with respect to CFE-related equipment to be destroyed have been reduced several times. See: Ulrich Weiser, Head of the German MoD's Planning Staff, quoted in Defense News (25 March 1991, p.61), as saying that "4,500 main battle tanks, 6,000 armored vehicles, 50 armed helicopters and 150 combat aircraft will have to be destroyed."*
Additional sources: Hartmann, et al., 1992, p.397;
Frank, 1992, p.31, Hartmann, et al, 1994, p 598.

were destroyed at Swedish Ordnance, since environmental regulations did not allow Germany to do so domestically within acceptable costs (Wehrtechnik, 21 October 1991, pp. 1–3).

By 31 December 1993 a total of 60,500 tons had been exported, while 109,100 tons had been destroyed. An additional 57,400 tons were awaiting export, while 54,100 tons were awaiting destruction. No explanation is given for the difference of 300 tons from the estimated total (Deutscher Bundestag, Verteidigungsausschuß, 6 April 1994, pp. 11-12; Annex 5).

The ammunition disposal is expected to be finished by the end of 1995. Since, for security reasons, the Bundeswehr does not intend to transport other countries' surplus ammunitions to the new facilities for ammunition disposal built in the five new Länder, it intends to help the companies who developed these techniques to aggressively market their unique capabilities in other countries.

Costs and Revenues

The income from sales of weapons from former NVA stocks are used to finance the defense budget and especially the dismantling process, which was expected to cost about DM 1.5 billion. According to 1994 figures the Bundeswehr predicted the earnings from sales would total roughly DM 1.5 billion by 1997. As the process of ridding the Bundeswehr of NVA equipment is scheduled to end in 1996, this is also the estimate for the overall total.

Ammunition Stocks of the NVA

Category of Ammunition	*Types*	*Metric Tons*
Army		
Small Arms Ammunition	92	58,600
Artillery/Grenade Launchers	87	52,900
Rocket Launchers	6	23,600
AD-guns and SP-AD guns	17	21,800
Tanks, AFV, IFV	63	66,000
AT-Weapons	12	18,000
Guided AT-Missiles	8	1,500
Short Range AD-Missiles	4	500
Hand Grenades	9	8,000
Engineer Ammunition	66	16,000
850,000 AT-mines		
500,000 Directional Mines		
Additional munitions & parts	25	3,000
Air and Air Defense Forces		
1080 Air Defense Missiles	3	4,378
17,564 Air-to-Air Missiles	10	2,429
711 Air-to-Surface Missiles	7	406
177,346 Air-to-Surface Rockets	8	1,656
Bombs	15	1,290
Ammunition for Aircraft Guns	5	886
Naval Forces		
Naval Arty/Naval AD-guns	5	2,909
Naval Mines	6	2,208
Depth Bombs	2	1,785
Large explosives/Torpedoes/Parts	5	685
Pyrotechnical Ammunition		
Signals/Light	68	6,000
Smoke/Fog	9	898
Total		**295,430**

Sources: *Machon, 1991, p.38; Heckmann, 1990, p.76. While the Bundeswehr first used figures significantly lower than the NVA numbers (Preißler, 1991), it returned to the NVA estimates and continues to use them. In some cases, the Bundeswehr estimated the ammunition heritage to be even larger, i.e., 350,000 tons. See: Erbe, 1991, p.413.*

In addition to category 1 weapon systems, the Bundeswehr initially intended to use about 30,000, then 16,400, metric tons of NVA ammunition. This figure was reduced to approximately 14,000 tons. No lower figure has since been given publicly, although the number of NVA weapon systems in Bundeswehr use has been consistently reduced.

The German MoD hopes to finish managing the NVA's heritage by the end of 1996. In 1994, several initiatives were begun to make this a realistic date. Whole storage sites containing old NVA equipment have been offered to civil industries willing to empty them and scrap the rest of the equipment still available. Companies accepting these offers will receive the infrastructure plus guards paid by the government for the time in which they commit themselves to emptying a site.

From a Bundeswehr perspective, there is another good reason for speeding up the process of managing the NVA's heritage. The Bundeswehr already must prepare itself for the next round of reductions of weapons and equipment in service. In the post-Cold War era, its manpower has been reduced to 370,000 soldiers; a reduction to 340,000 has been decided and further cuts—possibly to less than 300,000 soldiers—will have to be made during the next years if no significant increases in the defense budget are decided. Constant pressure exists on the defense budget, leading to the investments share falling from a Cold War third of the budget to a fifth under current conditions. With new reductions, substantial numbers of weapon systems will again become available as surplus weapons. The reduced Bundeswehr will no longer need them, and has neither the manpower to operate nor the money to stockpile and maintain them for long periods. They will therefore fuel the surplus weapons market.

Estimated Earnings from Selling NVA Equipment (Official estimate for 1990–1997)

Year	*Income from Sales (in DM)*
1990–1993	595,100,000
1994	535,300,000*
1995	278,300,000*
1996	92,100,000*
1997	16,000,000*
Total	1,516,800,000*

* *Estimate.*

***Sources**: Wehrdienst 13/1994, p.4; Wehrdienst 17/1994, p. 1. At the end of 1993, DM 903 million had been spent (DM 170 million for storage and safeguarding; DM 733 million for destruction). In the budget for 1995, the estimated costs for destruction of weapons have been reduced by DM 209 million to DM 178 million, because of reduced needs to scrap weapons and equipment. Bundesministerium der Verteidigung, FüS IV 2, 1994, p.5. The figures given by the Bundeswehr for 1990 to 1993 sales are contradictory, since in another document (Wehrdienst, 13/1994, p.4) the total given was only DM 338 million for the same period.*

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Annex 1

Main Equipment of the NVA—West and East German Accounting Differences

Type of Equipment	GDR listing	FRG listing	Difference	Remarks
Tanks				
MBT T-72	549	551	+ 2	FRG numbers vary*
MBT T-55/T-55A	1,480	1,589	+ 109	FRG numbers vary, partially explained
MBT T-54	193	198	+ 5	FRG numbers vary
Armored and Armed Vehicles				
AFV BMP-1	1,112	1,133	+ 21	FRG numbers vary
AFV BMP-2	24	24		
APC SPW 40P	299			
APC SPW 40P2	1,579	1,158	- 421	FRG numbers vary, partially explained
APC SPW 50 PK	199	154	- 45	partially explained
APC SPW 60 PA/PB	1,468	1,455	- 11	FRG numbers vary
APC SPW 70	1,266	1,254	- 12	
APC SPW 152 W1/K	759	717	- 42	FRG numbers vary
AFV PT 76	120	142	+ 22	FRG numbers vary
ARV BRM1 K	15	10	- 5	FRG numbers vary
Arm. multi-purpose veh. MT-LB	529			
Artillery Systems				
Cannon 85mm	225	180	- 45	
Cannon 100mm	267	255	- 12	
Cannon 130mm	175	137	- 38	
Howitzer 122mm M-30	407	405	- 2	FRG numbers vary
Howitzer 122mm D-30	395	394	- 1	FRG numbers vary
Howitzer cannon 152 mm D-20	137	137		
SPH SFL 2S1 122mm	374	372	- 2	FRG numbers vary
SPH SFL 2S3 152mm	96	95	- 1	
Rocket launcher RM-70	265	261	- 4	FRG numbers vary
Rocket launcher BM-21	58	59	+ 1	
Missile launcher LUNA	48	69	+ 21	
Missile launcher Totschka	8			
Missile launcher SS-23	—	—		four with 24 msl
Msl transport vehicle Totschka	26			
Msl transport vehicle LUNA M	94			
Grenade launcher 82mm	491	479	- 12	
Grenade launcher 120mm/SANI	291	296	+ 5	FRG numbers vary

Air-Defense Systems				
Launcher SM-65 Dwina eight complexes	48			
Launcher SM-90 Wolchow 30 complexes	174			
Launcher 5P71/73 Newa ten complexes	40			
Launcher 5P72 S-200 two complexes	24			
Launcher 5P85 S-300 one complex	12			
Launcher 'Krug'	42			
Launcher 'Kub'	107			
Launcher 'OSA-AK'	41			
Msl transport vehicle 'Krug'	240			
Msl transport vehicle 'Kub'	219			
Msl transport vehicle 'OSA-AK'	42			
Portable SAM - Strela-2	1,896			
Portable SAM IGLA	75	75		
ZU 23 mm twin AD-gun	924			
ZSU 23/4 Schilka AD-gun	128	99	- 29	
Anti-Tank Systems				
AT missile launch vehicle 9P110	48			
AT missile launch vehicle 9P122	54	50	- 4	
AT missile launch vehicle 9 P133	156	169	+ 13	
AT missile launch vehicle 9P148	52	48	- 4	
AT missile launcher for FAGOT	419	393	- 28	
AT missile launcher for METIS	31	20	- 11	
Light Arms *see Appendix 2*				
Helicopters				
Mi-24 attack helicopter	51	51		
Mi-8 TB armed helicopter (see below)	36	n.a.		
Mi-14 PL special helicopter (Haze)	8	8		
Mi-14 BT special helicopter (Haze)	6	6		
Mi-9 special helicopter	8	8		
Mi-2 transport helicopter	25	25		
Mi-8 transport helicopter	54	93	+ 3	FRG counts all Mi-8 here

Aircraft				
Mig-21	251	251		
Mig-23	47	45	- 2	difference explained
Mig-29	24	24		
Mig-23 BN	18	18		
SU-22	54	54		
L-39 training aircraft	52	52		
AN-2 transport aircraft	18	n.a.		
AN-26 transport aircraft	12	12		
L-410 transport aircraft	12	12		
TU-134 transport aircraft	3	3		
TU-154 transport aircraft	2	2		
IL-62 transport aircraft	3	3		
Z-43 aircraft	12	n.a.		
Naval Weapon Systems				
Koni Class frigate (1159)	3	3		
OSA missile corvette (205)	12	12		
Tarantul missile corvette (1241)	5	5		
Balcom 10 missile boats (151)	1	3	+ 2	difference explained
Kondor I minesweeper/ patrol boats	1		+ 1	difference explained
Kondor II minesweeper (89.2)	20	20		

* *Indicates that at different times, different figures for the holdings of this item have been given by the Bundeswehr.*

Sources: *Deutscher Bundestag, Document 12/2026, 1992, Annex 1; Deutscher Bundestag, Document 12/1820, 1991; Wehrdienst 41/ 1993, p.4; Ministerium für Abrüstung und Verteidigung (der DDR), 1990 (author's archive). Where no figure for the Bundeswehr accounting system is listed, the author could not find one.*

'Small Firearms' are a good example of the confusion about data, which consists of two parts:

1. The Definition Problem

NVA and GDR figures calculating small firearms probably include AK-47s, AK-74s, 9mm pistols, the sniper and automatic rifles plus the machine guns, and thus roughly total 1.2 million weapons at the beginning of 1990—i.e., at a time when the process of bringing stocks from outside the NVA into NVA custody was ongoing.

FRG and Bundeswehr figures include in addition the AGS-17 grenade launcher and the 40mm LAW RPG-7, but for unknown reasons list the sniper rifle only until January 1992. Because the holdings of these weapons were not very large, Bundeswehr totals also were around 1.2 million.

West German Heckler & Koch submachine guns, machine guns and sniper rifles illegally exported to the GDR do not appear in either definition. This also appears to be true for a small number of submachine guns, 'Skorpion,' which were mentioned when taken into Bundeswehr stocks.

2. The Accounting Problem

Neither the NVA nor the Bundeswehr figures used publicly may be viewed as reliable. The problem with the NVA figures is related to their obtainment during the ongoing process of bringing in stocks from other armed groupings in the GDR—totaling some 518,220 weapons according to GDR definitions—which did not allow a complete figure for small firearms to exist within the NVA before the Bundeswehr takeover started. It may have been as low as about 700,000 weapons, but it may have been much higher, between 1 and 1.2 million weapons.

The Bundeswehr/FRG figures may also be completely artificial, since the accounting was accomplished during the process of scrapping and exporting these weapons—this gives the Bundeswehr complete freedom to list or not list weapons without supervising control. To make the

Annex 2
Small Firearms in NVA Stockpile

Light Arms	GDR	FRG 1992	Difference	FRG 1994	Remarks
Machine guns	42,526	40,991	- 1,535	55,575	
Sniper rifles	1,749	1,509	- 240	n.a.	listed by FRG only in1992
Submachine gun 7.62mm AK-47	705,032	731,050	+ 25,988	783,217	FRG numbers vary
Submachine gun 5.45 mm AK-74	163,039	163,039		171,925	
Pistol 9mm	267,125	270,681	+ 3,556	266,537	diff. caused by FRG
Automatic rifle	3,518	3,862	+ 344	4,279	
Automatic grenade launcher AGS-17	184	173	- 11	651	
Light assault weapons RPG 7	26,526	26,346	- 180	22,032	
LAW RPG 18	n.a.	n.a.			

problem worse, even the Bundeswehr figures given after the process of scrapping and exporting weapons was completed are inconclusive, and contradict other Bundeswehr reports about exports. Thus, the Bundeswehr figures are likely not trustworthy as well. According to the final figures published by the Bundeswehr in 1994, the unified Germany had scrapped 891,217 small firearms, retained 4,784 and exported another 408,215 weapons of this category (according to the FRG definitions). But after cross-checking with the individual exports reported officially beforehand, this figure proves to be too low:

- a minimum of 303,934 AK-47s has been exported to Turkey
- a minimum of 4,996 RPG-7s has been exported to Turkey
- a minimum of 2,491 light machine guns has been exported to Turkey
- 100,000 AK-47s have been exported to Finland.

This already adds up to more than 411,000 small fire arms exported, excluding lower numbers that were exported to many other countries as well as additional substantial exports—for example, another 2,500 heavy machine guns for Turkey were under consideration and were at least partially delivered by the end of March 1994.

The minimum number of small firearms in NVA stockpiles was therefore about 1.3 million; the highest possible figure may have been around 1.7 million.

***Sources**: Goldbach, 1990, p.124f.; Ministerium für Nationale Verteidigung(DDR)/MAV, 1990; Deutscher Bundestag, Document 12/2026, 1992; Bundesministerium der Verteidigung, RüZ II,2, 1994; Deutscher Bundestag, Verteidigungsausschuß, 6 April 1994; Scheuer, 1992.*

Annex 3
NVA equipment delivered to Greece and Turkey
Part I: NVA Equipment Exported to Turkey

Type of Equipment	*Designation*	*Number Planned*	*Number Delivered**
Light MGs		2,500	2,491
Ammunition	for Light MG	132,000,000	?
Field hospital		3	3
Light assault weapons	RPG-7	12,000; later 5,000	4,996
Ammunition for RPG 7		250,000	197,139
APC	BTR/SPW-60 PB	300	300
Ammunition 14.5mm	for BTR-60 cannon	30,000,000	4,993,228
Ammunition 7.62mm	for BTR-60 MG	30,000,000	30,000,000
Machine pistols	Kalashnikov	256,125	303,934
Ammunition for Kal.	M-43	100,000,000	83,000,000
Heavy MGs		2,500	222
Ammunition	for Heavy MG	132,000,000	23,878,000
Mine clearance equip.	KMT-5	20	20
RPG-18		100,000	one delivery canceled
Trucks (ac fuel)	Tatra 815 CA 15	50	
Trucks (ac fuel)	Tatra 815 CA 16	100	
Decontamination equip.	Various		
Trucks (fire bdes)	Tatra	38	
Steel helmets		500,000	500,000
Trucks	Tatra	800	perhaps canceled
Trucks (POL)	Tatra 148 CA-17	30	perhaps canceled
Missiles	unnamed	100	
Bombs with fuz	unnamed	100	
Equipment, other	various	small	incl. 5 SAMs, etc.
Trucks POL	Tatra	100	
Mine laying equip. (mech)		3	unknown
Tank transporter	Ural 4320 C	90	unknown
Field hospitals		3	unknown
Bridging equipment		3	unknown

* *Examples for deliveries listed for October 1990 until March, early April 1994*

Part II: NVA Equipment Exported to Greece

Type of Equipment	*Designation*	*Number Planned*	*Number Delivered**
Search and Rescue Boat	RSB	5	5
River engineer boats	BMK-103 M	4	4
AD-gun 23mm	ZU-23	316	306
Ammunition 23mm		8,000,000	8,000,000
Ammunition 23 mm		4,500,000	294,928
Self-propelled AD guns	ZSU 23/4	120	unclear whether canceled or 72 delivered
ACV	BMP-1	500	501
Ammunition 73mm	three types	200,000	140,000
Rocket launcher	RM-70	150	158
Ammunition 122mm	for RM-70	200,000	205,000
Air defense msl systems	OSA-AK	3	3 (with 12 launchers)
AD-missiles	9 K-33 M2 and 3	408, later more	924
LAW	RPG-18	21,500	21,675
AT-missiles	9 M-111 and 9 M-111M	11,500	7,051
Ammunition 7.62mm	M-39 and M-43	40,000,000	5,473,712
Ammunition 7.62mm	M-39	16,210,228	16,210,228
Light trucks	UAZ 469 B	2,000	292
Trucks (POL)	Tatra 815 CA	20	
Trucks	Ural D 375	1,000	
MT-LB		unknown	at least 1
Multi-purpose towing veh.	ABPC	500	probably canceled
Bridging equipment	Ribbon	8	
Electrical generators	GAB-2, GAD-40 etc.	200	
Field kitchens		650	
Camouflage nets	different types	230,000	114,357
NBC-protection masks		260,000	260,000
Trucks	LO 2002 A	56	56
Additional equipment	different types	small	small

* *Examples of deliveries listed for October 1990 until March/April 1994*

Bundeswehr equipment delivered to Greece and Turkey

Part III: Surplus FRG Equipment Exported to Turkey

Type of Equipment	*Designation*	*Number Planned*	*Number Delivered**
Air defense guns	20mm twin gun	300	300
Ammunition AD gun 20mm	1 DM-81	4,000	4,000
Ammunition AD gun 20mm	4 DM-101	16,000	16,000
Steel helmets		500,000	500,000 (NVA?)
Main battle tanks	Leopard 1	85 + 85	170
APC	M-113	350 + 137	537
Bridge-laying tanks	M-48	10 + 10	20
Engineer tanks	M-48 A2G1	20	20
ARV tanks	M-88	20	20
Ammunition 105mm	DM-23 KE	100,000	100,000
Ammunition 105mm	DM-456 HEAT	15,000	15,000
Surface to Air Missiles	Redeye	300	300
Howitzers 203mm	M110	131	131
Ammunition 203mm	HE	30,000	30,000
Ammunition 203mm	Bomblet	9,900	9,900
Ammunition 175mm	DM-12 and DM-21	68,004	68,004
AA-missiles	Sidewinder AIM 9B	1,000	1,000
Ammunition 40mm for L70	DM-28	138,000	138,000
Ammunition 40mm for L70	DM-31	257,000	257,000
AD guns	L-70	260	260
RPV-systems	CL-89	unspecified	unspecified
Aircraft	RF-4	46	46

* *Examples for Deliveries listed for October 1990 until April 1994*

Part IV: Surplus FRG Equipment Exported to Greece

Type of Equipment	Designation	Number Planned	Number Delivered*
Support ship	Class 701	1	1
Landing boats	Class 521	11	11
Landing boats	Class 520	2	2
Harbor tug	Class 723	5	5
Torpedo recovery vessel	Class 430	2	2 (plus 2 delivered earlier)
Tetis Class corvettes	Class 420	5	5
FPB	Class 148	2	2
Machine gun	MG-3	75	75
AD guns 20mm	20mm twin gun	546	546
Ammunition 20mm	DM-101	1,092,000	1,092,000
Ammunition 20mm	DM-81	1,092,000	1,092,000
Aircraft	RF-4 E	20 (plus 7 in spares)	20 (plus 7 in spares)
Aircraft	F-104 G	12 (plus more earlier)	12 (plus more earlier)
Naval mines	DM-21/DM-39	n.a.	150
Machine guns	MG-3 and MG-3 A1	675	675
Howitzers	M-110 (203mm)	88	72
Main battle tanks	Leopard 1 GR2	75	75
ARV	M-88	25	25
Tank (bridging)		10	10
APC	M-113	200	200
Camouflage nets	different types	230,000	114,357

* *Examples of deliveries listed for October 1990 until April 1994*

Sources: *Bundesministerium der Verteidung, 15 April 1994, Attachment (an older version of this computer printout from the MoD, dating from 2 December 1993, was used to check the reliability); Wehrdienst 1315/1992 pp. 2-4; Wehrdienst 28/1993, p.4; Wehrdienst 13/1993, p.2; Bundesministerium der Verteidigung, 22 February 1991.*

Annex 4

Examples of NVA Deliveries for Technical Intelligence, Testing and Evaluation Purposes

T*ype of Equipment*	*Number Delivered*	*Year*	*Recipient*	*Remarks*
AT-missiles and launchers	about 20	n.a.	France	different types, partly on vehicles, delivery intended
Small fire arms				different types
SS-missile Frog-7	2		France	intended for delivery
Telecommunications equip.	various		France	probably delivered
IFF-Systems SRZO-2	3	1990	Israel	
SSM P-15	1	1990	Israel	
SSM P-21	1	1990	Israel	
SSM P-22	1	1990	Israel	
Air-to-air missiles	7 or 8	1990	Israel	AA-8, AA-10a and b, AA-11 and AA-7 were available
Air-to-surface missiles	6	1990	Israel	likely CH-25ML, MR; CH-29L,T and CH-58Ä were available
Radar for Mig-29	1	1990	Israel	returned in 1991
SAM SA-5 Seeker (warhead)	1	1990	Israel	
SAM SA-13	3	1990	Israel	likely to have included launcher vehicle
Spares T-72 tank		1990/1991	Israel	
FROG-7 warheads	n.a.	1990	Israel	two types available
Mine clearance equip.			Israel	EMT-7 and KMT-6 most likely included
Range finders	3		Israel	
Laser recon. system LPR-1	1		Israel	
Radar 'Big Fred'	1	1990 or 1991	Israel	
AT-missiles	15	1991	Israel	AT-3,-4 and 5 available
SA-16			Israel	launcher and missiles
AP- and AT-mines	ca 100	1991	Israel	
Spares Mig-23	1	1991	Israel	included engine, ext. tanks
Torpedo SAET 40	2	1991	Israel	
ECM-Pod	1	1991	Israel	
SA-6 reconnaissance + fire control	1	1991/1992	Israel	intercepted in Hamburg
SA-6 launch vehicle	1	1991/1992	Israel	(Hamburg)
Long track radar P40	1	1991/1992	Israel	(Hamburg) adv. ECCM sys.
AD-gun ZSU 23/4	2	1991/1992	Israel	(Hamburg)
Schilka maintenance vehicle	1	1991/1992	Israel	(Hamburg)

Truck KRAZ 214	2	1991/1992	Israel	(Hamburg)
Truck KRAZ B-255	2	1991/1992	Israel	(Hamburg; msl trsp. veh. P21 P22 and missiles ?)
Truck Zil 157	1	1991/1992	Israel	(Hamburg) msl trsp. veh. P15
Truck Zil 131	1	1991/1992	Israel	(Hamburg) msl trsp. veh. P15
Truck GAZ 66	2	1991/1992	Israel	(Hamburg)
Light truck UAZ 469	2	1991/1992	Israel	(Hamburg)
Spares for BMP-2	1	1991/1992	Israel	(Hamburg)
Spares for BMP-1	1	1991/1992	Israel	(Hamburg)
Chaff and flares launcher	1	1991/1992	Israel	(Hamburg)
Mine clearance equip. EMT-7	2	1990	UK	
AT-missiles		1991	UK	AT-4 and AT-7
Small arms	27	1991	UK	different types
Fighterbomber SU-22 M4	1	1991	UK	
SSM P21 with seeker warhead	1	1991	UK	
SSM P22 with seeker warhead	1	1991	UK	
Missile launcher RUBESH	1	1991	UK	
Torpedo SAET-40	2	1991	UK	
Naval mines		1991	UK	different types
Chaff and flare dispenser PK-16	1	1991	UK	
AD-gun AK-630	1	1991	UK	
SSM P-15	1	1991	UK	
Fighter bomber Mig-23BN	1	1992	UK	
SSM P21/P22	1	1992	NL	one each
Torpedo SAET-40	1	1992	NL	
FROG-7 SS-missile system	1	1992	USA	launcher, four msl, two warheads
Mine clearance equip. KMT-6	1	1991	USA	
Mine clearance equip. EMT-7	2	1991	USA	
Funkstörgranate DZW 90	12	1991	USA	different types
AP-mines PMP-2	192	1991	USA	
AT-mines TM-46	120	1991	USA	
AT-mines TM-62 M	128	1991	USA	
AT-mines TM-62 P3	112	1991	USA	
SA-13 missile	6	1991	USA	
SA-8 missile	12	1991	USA	
Battlefield surv. radar 1RL232	1	1991	USA	
Acc. measurem. sys. AZK-5	1	1991	USA	
AAM AA-8	1	1990	USA	
AAM AA-10	1	1990	USA	

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AAM AA-11	2	1990/1991	USA	
AAM AA-7 Guidance	1	1991	USA	
Mig-29 fighter ac.	1	1991	USA	returned
Mig-29 engines	2	1991	USA	
Mig-29 pilot helmet	1	1991	USA	
Spares package for SU-22	1	1991	USA	
SSM P21 with seeker warhead	1	1991	USA	
SSM P22 with seeker warhead	1	1991	USA	
SAM SA-5 missiles	?	?	USA	planned
ASM CH-25	3	1990	USA	three types
ASM CH-29	2	1990	USA	two types
ASM CH-58	6	1991	USA	
ASM CH-25	2	1991	USA	
Tarantul Class corvette	1	1991	USA	
MI-14 Haze helicopter	2	1991	USA	Naval ASW version
Naval mines	11	1992	USA	different types
AD-gun AK-630	1	1992	USA	
Torpedo SAET 40	2	1992	USA	
Chaff and flare dispenser PK-16	1	1992	USA	

***Note**: Most deliveries to Israel listed here are widely confirmed; additional Israeli requests have been approved since the end of 1991; probably additional deliveries not listed have been taking place. All deliveries to Israel are loans. Information on France is somewhat uncertain since parliament was informed only during preparations for delivery. UK information seems to be solid although more may have been supplied; US information is probably reliable.*

***Sources**: Deutscher Bundestag, 2 December 1991; Deutscher Bundestag, Verteidigungsausschuß, 10 December 1991; Kolbow/Stoltenberg, 1992; Gießmann, 1992, pp. 235-237; notes by journalist colleagues cross-checked by interviews with members of parliament and their researchers. UK and US information is mainly based on two detailed computer printouts (archives of a journalist colleague), German MoD, 6 December 1991; also, United Nations General Assembly, 1992 and 1993.*

Examples of Deliveries to the United States for Training Purposes

Type of Equipment	Number	Year	Remarks
T-72 MBT	59	1991	
T-72 MBT	27	1993	
T-55 MBT	11	1991	
BMP-1 AFV	19	1991	
BMP-2 AFV	15	1991	
BMP	2	1993	
MB-LT	14	1991	
MTP-LB	3	1991	
BTR-70	5	1991	
BTR-70	2	1993	
BTR-60 PB	3	1991	
BTR-50 PK	1	1991	
BTR-40 P2	2	1991	
BTR-40 with 9 P148 AT-system	5	1991	
122mm howitzer D-30	1	1991	
152mm howitzer D-20	2	1991	
SPH 2S1	5	1991	
SPH 2S1	6	1993	
SPH 2S3	5	1991	
SPH 2S3	4	1993	
RM-70 MRL	2	1991	
BM-21 MRL	4	1991	
AKLPz BRDM-1K	2	1991	
BM-24	2	1991	
100mm canon (AT)	7	1991	
Mig-23 ML/MLD aircraft	5	1991	
Mig 23	9	1993	
SU-22 M4 aircraft	2	1991	
Su-22	2	1993	
Mi-24 helicopters	2	1991	
Mi-24	1	1992	
SAM 9M33M3	72	1991	
SAM launcher 9A 338	12	1991	
120mm grenade launcher	1	1991	
Ammunitions	small	1991	100mm, 125mm, 122mm, various versions
Trucks		1991	various
Guided missiles	182	1992	various, not specified, NVA possibly

***Note**: Officially most of these deliveries have been categorized as being intended "for training purposes." It may be assumed that they have served technical intelligence purposes as well. They represent NVA army equipment otherwise not listed in the technical intelligence context. In addition, some items listed here have been exported in such small amounts that they may have been used for technical intelligence purposes but probably not for training purposes.*

***Sources:** United Nations General Assembly, 1992 and 1993; Wehrdienst 13/1993, p.4; Berliner Zeitung, 17 January 1992; computer printout from the German MoD, "Ausbildung," 6 December 1991 (archives of a jounalist colleage); Der Spiegel 47/991, p.26; Gießmann, 1992, p.236.*

Annex 5

Examples of Additional Exports from NVA Stocks

T*ype of Equipment*	*Number*	*Year*	*Recipient*	*Remarks*
Spares from SPH 2S1	228	1994/5	Sweden	
MB-LT Armored	809 ?	1992-??	Sweden	5 in 1992,
Personnel Carrier			9 in 1993	
T-72 MBT	5	1992	Sweden	
BMP-1	5	1993	Sweden	planned
A/S- missiles S5	8	1992	Sweden	item not clearly identified
T-72 MBT	8	1992	Canada	
T-72 MBT	1	1992	Belgium	
T-55 MBT	1	1992	Belgium	
BMP-1	1	1992	Belgium	
BTR-70	1	1992	Belgium	
SPH 122mm	2	1992	Belgium	
Mig-21	1	1992	Belgium	
Mig-23	1	1992	Belgium	
Parchim Class	16	1993/94	Indonesia	
FROSCH I class landing ships	12	1993/94	Indonesia	
FROSCH II class supply ships	2	1993/94	Indonesia	
Kondor-II Class miners	9	1993/94	Indonesia	
Spares and ammunition (tons)	5,000	1993-95	Indonesia	only incomplete details known, fitting with ships
Electrical generators	75	1994/95	Indonesia	
Field kitchens	150	1994/95	Indonesia	
Kondor Class	1	1991/92	Guinea	demilitarized; details details deal
Kondor-II Class	4	1991/2	Uruguay	without weapon systems
Tug (unspecified)	1	1991	Uruguay	
Piast Class	1	1991	Uruguay	
MI-24 attack helicopters	30-40	1995/6	Hungary	planned
Medical equipment for 3 co.	n.a.	1992	Hungary	
PTS	6	1993	Hungary	
Bremse Class CPB	2	1992	Malta	BGS stocks; corruption investigated
Kondor-I Class coastal patrol boat	4	1992	Tunisia	BGS stocks
Bremse Class CPB	5	1992	Tunisia	BGS stocks
Kondor-I Class CPB	2	1992	Malta	BGS stocks; corruption investigated
SAB-12 Class CPB	5	1992	Cyprus	BGS stocks
Bremse Class CPB	2	1992	Jordan	BGS stocks
OSA Class	6	1993	Estonia	partially demilitarized

Kondor-I Class	2	1993	Estonia	partially demilitarized*
OSA Class	3	1993	Lithuania	partially demilitarized
Kondor-I Class	1	1993	Lithuania	partially demilitarized
Kondor-II Class	2	1993	Latvia	partially demilitarized
OSA Class	3	1993	Latvia	partially demilitarized
OSA and Kondor	4	1993	Lithuania	intended
Trucks	200	1992/3	Estonia	
Trucks	200	1992/3	Latvia	
Trucks	200	1993	Lithuania	possibly not all delivered
L-410 transport aircraft	2	1992/3	Estonia	
L-410 transport aircraft	2	1993	Latvia	
L-410 transport aircraft	2	1993	Lithuania	
Trucks	9,000	1992	CIS	i.e., Russia, Ukraine, Kazakhstan
AK-47 Kalashnikovs	100,000		Finland	
MBT T-72	100	1991/2	Finland	
Artillery	447	1993	Finland	incl. 218 HD-30 howitzers
BMP-1	110	1993	Finland	
MB-LT	3	1992	Finland	
Ammunition	46,000 +		Finland	tons
BTR -70	149 +	149	UN	for UNPROFOR
AK-74	1	1991	NL	
AK-47	1	1991	NL	
AK-74	1	1991	Spain	with 50 rounds ammunition
AK-47	1	1991	Spain	with 50 rounds ammunition
KM-46 130mm mortar	92	1994/5	GR/US/ FI/SW	not clear from source,possibly Finland,planned
Iljuschin -62	3	1993	Egypt	private businessman

Sources: *Deutscher Bundestag, Document 12/1820, 1991; Deutscher Bundestag, 21 January 1994, p.12; Feldmayer, 1992; Schibli, 1992; Casdorf, 1992; Der Spiegel 29/1994, p.16; Gießmann, 1992, pp. 211-248; Mierzwa, 1993, pp. 59-69; Thielbeer, 1992. Deutscher Bundestag, Verteidigungsausschuß, Unterausschuß 'Streitkräftefragen in den neuen Bundesländern,' Protokoll der 18. Sitzung. pp.8+.*

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