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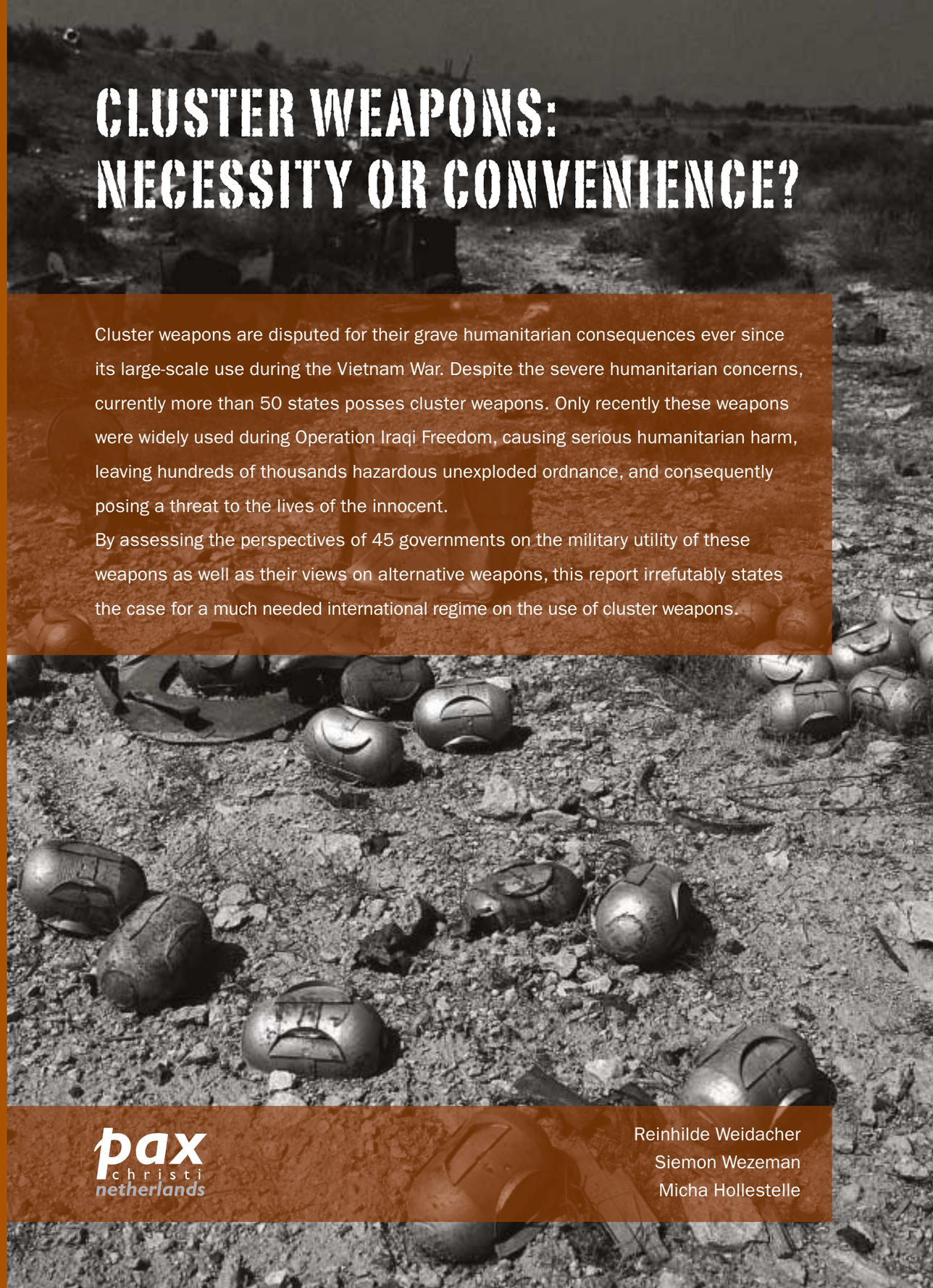

CLUSTER WEAPONS: NECESSITY OR CONVENIENCE?

Cluster weapons are disputed for their grave humanitarian consequences ever since its large-scale use during the Vietnam War. Despite the severe humanitarian concerns, currently more than 50 states posses cluster weapons. Only recently these weapons were widely used during Operation Iraqi Freedom, causing serious humanitarian harm, leaving hundreds of thousands hazardous unexploded ordnance, and consequently posing a threat to the lives of the innocent.

By assessing the perspectives of 45 governments on the military utility of these weapons as well as their views on alternative weapons, this report irrefutably states the case for a much needed international regime on the use of cluster weapons.

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Photographer: John Rodsted

Afghanistan 2002. An area north of Kabul is littered with unexploded AO2.5 submunitions. All live. All dangerous.

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CONTENT

I. SUMMARY

Cluster weapons commonly in service with the armed forces of a large number of countries across all regions disperse a large number of unguided submunitions, each with a significant failure rate, over a large area. Their use in past conflicts has caused significant un-intentional damage during attacks and left a large number of unexploded but armed explosives (UXO) in the field for many years. Both immediate and long term effects of the use of cluster weapons have raised serious concerns about whether they cause harm to civilians as well as soldiers that is disproportionate to their military utility.

International Humanitarian Law includes general principles - *distinction and proportionality* - restricting the means and methods of military attacks. It is widely acknowledged that these principles are relevant also for addressing the grave concerns raised by the use of cluster weapons. However, no general agreement has so far been reached about their specific implications for such use, or whether they prohibit the use of certain types of cluster weapons, or prohibit the use of cluster weapons in or near populated areas.

Restrictions on the use of cluster weapons have been on the agenda of international discussions for several decades. Since the mid-1970s NGOs as well as a number of states have urged the international community to prevent the suffering caused by the use of cluster weapons through the establishment of a legal regime restricting their use. However, governments have failed to provide sufficient information about the perceived utility of cluster weapons within current military doctrines and the related issue of procurement cycles. If a widely accepted balance is to be found between the military advantage that is anticipated to be obtained by the use of cluster weapons and the humanitarian costs such use can be expected to cause, access to information about perceived military utility is crucial.

A significant number of governments contend that cluster weapons are still an effective and sometimes decisive weapon, in specific circumstances, such as confrontations with large-scale moving targets, including, for example A significant number of governments contend that cluster weapons are still an effective and sometimes decisive weapon, in specific circumstances, such as confrontations with large-scale moving targets, including, for example, mechanised columns. At the same time, the few pieces of information made available about the utility of cluster weapons in general and specific types of cluster weapons in particular within current military doctrines appear to challenge such a position. For a significant number of countries anticipated conflicts are of a limited nature, and involvement often limited to peace-keeping or peace-enforcing missions where the use of indiscriminate weapons cannot be considered an option. Such operations require precision weapons that can be expected to cause limited un-intentional damage during and after use.

Old types of cluster weapons are therefore being replaced in the arsenals of a number of armed forces by precision weapons with unitary warheads.

However, large holdings remain: According to available information, 43 of the 45 countries upon which this survey focuses, have stockpiles of cluster weapons.

Issues related to weapons procurement cycles appear to be important factors delaying the withdrawal of obsolescent cluster weapons as well as their upgrade aimed at increasing their reliability and accuracy. Fusing technology has been available over the past 10 years that can significantly increase the reliability of submunitions and reduce the number of hazardous duds left in the field. A significant number of countries have acquired cluster weapons carrying submunitions with self-destruct fuzes.

Few governments, however, appear to be willing to retrofit current holdings. Moreover, the addition of back-up systems to increase submunition reliability alone does not constitute a satisfactory solution to the humanitarian problems caused by unexploded submunitions. Technology allowing for precise targeting can reduce the humanitarian problems caused by unguided cluster weapons during use. However, while such technology is available, it requires advanced industrial capabilities and is very costly.

There exists therefore a clear divide across countries and regions not only with regard to the perceived military utility of cluster weapons, but also with regard to their willingness and even ability to accept technical specifications for submunition reliability and accuracy. At the same time it must be emphasized that discussions on possible solutions to the problems caused by the use of cluster weapons have so far built upon limited information, especially with regard to the specific utility of cluster weapons within current military doctrines. If national assessments of the actual role of cluster weapons currently in service were carried out by a larger number of countries and if national authorities were willing to discuss their results within international forums, significant progress significant progress towards finding solutions to widely shared humanitarian concerns could be achieved.

II. RECOMMENDATIONS

Destruction

1. States Parties holding residual stocks of cluster weapons maintained in spite of the fact that military doctrine does not envision any future military utility for these weapons should destroy them.

Collection and disclosure of relevant information

2. State Parties to the CCW Convention should agree to make detailed information available to all other parties to the CCW Convention as well as to a more general public, such as NGOs, on the following topics:
- **a)** current holdings of submunitions (amount, type & date of acquisition);
- **b)** the results of reliability tests and about parameters applied; and
- **c)** efforts carried out or planned to improve the reliability and accuracy of submunitions in the inventory of the national armed forces, including related financial costs.

3. States Parties that have used submunitions with improved fuzing and guidance systems in recent military operations should carry out a swift investigation into the actual relevance of such improvements for minimizing the occurrence of UXO and disproportionate collateral damage.
[Examples are the use of 155mm ERBS artillery shells by UK forces in Iraq in 2003 and the CBU-105 cluster bombs used by US forces in Iraq in 2003. What impact did self-destruct fuzes and WCMD have on operational reliability and accuracy?]

4. States Parties should initiate a review of the specific military utility of cluster weapons as perceived by their armed forces and in armed conflicts they anticipate. The findings of these reviews should be presented and subject to discussion during the coming CCW inter-sessional meetings of military experts.

5. States Parties should disclose their views with regard to alternative weapons and their anticipated humanitarian costs.

Negotiations

6. Within a broad interpretation of the mandate (including the issue of disproportionate collateral damage during attack), and departing from a human security perspective, State Parties must address issues of IHL concerning the use of cluster weapons. Departing from a human security perspective, the discussion should include:
- **a)** the military utility and humanitarian cost of anti-personnel versus anti-armour submunitions;
- **b)** clear restriction on the use of cluster weapons in (semi) urban settings;
- **c)** problems regarding targeting decisions;
- **d)** the validity of ad hoc, case by case evaluations of the legitimacy of the use of cluster weapons; and
- **e)** user responsibility regarding short and long term consequences of dud rates (clearance, removal, destruction).

7. If these recommendations cannot be pursued within the CCW mandate and/or as a result of the conservative attitude of some State Parties within, progressive State Parties ought to consider setting the humanitarian standard for the use of cluster weapons:
- **a)** on a voluntary basis in their rules of engagement like Australia in Iraq;
- **b)** in close co-operation with each other and the members of the CMC.

III. GLOSSARY

IV.I. Acronyms

BLU	Bomb Live Unit
CBU	Cluster Bomb Unit
CCW	Convention on Certain Conventional Weapons
CMC	Cluster Munition Coalition
ERW	Explosive Remnants of War (see definitions below)
ICRC	International Committee of the Red Cross
IHL	International Humanitarian Law
MRL/MLRS	Multiple Rocket Launcher; Multiple Launch Rocket System
NATO	North Atlantic Treaty Organization
UXO	Unexploded explosive Remnants of War (see definitions below)
WTO	Warsaw Treaty Organization (Warsaw Pact)

IV.II Definitions

Key Terms

Cluster weapons or **cluster munitions**. Cluster munitions are containers designed to disperse or release multiple sub-munitions. [This includes containers or parents that are carried on or delivered by an aerial platform or fired from ground or sea-based systems. It includes containers variously referred to as cluster bombs, cluster weapon systems, cluster dispensers, cluster munitions shells, etc. This definition refers only to conventional weapons.][1]

In order to avoid confusion between 'cluster munitions' and 'submunitions' (see below), the complete weapon is referred to as 'cluster weapon' (except in direct quotes that use 'cluster munition').

Submunitions refers to any munition that, to perform its tasks, separates from a parent munition. [It includes all munitions/explosive ordnance designed to explode at some point in time following dispersal or release from the parent cluster weapon.
It includes munitions that are sometimes referred to as bomblets, grenades, remotely delivered landmines and "improved conventional munitions". This definition refers only to conventional weapons.][2]

Unexploded Explosive Ordnance (UXO) is "explosive ordnance which has been primed, fuzed, or otherwise prepared for action, and which has been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel or material and remains unexploded either by malfunction or design or for any other cause."[3]

Explosive Remnants of War (ERW) refers to both unexploded explosive ordnance and abandoned explosive ordnance. [Abandoned explosive ordnance means explosive ordnance that has not been used during an armed conflict, that has been left behind or dumped by a party to an armed conflict, and which is no longer under control of the party that left it behind or dumped it. Abandoned explosive ordnance may or may not have been primed, fuzed, armed or otherwise prepared for use.[4]]

[1] UNMAS, UNDP and UNICEF, Proposed definitions for cluster munitions and submunitions, Group of Governmental Experts of The Parties To The 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, Working Group on Explosive Remnants of War, CCW/GGE/X/WG.1/WP3, 8 Mar. 2005; available at URL http://documents.un.org/.

[2] UNMAS, UNDP and UNICEF, Mar. 2005.

[3] US Department of Defense, Dictionary of Military and Associated Terms (as amended through 30 Nov. 2004).

[4] Protocol on Explosive Remnants of War (Protocol V to the 1980 Convention), 28 Nov. 2003, fulltext available at URL http://www.icrc.org/ihl.nsf/385ec082b509e76c41256739003e636d/c110d2926d08a892c1256e280056b275?OpenDocument.

Related terms

Accuracy refers to the measurement of how likely the cluster weapon or the submunition will hit its intended target.

Air-delivered weapons are weapons carried and fired or dropped from an aircraft (including helicopter or UAV) or by a guided long-range missile. Generally air-delivered cluster weapons carry a larger number submunitions than artillery-delivered weapons.

Artillery-delivered weapons are weapons fired from a surface-based (including sea-based) delivery system, generally a piece of artillery (gun, howitzer, mortar, rocket-launcher).

Collateral damage refers to "unintentional or incidental injury or damage to persons or objects that would not be lawful military targets in the circumstances ruling at the time. Such damage is not unlawful so long as it is not excessive in light of the overall military advantage anticipated from the attack."[5]

Dud is a submunition that failed to explode on impact or as designed. Duds have often activated fuzes and are therefore not inert or de-activated.

Dud rate or **failure rate** refers to the percentage of duds.

Fuze is a device which initiates the explosion of the submunition. This can either be a fuze set to act on impact or a timer set to explode the submunition after a certain time.

Primary fuze is the main fuze to explode the submunition at the time planned (on impact or after a set time).

Secondary fuze or self-destruct fuze is a fuze additional to the primary fuze and meant to explode the submunition when the primary fuze fails. It generally makes use of a timer.

Reliability refers to the measurement of function of the cluster weapon or the submunitions.

Self-deactivation and **self-neutralization mechanism** refers to the system of undoing the arming of the primary fuze (often a timer) or to neutralise the explosive at a pre-set time. The munition will not explode and will become inert.

[5] US Department of Defense, Dictionary of Military and Associated Terms (as amended through 30 Nov. 2004), Collateral damage, at URL http://www.dtic.mil/doctrine/jel/doddict/data/c/01014.html.

1. INTRODUCTION

A series of recent reports and testimonies by, among others, the Geneva International Centre for Humanitarian Demining, the International Committee of the Red Cross (ICRC), Human Rights Watch, Handicap International, and the Mennonite Central Committee,[6] have documented the humanitarian suffering caused by the use of cluster weapons in past and ongoing armed conflicts. The knowledge that cluster weapons cause humanitarian problems during and after the conflict is not new, as witnessed from earlier reports.[7]

Cluster weapons that have been widely used in past - and are used in ongoing - armed conflicts, have in common that they disperse a large number of unguided submunitions with a significant failure rate over a large area. These weapons have proved to cause significant unintentional damage during attacks and leave a high rate of unexploded explosives on the field. Both immediate and long term effects of the use of cluster weapons have raised severe concerns about whether they cause harm to civilians that is *disproportionate to their military utility*.

Improvements to cluster weapons designs are possible - with regard to both increased reliability and increased accuracy. Technological developments are driven primarily by military requirements and budgetary constraints. While some countries have undertaken efforts to improve both accuracy and reliability - or are in the process of doing so - most currently existing cluster weapons and submunitions still have higher failure rates and lower accuracy than need be. Technology is available to do better.

1.1. Purpose of the survey

The overall aim of this survey is to contribute to a better understanding of the *actual efforts* undertaken to prevent disproportionate physical harm to civilians and damage to civilian property caused by the use of cluster weapons, in relation to the technical *possibilities* for doing so.

The key research question concerns the *perceived military utility of cluster weapons* against the background of their high humanitarian cost. Reservations about the sufficiency of technical solutions and the adequacy of existing International Humanitarian Law to prevent the humanitarian problems caused by the use of cluster weapons call attention to the need for a thorough assessment and evaluation of the actual military requirement for cluster weapons.

This is not to support the idea that only weapons that are perceived to have limited military utility can or should be prohibited. It is rather an attempt to explore the actual possibilities for preventing the use of cluster weapons as weapons of convenience in situations were the use of alternative weapons can be expected to cause less suffering among civilians. Governments of 45 countries have been contacted and asked for information about their positions and policies with regard to the use of cluster weapons. A list of these countries in provided in appendix I. The military utility of cluster weapons is under investigation in a number of countries on a national level. Efforts based on technical solutions have been completed or initiated by a small number of countries, and are planned by more countries. Our findings are therefore fragmentary.

We would like to thank those that have shared their perspectives and experience. While it was not originally intended to devote particular attention to the issue of transparency within this survey, the poor response rate has led us to add a brief summary of the availability of information in appendixes I-IV.

[6] See for instance: Prokosh, Eric, The Technology of Killing. A Military and Political History of Antipersonnel Weapons, Zed Books, 1995; McGrath, Rae, Cluster Bombs: The Military Effectiveness and Impact on Civilians of Cluster Munitions, commissioned by the UK Working Group on Landmines and Mennonite Central Committee US, UK Working Group on Landmines, 2000; available at URL http://www.landmineaction.org/resources/Cluster_Bombs.pdf; Wiebe, Virgil, and Peachey, Titus, Drop Today, Kill Tomorrow: Cluster Munitions as Inhumane and Indiscriminate Weapons, Mennonite Central Committee US, Dec. 1997 (revised June 1999); available at URL http://www.mcc.org/clusterbomb/drop_today/; Handicap International, Cluster Munition Systems: Situation and Inventory, 2003; Geneva International Centre for Demining, Explosive Remnants of War (ERW): Warnings and Risk Education, May 2003; International Committee of the Red Cross (ICRC), Cluster Bombs and Land Mines in Kosovo: Explosive Remnants of War, 2001; available at URL http://www.icrc.org/web/eng/siteeng0.nsf/htmlall/p0780/$File/ICRC_002_0780.PDF!Open; Human Rights Watch, at URL http://www.hrw.org/doc/?t=arms_clusterbombs.

[7] Westing, Arthur H., Explosive Remnants of War: Mitigating the Environmental Effects, Stockholm International Peace Research Institute (SIPRI) and United Nations Environment Programme, Taylor & Francis, 1985; Lumsden, M., Anti-personnel Weapons, Stockholm International Peace Research Institute (SIPRI), Taylor & Francis, 1978.

1.2. Outline

The second part of the paper describes the dynamics of the international debate about the humanitarian costs of the use of cluster weapons since the mid-1970s and outlines the key issues discussed: humanitarian concerns and relevant principles of existing International Humanitarian Law, as well as military utility of cluster weapons as perceived by different armed forces.

The third part discusses possible technical solutions for decreasing the humanitarian costs of the use of cluster weapons. It looks at technical improvements on cluster weapons and submunitions as well as at the possibility of employing alternative weapons which carry a lower humanitarian cost. Part four presents the findings of the survey.

Appendix I provides a list of the states contacted for the purpose of this survey and appendix II lists the questions asked to states. Appendix III provides a short summary of information received from arms producing companies contacted for the purpose of this survey. Finally, appendix IV offers a summary of available information about producers of cluster weapons and submunitions.

2. THE DEBATE

"Die zahlreichen Auseinandersetzungen, die zum Alltag vieler Menschen gehören, werden charakterisiert durch immer effizientere Waffen, beispielsweise Streubomben, welche die Zivilbevölkerung zur eigentlichen Zielscheibe machen."[8]

"At the very least, their reputation as an indiscriminate weapon risks international condemnation, undermining popular support for an action."[9]

Modern cluster weapons have been used in armed conflicts since the early 1960s. First reports about the severe humanitarian problems caused by these weapons in Vietnam and Laos emerged in the early 1970s.[10] Since then numerous organizations have documented the immediate and long-term negative effects of the extensive use of cluster weapons in, among others, Chechnya, the Gulf War of 1991, Kosovo, Afghanistan and Iraq.[11]

As a result restrictions on the use of cluster weapons have been on the agenda of international discussions for several decades.

2.1. History of the debate

At the 'Conference of Government Experts on Weapons that May Cause Unnecessary Suffering or Have Indiscriminate Effects' held in 1974 under the auspices of the ICRC in Lucerne (Switzerland), Sweden - supported by Egypt, Mexico, Norway, Sudan, Switzerland, and Yugoslavia - presented a proposal for an international agreement on the prohibition of cluster weapons and other categories of conventional weapons. The proposal was rejected by the majority of government experts present. Eric Prokosh, who participated in the conference, concluded:

"What was the saddest thing about the Lucerne conference was its failure to come to grips with one of the direst developments of the Vietnam war: the emergence of wide-area anti-personnel weapons."[12]

The discussions at the second session of the conference, held in Lugano in 1976, did not bring about any changes, in spite of a call for a ban on anti-personnel cluster weapons supported by 13 states.[13] The 13 states submitted a working paper arguing that

"(...) these anti-personnel fragmentation weapons tend to have both indiscriminate effects and to cause unnecessary suffering. At detonation a vast number of small fragments or pellets are dispersed evenly covering a large area with a high degree of probability of hitting any person in the area. The effect of such a detonation on unprotected persons - military or civilian - in the comparatively large target area is almost certain to be severe with multiple injuries caused by many tiny fragments. Multiple injuries considerably raise the level of pain and suffering. They often call for prolonged and difficult medical treatment and the cumulative effect of the many injuries increases the mortality risk."[14]

Discussion continued at the United Nations 'Diplomatic Conference on the Re-affirmation and Development of International Law Applicable in Armed Conflicts' - the conference that lead up to the adoption of the '1977 Protocols' to the 'Fourth Geneva Convention'. The protocols however failed to

[8] The numerous conflicts that are part of every-day LIVE for a large number of people are characterized by the use of more efficient types of weapons - for instance cluster bombs, which actually target the civilian population (unofficial translation). Schweizerischer Bundesrat, Aussenpolitischer Bericht 2000, Präsenz und Kooperation: Interessenwahrung in einer zusammenwachsenden Welt, 15 Nov. 2000, available at http://www.eda.admin.ch/eda/g/home/recent/rep/forpol.Par.0006.UpFile.pdf/rp_001115_fpr-bbivs-g.pdf.

[9] House of Commons, Defence Committee, Fourteenth Report, Lessons of Kosovo, 2000, available at URL http://www.parliament.the-stationery-office.co.uk/pa/cm199900/cmselect/cmdfence/347/34702.htm.

[10] See Martin, Earl S., and Hiebert, Murray, 'Explosive remnants of the Second Indochina War in Viet Nam and Laos', pp. 39 -49, in Westing, Arthur H., Explosive Remnants of War: Mitigating the Environmental Effects, Stockholm International Peace Research Institute (SIPRI) and United Nations Environment Programme, Taylor & Francis, 1985.

[11] See footnote 1.

[12] Prokosh, Eric, 1995, p. 153. Prokosh represented the Friends World Committee for Consultation, an international organization of the Religious Society of Friends (Quakers).

[13] The ban was supported by Algeria, Austria, Egypt, Lebanon, Mali, Mauritania, Mexico, Norway, Sudan, Switzerland, Venezuela, and Yugoslavia.

[14] Mennonite Central Committee, Call for a moratorium on cluster bomb use, production, and transfer, (as revised Apr. 2003); at URL http://www.mcc.org/clusterbomb/moratorium/#fn1.

address the issue of possible restrictions on - or prohibitions of - the use of specific weapons.
A special UN conference was therefore convened in 1979. The conference resulted in the signatures in 1981 of the 'Convention on Prohibitions or Restrictions on the Use of Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects' (CCW Convention). [15]

2.1.1. Developments within the framework of the CCW Convention

The convention is an 'umbrella treaty'. The four specific agreements, which had been added to the convention in the form of protocols by the mid-1990s, did not specifically address the issue of cluster weapons. Nonetheless, the CCW Convention and its institutional setting continued to provide the main framework for ongoing international discussions about the use of cluster weapons.

Cluster weapons received only limited attention during the meetings of government experts leading up to the 'First Review Conference of the CCW Convention' in 1995.[16] An ICRC report prepared for the review conference emphasized that "the use of cluster bombs has increased tremendously over the last 30 years." Focusing on the issue of ERW the report recommended that the review conference should seriously consider making the use of self-destruct devices for submunitions mandatory as this was technically possible.[17] However, the conference, which focused on a possible revision of the protocol on the use of land-mines, booby traps and similar devices and a new protocol on the use of blinding laser weapons, issued no such requirement.

Meanwhile negotiations outside the framework of the CCW Convention and the Conference on Disarmament led to the signature of the 'Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction' in late 1997. After weeklong deliberations in Oslo, the treaty was finally signed in Ottawa. The Convention was the result of what is commonly referred to as the "Ottawa Process", a Canadian-led initiative that built on close cooperation between governments and NGOs.

The 'Second Review Conference of the CCW Convention' was held in December 2001.
Two proposals addressing the humanitarian problems caused by submunitions were submitted. Switzerland proposed the adoption of a new protocol on technical specifications to prevent submunitions from becoming explosive remnants of war and including a 98 per cent reliability requirement.

The ICRC proposed the adoption of a new protocol establishing responsibility for clearance and processes for information sharing. The proposal also included specific restrictions on the use of cluster weapons:

> *"it called for a prohibition on the use of submunitions against any military objective situated within a concentration of civilians. The reason for this rule is that not only do large numbers of submunitions fail to explode as intended after they are dropped or launched (an estimated average of 10 per cent-20 per cent), but because of their devastating area-wide impact these weapons have indiscriminate effects in civilian areas even when they function properly."*[18]

The conference did not adopt any of the proposals submitted, but set up a Group of Government Experts to address concerns related to ERW next to concerns related to the use of Mines Other Than Anti-Personnel Mines (MOTAPM). The mandate of the group of experts with regard to ERW was defined as including the following:

> *"(...) the Group shall consider all factors, appropriate measures and proposals, in particular: 1. factors and types of munitions that could cause humanitarian problems after a conflict; 2. technical improvements and other measures for relevant types of munitions, including sub-munitions, which could reduce the risks of such munitions becoming ERW; 3. the adequacy of existing International Humanitarian Law in minimising post-conflict risks*

[15] A summary of the status of ratification of the CCW Convention and its Protocols as of end of Jan. 2005 is available at the website of the German Ministry for Foreign Affairs, at URL http://www.auswaertiges-amt.de/www/de/infoservice/download/pdf/friedenspolitik/abruestung/status_vn.pdf.

[16] Prokosh, Eric, 1995, p. 153.

[17] ICRC, 'Report of the ICRC for the review conference of the 1980 UN conventions on Prohibitions or restrictions on the use of certain conventional weapons which may be deemed to be excessively injurious or to have indiscriminate effects', International Review of the Red Cross, N.299, 30 Apr. 1994, pp. 123-182, available at URL http://www.icrc.org/Web/Eng/siteeng0.nsf/html/57JMCR.

[18] Maresca, Louis, 'Second Review Conference of the Convention on Certain Conventional Weapons', ICRC, International Review of the Red Cross, N.845, 31 Mar. 2002, pp. 255-262

of ERW, both to civilians and to the military; 4. warning to the civilian population, in or close to, ERW-affected areas, clearance of ERW, the rapid provision of information to facilitate early and safe clearance of ERW, and associated issues and responsibilities; 5. assistance and co-operation."[19]

NGOs welcomed the formation of an expert group but urged governments to take immediate action. A group of 50 NGOs in 12 countries called for an

"immediate moratorium on the use, production and transfer of cluster weapons, covering air-dropped munitions as well as submunitions delivered by missiles, rockets and artillery projectiles, to remain in effect until effective agreement on explosive remnants of war was reached."[20]

At the end of 2002 the group of government experts on ERW asked to be given a new mandate to negotiate during 2003 an instrument on "post-conflict remedial measures of a generic nature which would reduce the risks of ERW."[21] The new treaty was adopted on 28 November 2003 and is the fifth protocol to the CCW Convention.

PROTOCOL ON EXPLOSIVE REMNANTS OF WAR (Protocol V to the 1980 Convention)[22]
The protocol determines responsibilities with regard to the clearance, removal or destruction of explosive remnants of war.
The Technical Annex to the protocol specifies generic preventive measures for improving the reliability of munitions, and therefore minimising the occurrence of explosive remnants of war. Such measures are not made compulsory but are suggested as voluntary best practices. Member states producing or procuring explosive ordnance are encouraged to ensure the best possible long-term reliability of explosive ordnance.

Eight (Croatia, Finland, Germany, India, Lithuania, Sierra Leone, Sweden and Ukraine) states parties to the CCW Convention had ratified the Protocol on ERW by late May 2005.[23]

For 2004 the group of government experts on ERW was given a new mandate to

"continue to consider the implementation of existing principles of International Humanitarian Law and to further study, on an open-ended basis, and initially with particular emphasis on meetings of military and technical experts, possible preventive measures aimed at improving the design of certain specific type of ammunitions, including sub-munitions, with a view to minimize the humanitarian risk of them becoming explosive remnants of war."[24]

On the basis of this mandate and in spite of the awareness shared by many delegations to the meetings, that submunitions in general pose particularly grave concerns from a humanitarian point of view, discussions continued to focus throughout 2004 on design features and technological improvements as a way to prevent humanitarian problems. At the same time the key underlying question of the actual military utility of cluster weapons received very limited attention until early 2005.

2.1.2. Cluster Munition Coalition

In response to the slow pace of international consultations and the partial approach to the humanitarian problems caused by the use of cluster weapons, a new international coalition was launched on 13 November 2003, the Cluster Munition Coalition (CMC). The coalition was founded by 80 organisations from forty-two countries and calls for a moratorium on "the use, production or trade of cluster weapons until the humanitarian problems associated with these

[19] Report of the Second Review Conference of the States Parties to the 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, Dec. 2001; available at URL http://www.ccwtreaty.com/report.htm#final.

[20] Report of the Second Review Conference, Dec. 2001.

[21] CCW/CCE, Explosive Remnants of War: The Way Forward, Note by the Co-ordinator on Explosive Remnants of War (ERW), Group Of Governmental Experts Of The Parties To The 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, CCW/GGE/III/WP.1, 2 Oct. 2002; at URL http://www.ccwtreaty.com/KeyDocs/GGE3/CCW-GGE-III-WP1-E.pdf.

[22] The full text of the Protocol on ERW is available at the ICRC website at URL http://www.icrc.org/ihl.nsf/WebFULL?openview.

[23] A summary of the status of ratification of the CCW Convention and its Protocols is available at the website of the German Ministry for Foreign Affairs, at URL http://www.auswaertiges-amt.de/www/de/infoservice/download/pdf/friedenspolitik/abruestung/status_vn.pdf.

[24] CCW/GGE, Working Group on Explosive Remnants of War, Note by the Co-ordinator, Group Of Governmental Experts Of The Parties To The 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, CCW/GGE/VII/WG.1/WP.1, 8 Mar. 2004; available at URL http://www.ccwtreaty.com/KeyDocs/GGE7/CCW-GGE-VII-WG1-WP1-E.pdf.

weapons have been resolved."[25] Also, the coalition urges states to provide increased resources for victims and to accept responsibilities for clearance and the provision of relevant information. The coalition welcomed the Protocol on ERW as a useful addition to International Humanitarian Law (IHL) but stressed its weakness in scope - referring to post-conflict remedial measure of a generic nature - and in language - leaving too much discretion to states in the interpretation and implementation of their obligations.

2.1.3. EU Parliament and national developments

On 28 October 2004 the European Parliament adopted a resolution on cluster weapons, calling for

> *"an immediate moratorium on the use, stockpiling, production, transfer or export of cluster munitions, including air-dropped cluster munitions and submunitions delivered by missiles, rockets, and artillery projectiles, until an international agreement has been negotiated on the regulation, restriction or banning of these weapons".*[26]

The EU Parliament resolution is however not mandatory for EU member states, and had as of mid-2005 not received widespread support in the national parliaments or governments of EU member states.

International negotiations both are a result of, and result in discussions on the national level. National discussions in both the USA and the United Kingdom followed from evaluations of whether the use of cluster weapons in the Gulf War of 1991 and in the Kosovo conflict had been appropriate or legitimate in view of both military and humanitarian problems caused.

A 2000 United Kingdom House of Commons Defence Committee report contended that "the weaknesses of the cluster bombs were highlighted in the Kosovo air campaign" and stated:

> *"At the very least, their reputation as an indiscriminate weapon risks international condemnation, undermining popular support for an action. The UK needs a more discriminatory anti-armour system in order to move to an early end to reliance upon recourse to these weapons in inappropriate circumstances."*[27]

In January 2001 the US Secretary of Defence issued a memorandum on submunition reliability stating:

> *"Submunition weapons employment in Southwest Asia and Kosovo, and major theater war modeling, have revealed a significant unexploded ordnance (UXO) concern . . . . It is the policy of the DoD to reduce overall UXO through a process of improvement in submunition system reliability-the desire is to field future submunitions with a 99% or higher functioning rate."*[28]

The Norwegian Parliament issued a decision in June 2001 which asked the government to actively support international efforts aimed at banning the use of cluster bombs, in line with the ban on anti-personnel mines.[29] In response to this call the Norwegian government stated in August 2001 its decision to pursue as a first priority an international agreement regulating the use of cluster weapons, and secondly an agreement on the prohibition of specific types of cluster weapons.[30]

The Australian Senate passed a motion in October 2003 calling upon the government to support a moratorium on the production, transfer and use of cluster weapons.[31] A law proposal for the amendment of the national law ratifying the anti-personnel mine

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[25] Pax Christi Netherlands, Conference Report: International Launch Conference.,Cluster Munition Coalition, 12-13 Nov. 2003, The Hague, The Netherlands; available at URL http://www.passievoorvrede.nl/upload/wapens/041113_report_conference_CMC.pdf.

[26] The full text of the resolution is available at the website of the European Parliament at URL http://www2.europarl.eu.int/omk/sipade2?PUBREF=-//EP//TEXT%2BTA%2BP6-TA-2004-0048%2B0%2BDOC%2BXML%2BV0//EN&LEVEL=3&NAV=X.

[27] House of Commons, Defence Committee, Fourteenth Report, Lessons of Kosovo, 2000, available at URL http://www.parliament.the-stationery-office.co.uk/pa/cm199900/cmselect/cmdfence/347/34702.htm.

[28] Quoted in United States General Accounting Office (GAO), Military Operations Information on U.S. Use of Land Mines in the Persian Gulf War, Report to the Honorable Lane Evans, House of Representatives, Sep. 2002; available at URL http://www.gao.gov/new.items/d021003.pdf.

[29] "Stortinget ber Regjeringen om å gi aktiv støtte til internasjonalt arbeid som kan lede fram til et forbud mot klasebomber, på linje med forbudet mot antipersonellminer." Vedtak nr. 667, 14. juni 2001. See 2 Anmodningsvedtak stortingssesjonen (2000-2001), at URL http://odin.dep.no/smk/norsk/dok/stortingsmeldinger/001001-040003/hov002-bn.html.

[30] "En tilnærming basert på i første omgang regulering av bruk, for så å bevege seg over til forbud mot nærmere definerte «klasebomber», vil for øvrig være i tråd med den som førte fram til totalforbudet mot antipersonellminene." 'Utenriksdepartementet uttaler i brev datert 14. august 2001', in 2 Anmodningsvedtak stortingssesjonen (2000-2001), at URL http://odin.dep.no/smk/norsk/dok/stortingsmeldinger/001001-040003/hov002-bn.html.

[31] The Parliament of the Commonwealth of Australia, Journals of the Senate, No. 103, 8 Oct. 2003, available at URL http://www.aph.gov.au/Senate/work/journals/2003/jnlp_103.pdf.

treaty to include a prohibition of submunitions, presented in late 2004, is discussed in the Italian Senate.[32] A similar law proposal was presented in Belgium in early 2005.[33]

Also in early 2005 the German Green Party obtained a commitment from its government coalition partner to accelerate the withdrawal of obsolescent cluster weapons (with submunitions without self-destruct mechanisms and a failure rate of more than 1 per cent), in exchange for the Green Party's agreement to other military procurement plans.[34]

While international negotiations have so far not resulted in binding restrictions applied specifically to the use of cluster weapons, some countries have introduced restrictions on a national level, in particular with regard to weapon design (see below). National campaigns driven by some member organizations of the CMC have accelerated - if not triggered - a review of military requirements with regard to cluster weapons and a debate about the adequacy of existing international humanitarian law and its implementation with regard to the use of cluster weapons. This debate is ongoing and its overall outcome uncertain.

2.1.4. The way forward

The Third Review Conference of the States Parties to the CCW Convention is scheduled to be held in 2006. If the group of government experts will not have reached a binding agreement on preventive measures with regard to ERW in general and submunition in particular by the end of 2005, those parties to the discussion that seek a constructive approach may search for alternatives forums.
Already at the end of 2004 the CMC voiced its dissatisfaction about the fact that a solution for the humanitarian problems related to the use of cluster weapons has so far not been achieved within the framework of the meetings of government experts. Also single states parties to the CCW Convention appeared to be interested in discussions within other forums in order to accelerate the process.

Continued meeting of government experts within the framework of the CCW Convention are not likely to lead to any agreement unless a larger number of states parties are willing to participate in a more engaged and open way. Many states do not appear to have the capacity to investigate their own position on the use of cluster weapons or the perceived utility of cluster weapons within their own military doctrine, nor do many of those states appear to have the possibility or willingness to invest resources to attain such a capacity. The often very limited number of disarmament experts in the service of governments of smaller countries in particular, deal with a range of issues, covering both conventional and non-conventional weapons. They often are forced by budget and manpower restraints to focus on one or a few disarmament issues, and to neglect issues perceived to be less urgent or less rewarding.

States failed so far to provide sufficient information about the perceived military utility of cluster weapons and the related issue of procurement cycles.
This type of information is crucial for an assessment of the balance to be found between the military advantage that is anticipated to be obtained by the use of cluster weapons and the humanitarian costs such use can be expected to cause. IHL requires that such a balance be found.

The following sections seek to outline the key issues for a constructive debate about possible or necessary restrictions of the use of cluster weapons. These are, firstly, humanitarian concerns related to the use of cluster weapons and the adequacy of existing International IHL to address these. Consequently the perceived military utility of cluster weapons is explored in more detail.

2.2. Humanitarian concerns and International Humanitarian Law

"If nations must continue to resort to war to address their international problems, then such especially inhumane weapons should be outlawed."[35]

"We will use them (cluster bombs) only when enemies invade our country (...) Our country has no intention of using them in other countries and killing people inhumanely."[36]

[32] Senato della Repubblica, Disegno di legge N. 3152, Oct. 2004, available at URL http://www.senato.it/japp/bgt/showdoc/frame.jsp?tipodoc=Ddlpres&leg=14&id=125960.

[33] Belgische Senaat, Zitting 2004-2005, 1 Apr. 2005, Voorstel van wet tot aanvulling van de wet van 3 januari 1933 op de vervaardiging van, de handel in en het dragen van wapens en op de handel in munitie, wat betreft de fragmentatiebommen (Ingediend door de heer Philippe Mahoux), 3-1152/1, available at URL http://www.senate.be/ (publications).

[34] Die Welt, 'Grüne geben Widerstand gegen „Meads" auf', 18 Apr. 2005, available at URL http://www2.welt.de/data/2005/04/18/706786.html.

[35] Martin, Earl S., and Hiebert, Murray, 1985.

[36] Taiwan Security Research, 'Japan Defends Cluster Bombs', 19 Apr. 2003; CNN.com; at URL http://taiwansecurity.org/CNN/2003/CNN-041903.htm.

There exists no specific legal regime regulating the use of cluster weapons. However, IHL includes general principles restricting the means and methods of military attacks. These principles are distinction and proportionality. They are relevant also for addressing the grave concerns raised by the use of cluster weapons:

(a) disproportionate harm to civilians and damage to civilian property during military attacks due to the indiscriminate nature of cluster weapons, and

(b) the extraordinary high number of unexploded submunitions likely to cause injuries and casualties among civilians long after military attacks.

DISTINCTION AND PROPORTIONALITY

Convention IV of the Geneva Conventions of 1949 refers to the Protection of Civilian Persons in Time of War. As mentioned above, in the early 1970s the United Nations convened a Diplomatic Conference on the Re-affirmation and Development of International Law Applicable in Armed Conflicts with the task of addressing concerns arising from new type of wars and the use of new means of warfare - all of which had considerably weakened the protection of civilians.

In 1977 the conference agreed on two additional protocols to the Geneva Conventions of 1949.37 Protocol II extended the principles of the Geneva Conventions to armed conflicts that are not of an international character, while Protocol I reaffirmed and expanded the prohibition to use weapons that cause superfluous injury or unnecessary suffering and the prohibition against indiscriminate attacks.

Article 48: In order to ensure respect for and protection of the civilian population and civilian objects, the Parties to the conflict shall at all times distinguish between the civilian population and combatants and between civilian objects and military objectives and accordingly shall direct their operations only against military objectives.

Article 51(4): Indiscriminate attacks are prohibited. Indiscriminate attacks are: (a) those which are not directed at a specific military objective; (b) those which employ a method or means of combat which cannot be directed at a specific military objective; or (c) those which employ a method or means of combat the effects of which cannot be limited as required by this Protocol; and consequently, in each such case, are of a nature to strike military objectives and civilians or civilian objects without distinction.

Article 51(5): Among others, the following types of attacks are to be considered as indiscriminate: (a) an attack by bombardment by any methods or means which treats as a single military objective a number of clearly separated and distinct military objectives located in a city, town, village or other area containing a similar concentration of civilians or civilian objects; and (b) an attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated.

Article 57(2): With respect to attacks, the following precautions shall be taken: (..) b) take all feasible precautions in the choice of means and methods of attack with a view to avoiding, and in any event to minimizing, incidental loss of civilian life, injury to civilians and damage to civilian objects.

Agreement exists among states as well as NGOs that existing IHL imposes certain restrictions on the use of cluster weapons - not unlike the use of other types of weapons. At the same time a number of states have made clear that according to their interpretation existing IHL does not prohibit all use of cluster weapons.

Very little is known about the position of many governments in different parts of the world, including countries where past use of cluster weapons has caused grave human suffering and severe damage to local economies. Information is however available about the position of a number of Western countries, as well as about the positions of Russia and China.

A Swiss government answer to Parliament affirmed:

"The use of cluster munitions is not prohibited by humanitarian law. However, article 51 (protection of civilians) and article 57 (precautions during attacks) of the 1977 Additional Protocol to the Geneva Conventions of 1949, impose restrictions on the use of all types of weapons, including cluster weapons."[38]

[37] Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), 8 June 1977. Full text available at URL http://www.icrc.org/ihl.nsf/0/f6c8b9fee14a77fdc125641e0052b079?OpenDocument.

[38] „Der Einsatz von Streumunition ist im humanitären Völkerrecht nicht verboten. Eine für alle Waffen geltende Einschränkung des Gebrauchs von Streumunition ergibt sich jedoch aus Artikel 51 (Schutz der Zivilbevölkerung) und Artikel 57 (Vorsichtsmassnahmen beim Angriff) des ersten Zusatzprotokolls von 1977 zu den Genfer Abkommen von 1949." Swiss Parliament, Einfache Anfrage: Zukünftige Beschaffung von Streumunition und Minen, Günter Paul (03.1065), 16 June 2003, available at http://www.parlament.ch/afs/data/d/gesch/2003/d_gesch_20031065.htm.

Comparable positions have been stated by others, including the Danish[39], the Dutch[40] and the German[41] governments.

And yet, cluster weapons have reportedly been used in violations of core principles of existing IHL - and the risk they will continue to be used in such a manner is high. Human Rights Watch concludes that "even states that generally follow IHL cause disproportionate civilian harm with cluster munitions", through the use of cluster weapons in populated areas and the use of obsolescent submunitions with high failure rates.[42] The findings of other NGOs, such as Landmine Action and the Mennonite Central Committee USA have confirmed this conclusion.

This has raised a number of questions in particular with regard to (a) the implementation of existing IHL and (b) whether existing IHL is sufficient to address concerns with regard to the long term effects of unexploded ordnance, including submunitions. The most important questions are the following:

- Does IHL prohibit the use of certain types of cluster weapons?
- Does IHL prohibit the use of cluster weapons in or near populated areas?

2.2.1. Does IHL prohibit the use of certain types of cluster weapons?

The *Anti-personnel Mines Convention* of 1997 bans production, use and stockpiling of anti-personnel landmines. This includes anti-personnel mines carried as a submunition by cluster weapons, mainly bombs, dispensers and rockets. A well-known example is the British JP-233 dispenser weapon system. However, the convention does not prohibit other anti-personnel submunitions.

Equally important, it does not consider dud anti-personnel submunitions as mines, even when in practice such duds function as de facto anti-personnel mines, and even when one can suspect that some countries may see such a 'mine field' of duds as a welcome alternative to forbidden anti-personnel mines.

All munitions can fail to function and for all munitions hitting the intended target is never fully guaranteed. However, submunitions known to be in service in vast numbers with the armed forces of a large number of countries have shown to be more unreliable than most other types of ordnance and to be highly inaccurate by design.[43] High failure rates and major collateral damage are partly due to the weapon design and partly a consequence of the way and circumstances in which these weapons are employed. Yet, within the discussions in the framework of the CCW significant attention is only paid to the technical specifications of cluster weapons and their submunitions.

As described in the following part of this survey, available technology has made it possible for new cluster weapons to be more reliable and more precise. A significant number of states have therefore introduced minimum requirements for the reliability of new submunition procured by their armed forces. Few states have also stated their support for the prohibition of certain types of obsolescent cluster weapons.

Denmark issued a temporary ban on the use and procurement of all cluster weapons, air-delivered and ground-launched. The ban is a result of Denmark's requirement for submunition reliability which demands a failure rate of no more than 1 per cent in addition to the presence of a back-up self-destruct or

[39] "(...) - at den humanitære folkeret forbyder, at civilbefolkningen gøres til genstand for direkte militære angreb, - at det er en grov overtrædelse af folkeretten at gennemføre vilkårlige angreb, der ikke kan rettes alene mod militære mål, og hvis virkning ikke kan begrænses, samt, - at indirekte skader på civile så vidt muligt skal begrænses og aldrig må overstige den forventede militære fordel af en militær action." Ministry of Foreign Affairs Denmark, Udenrigsministerens Besvarelse Af Folketingsforespørgsel Om Klyngeammunition (F 56), 20 Apr. 2004, available at URL http://www.um.dk/da/servicemenu/Nyheder/Udenrigspolitik/NyhedsarkivUdenrigspolitik/UDENRIGSMINISTERENSBESVARELSEAFFORESP%C3%98RGSELF56+AF20APRIL2004STILLETAFS%C3%98RENS%C3%98NDERGAARDELVILLYS%C3%98VNDALS.htm.

[40] "(...) is het gebruik van clusterwapens volgens het humanitair oorlogsrecht legitiem ... Uiteraard worden bij de inzet de algemeen geldenden uitgangspunten in acht genomen ten aanzien van het verbod van de burgerbevolking en civiele objecten onnodig in gevaar te brengen, het verbod onnodig leed te veroorzaken, alsmede het proportionaliteitsbeginsel bij de uitoefening van geweld.", 'Clusterbommen niet uit de bewapening', Defensie krant, 9 Dec. 2004, p.8.

[41] Ministry of Foreign Affairs Germany, communication to Pax Christi Netherlands, 29 Oct. 2004.

[42] Human Rights Watch, Cluster Munitions and International Humanitarian Law: The Need for Better Compliance and Stronger Rules, Memorandum to CCW Delegates, Prepared for the Convention on Conventional Weapons (CCW) Group of Governmental Experts on Explosive Remnants of War (ERW), 5-16 July 2004, available at URL http://www.hrw.org/backgrounder/arms/clusters0704/1.htm.

[43] Human Rights Watch, A Global Overview of Explosive Submunitions, Memorandum to CCW Delegates, May 2002; available at URL http://www.hrw.org/backgrounder/arms/submunitions.pdf.

self-neutralization feature. Such a high rate of reliability has according to the Danish government not yet been achieved.[44]

In its response to a Parliamentary question about Denmark's contribution to the international "battle against cluster weapons" (August 2004), the Government emphasized the need for a prohibition of certain types of cluster weapons. These were defined as cluster weapons with submunitions not equipped with self-destruct, self-deactivation, or self-neutralization mechanisms. Using less clear language the government also said to seek the prohibition and destruction of "all obsolescent and in-accurate types of cluster munitions".[45]
Norway introduced a de facto moratorium on the use of cluster bombs in early 2003. According to the decision all use of air-delivered cluster weapons "in future military operations shall be subject to the prior consideration and consent of the Norwegian Ministry of Defence."[46] The defence committee could not agree on a total ban given a widely held perception that the policy of the Norwegian government with regard to the use of cluster bombs and to the use of cluster weapons in general was already sufficiently restrictive.[47] The defence committee also emphasized the significant difference between different types of cluster bombs in terms of failure rates.[48]

It remains unclear however whether the taking of such a position reflects the view that it is required by existing IHL, that is to say that specific types of cluster weapons are deemed to be of such a nature as to violate the principle of distinction as defined within existing IHL.

Discussing legal issues regarding ERW at a CCW inter-sessional meeting in 2002 Christopher Greenwood contended that longer term humanitarian problems caused by munitions which failed to explode are too remote to be taken into account.[49] The degree of the risk which ERW can pose after a conflict has ended or after civilians have returned to an area from which they had fled, he argued,

> *"turns on too many factors which are incapable of assessment at the time of the attack, such as when and whether civilians will be permitted to return to an area, what steps the party controlling that area will have taken to clear unexploded ordnance, what priority that party gives to the protection of civilians and so forth. The proportionality test has to be applied on the basis of information reasonably available at the time of the attack. The risks posed by ERW once the immediate aftermath of an attack has passed are too remote to be capable of assessment at that time."*[50]

It is difficult to appreciate the relevancy of the above argument. Military decision makers are well aware of the fact that whenever certain types of cluster weapons are used a high percentage of their submunitions will fail to function. This is not a factor beyond their possibility of "assessment at the time of the attack". The movements of civilians in the aftermath of a war, however, are beyond their possibility of assessment at the time of attack. That alone should support an obligation to avoid dropping duds over any area.

Technology capable of increasing the reliability of submunitions has been available for around 10 years. However, in 2002 Greenwood also argued that

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[44] Ministry of Defence Denmark (Forsvarsministeriet), communication to Pax Christi Netherlands, 17 Feb. 2005.

[45] "Det er bl.a. på baggrund af disse overvejelser, at regeringen, som sit tredje indsatsområde, arbejder for et internationalt forbud mod alle former for klyngeammunition, som ikke er udstyret med selvdestruktions-, selvdeaktiverings- eller selvneutraliseringsmekanismer. Alle gammeldags og upræcise typer klyngeammunition bør destrueres." Ministry of Foreign Affairs of Denmark, Udenrigsministerens Besvarelse af Folketingsforespørgsel om Klyngeammunition (F 56), 27 May 2004; available at URL http://www.um.dk/da/servicemenu/Nyheder/Udenrigspolitik/NyhedsarkivUdenrigspolitik/UDENRIGSMINISTERENSBESVARELSEAFFORESP%C3%98RGSELF56+AF20APRIL2004STILLETAFS%C3%98RENS%C3%98NDERGAARDELVILLYS%C3%98VNDALS.htm.

[46] Norway, National interpretation and implementation of International Humanitarian Law with regard to the risk of Explosive Remnants of War, Working Group on Explosive Remnants of War, 24 Nov. 2003, Group Of Governmental Experts Of The Parties To The 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, available at URL http://www.ccwtreaty.com/KeyDocs/GGE6/CCW-GGE-VI-WG-WP3-E.pdf..

[47] Isaksen Wangberg, Marita, 'Nær forbud mot klasebomber', Forsvarsnett, 5 Feb. 2003; available at URL. http://www.mil.no/start/article.jhtml?articleID=38290.

[48] Isaksen Wangberg, Marita, ' Forbyr ikke klasebomber', Forsvarsnett, 5 Feb. 2003; available at URL http://www.mil.no/start/article.jhtml?articleID=37930.

[49] Christopher Greenwood is Professor at the London School of Economics.

[50] Greenwood, Christopher, Legal Issues Regarding Explosive Remnants of War, Working Group on Explosive Remnants of War, 23 May 2002, Group Of Governmental Experts Of The Parties To The 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, CCW/GGE/I/WP.10; available at URL http://www.ccwtreaty.com/KeyDocs/GGE1/CCW-GGE-I-WP10-E.pdf.

"even if it were technically possible, that fact would have only a limited bearing on the application of the existing law. While Additional Protocol I, Article 36 imposes obligations on a State with regard to its development of a new weapon, there is as yet no general rule - either of treaty or customary law - which requires a State to replace its existing stocks of weapons with new weapons which offer a higher level of humanitarian protection."[51]

Greenwood's assessment is disputed by the Technical Annex to the 2003 Protocol on ERW. In this annex states are urged to take preventive measures for improving the reliability of munitions, and therefore minimising the occurrence of explosive remnants of war. Some countries have translated this invitation into an actual obligation to increase the reliability of submunitions in service with their armed forces. However, the weak language of the protocol is insufficient to assure that all stocks of obsolescent cluster weapons will be destroyed.

2.2.2. Does IHL prohibit the use of cluster weapons in or near populated areas?

The use of all types of munitions is subject to the definition of legitimate targets. However, targeting principles are of particular relevance to the use cluster weapons which spread their effect over a wide area and are therefore more likely to cause unintended injuries and damage during attacks as well as long after attacks. In 1975 the Stockholm International Peace Research Institute (SIPRI), which attended the Lucerne conference, commented:

"In principle an area weapon is one which is directed at a target presumed to be within an area, but which cannot be precisely located. Any civilian or object within that area stands an equal risk of being hit. A point weapon, by contrast, is one which requires, first, positive identification of the target, and second, precise aiming at the target. Accidental damage to civilians may occur, but is not implicit in the use of the weapon."[52]

IHL prohibits indiscriminate attacks and demands that precautions be taken during attack in order to avoid incidental loss of civilian life and damage to civilian objects. The language of the restrictions imposed in the Geneva Conventions of 1949 and the Additional Protocol I of 1977 appears however to allow for a worrying degree of discretion in their interpretation by states.

According to the Danish Ministry of Defence the use of cluster weapons in or near populated areas is to be considered legitimate under certain specific conditions:

"Under certain circumstances the use of certain types of cluster munitions in or near populated areas could be regarded as an indiscriminate attack. This might be the case if the military target is of such a limited size that a major part of the bomblets are bound to hit outside the military target in a populated area. The fact that a military objective is placed near or in a populated area does not in itself designate an attack with cluster munitions as 'indiscriminate'".[53]

The Swiss Federal Department of Foreign Affairs contends that "the use of cluster munitions in densely populated areas such as inhabited cities or villages generally is highly problematic, most particularly where submunitions with high dud rates are being used".[54]

The Polish Ministry of National Defence, on the other hand, holds that "one can come to the conclusion that under existing rules of International Humanitarian Law the use of cluster bombs in 'densely populated regions' is prohibited."[55]
The USA is not a signatory of the 1977 Additional Protocols to the Geneva Conventions of 1949.
At the meeting of government experts of states parties to the CCW Convention in July 2004 a US representative argued that IHL did not impose restrictions with regard to legitimate target areas:

"Lastly, the call by some for a prohibition on the use of cluster munitions in or near populated areas is an overly simplistic approach that ignores the observations of recent conflicts. The imposition of such a prohibition would provide further incentives to those who employ the unlawful tactic of

[51] Greenwood, Christopher, May 2002.

[52] Stockholm International Peace Research Institute (SIPRI), 'The Prohibition of Inhumane and Indiscriminate Weapons', in SIPRI Yearbook 1975: World Armaments and Disarmament, SIPRI, Almqvist & Wiksell, 1975, pp. 47 ff.

[53] Ministry of Defence Denmark (Forsvarsministeriet), communication to Pax Christi Netherlands, 16 Feb. 2005.

[54] Swiss Federal Department of Foreign Relations, Directorate of International Law, Section for Human Rights and Humanitarian Law communication to Pax Christi Netherlands, 7 June 2005.

[55] Polish Ministry of National Defence, communication to Pax Christi Netherlands, 14 Feb. 2005. The Ministry's view does not necessarily reflect the official position of Poland.

positioning lawful military targets among civilians and civilian infrastructure in an attempt either deter or shield legitimate attacks or deliberately endanger non-combatants to gain political advantage. Inevitably, a targeting prohibition of this type would potentially increase harm to civilians, rather than further reduce humanitarian risk."[56]

Some have argued that whether the use of cluster weapons is to be considered indiscriminate must be evaluated on a case-by-case basis.[57]
For instance, decisions about the use of cluster weapons in Iraq by UK forces were taken by operational commanders.[58]
South Africa contends that

"it might prove valuable to establish guidelines for the use of cluster munitions, but such guidelines will depend largely on the characteristics of the particular weapon system in the arsenal of a country."[59]

The Rules of Engagement of the Australian armed forces in Iraq "endorsed by Government and issued to commanders", on the other hand, prohibited the use of all cluster weapons. The Ministry of Defence stated that "as a matter of Government policy, the use of cluster weapons by Australian forces has been prohibited."[60]

RULES OF ENGAGEMENT

Canadian Armed Forces: "The phrase 'Rules of Engagement' (ROE) refers to the directions guiding the application of armed force by soldiers within a theatre of operations. (...) First, they define the degree and manner of the force to which soldiers may resort. Second, they delineate the circumstances and limitations surrounding the application of that force."[61]

US Department of Defense Dictionary of Military Terms: "Directives issued by competent military authority that delineate the circumstances and limitations under which United States forces will initiate and/or continue combat engagement with other forces encountered."[62]

It has been emphasised that, without the formulation of general prohibitions, cluster weapons will be used as "weapons of deadly convenience".[63] The risk that cluster weapons are used as "weapons of convenience" appears to be higher with regard to ground-launched weapons as compared to air-delivered bombs. A Danish air force officer emphasised that aerial bombings involve a high degree of planning. If the aircraft does not have cluster bombs on board, the pilots cannot decide to use them. Land forces, on the other hand, operate in a more "dynamic" way and have all types of weapons with them.[64]

The Polish Ministry of National Defence emphasised the risk that decisions on targets and weapons during military operations may fail to follow the prescriptions of existing IHL:

"There is always a need to meet the requirement that military utility be balanced against potential impact on non-combatants, but this is not necessarily being adequately considered during decision-making on target sites."[65]

[56] Gade (Colonel), Statement on Implementation of Existing International Humanitarian Law, 8 July 2004; available at URL http://www.ccwtreaty.com/070804Gade.htm.

[57] Major Thomas J. Herthel, On the Chopping Block: Cluster Munitions and the Law of War, The Air Force Law Review 51 (2001), pp. 256-59, available at URL https://afls10.jag.af.mil/dscgi/ds.py/View/Collection-3056.

[58] House of Commons, 'Oral evidence, Taken before the Defence Committee', 9 July 2003; available at URL http://www.publications.parliament.uk/cgi-bin/ukparl_hl?DB=ukparl&STEMMER=en&WORDS=cluster+munit+&COLOUR= Red&STYLE=s&URL=/pa/cm200203/cmselect/cmdfence/uc695-viii/uc69502.htm#muscat_highlighter_first_match.

[59] South African Delegation to the Conference on Disarmament, Geneva, communication to Pax Christi Netherlands, 19 Jan. 2005.

[60] Australian Government, Department of Defence, Disarmament of Iraq: Operation Falconer - Frequent Questions, on URL http://www.defence.gov.au/opfalconer/faq.htm.

[61] Department of National Defence and Canadian Forces, 'Rules of Engagement', at URL http://www.dnd.ca/somalia/vol0/v0s16e.htm (accessed on 21 Dec. 2004).

[62] US Department of Defense, DOD Dictionary of Military and Associated Terms, available at URL http://www.dtic.mil/doctrine/jel/doddict/data/r/04628.html (accessed on 21 Dec. 2004).

[63] McGrath, Rae, 'Cluster Munitions - Weapons of Deadly Convenience? Reviewing the legality and utility of cluster munitions', Aktionsb_ndnis Landminen, Public Meeting, Berlin, 3 Dec. 2004; available at URL

[64] "Flyangreb involverer en stor grad af planlægning. Har du ikke klyngebomber med, når du letter, kan du heller ikke affyre dem. Situationen på landjorden er langt mere dynamisk. De har for eksempel alle deres våben med sig." Jensen, Sten, and Vestermark, Birgitte, 'Et problematisk men effektivt våben', Berlingske Tidende, 11 Dec. 2003; available at URL http://www.berlingske.dk/udland/artikel:aid=386910/.

[65] Polish Ministry of National Defence, communication to Pax Christi Netherlands, 14 Feb. 2005. The Ministry's view does not necessarily reflect the official position of Poland.

In view of the fact that the Protocol on ERW failed to address the problem of targeting, NGOs have emphasised the need for continued discussions on more specific rules. Also some states seem open for discussions on guidelines.
After several years of consultations only limited information has been made available about states' positions with regard to the relevance of IHL for the use of cluster weapons. In 2003 Norway proposed that states declare how existing IHL is interpreted and implemented in practice on the national level, and describe how the risk of ERW influences military planning and the conduct of military operations.[66]

In March 2005 a broader group of states, Australia, Canada, New Zealand, Norway, Sweden, Switzerland, United Kingdom and USA, proposed a concrete set of questions to be answered by states parties to the CCW Convention: (a) on which IHL principles are considered applicable to the use of munitions that may become ERW, in particular submunitions, and on whether states have ratified these provisions or if they are accepted as customary international law; as well as (b) on how states implement these principles, and the mechanisms they have established to ensure they are understood and respected by their armed forces.[67]

2.3. Military utility

"Set fra pilotens synspunkt er det et mindre attraktivt våben, da han kommer tæt på sit mål og inden for skudvidde af fjendens våben."[68]

"Daarnaast is de inzet van clusterbommen relatief veilig voor de vliegers, omdat minder aanvalsvluchten hoeven te worden uitgevoerd om de gewenste effect te bereiken."[69]
"AFDS, Autonomous Free-flight Dispenser System: The Modular Stand-off Missile for Peace Enforcement."[70]

It is commonly argued that cluster weapons are a "battle winning munition".[71]And yet, the military utility of cluster weapons is today debatable. This section shows the different and often contradicting perceptions of governments on the military utility of cluster weapons. It is mainly based on recent government statements obtained for the purpose of this survey complemented by information from open government or military sources.

According to research carried out by Human Rights Watch in 2002 at least 56 armed forces have cluster weapons in their arsenals.[72] This is an indicator of a strong perception of military utility.
A large number of armed forces contend that cluster weapons are still an effective and sometimes decisive weapon, in specific circumstances. Their main advantage is said to be the capability to attack a large-scale moving target, such as a mechanised column. It is commonly argued that using other types of weapons to attack a similarly wide range of targets over a similarly large area would require far more fire-power and explosives, leading to greater collateral damage. [73]

At the same time old types of cluster weapons are being replaced in the arsenals of a number of armed forces by precision weapons with unitary warheads. National reviews of the utility of cluster weapons in general and specific types of cluster weapons in particular within current military doctrines and related international discussions have only just

[66] Norway, Nov. 2003.

[67] Australia, Canada, New Zealand, Norway, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland and United States of America in consultation with the International Committee of the Red Cross, International Humanitarian Law and ERW, CCW/GGE/X/WG.1/WP.2, 8 Mar. 2005, Group of Governmental Experts of The Parties to the 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, 10th Session, Geneva, 7-11 Mar. 2005, available at URL http://documents.un.org/.

[68] From the pilots point of view this is a less attractive weapon as it bring him close to his target and therefore within the reach of his enemies (unofficial translation). Jørgensen, Anders, 'Kontroversielt klyngebombenotat', 7 Nov. 2003; available at URL http://www.information.dk/Indgang/VisArkiv.dna?pArtNo=20031107152175.txt.

[69] The use of cluster bombs is also relatively safe for the pilots, as they need to fly fewer missions in order to achieve the desired effect (unofficial translation). Defensie krant, 'Clusterbommen niet uit de bewapening', 9 Dec. 2004, p. 8.

[70] European Aeronautic Defence and Space Company (EADS), AFDS brochure (date unknown).

[71] Summing up a common argument a recent essay by Threat Reduction wrote: "Indeed the military advantage of these weapons is almost indisputable; they can be delivered by aircraft, rockets and artillery projectiles, they are highly effective in immobilising armoured vehicles and exposed troops and can therefore be labelled as a battle winning munition." Threat Resolution Ltd, 'The Case for Cluster Bombs, Cluster Bombs - The military advantage', May 2003, at URL http://www.trltd.com/trintel/cluster_bombs.php.

[72] Human Rights Watch, May 2002.

[73] E.g. a statement from a UK Ministry of Defence spokesman. BBC News, 'The Cluster Bomb Controversy', 3 Apr. 2003, at URL http://news.bbc.co.uk/1/hi/uk/2912617.stm.

started. Initial assessments appear to challenge former positions of a more general nature on the military value of cluster weapons.

Military doctrine is subject to change and may even change overnight. However, issues related to weapons procurement cycles are important factors influencing actual decisions on and timeframe for withdrawals of cluster weapons. Several respondents to the questionnaire sent out by Pax Christi Netherlands for the purpose of this survey stated that they do not foresee cluster weapons to be useful in anticipated conflicts. At the same time however these countries are only slowly withdrawing stockpiles of obsolescent weapons, or maintain holdings for the event of unforeseen conflict situations.

2.3.1. Past use of cluster weapons

Before the 1950s some weapons that can be classified as cluster weapons existed. Shrapnel ammunition, which in its first form in the Napoleonic Wars consisted of a canister filled with musket balls and set to explode and spread the musket balls after being fired, is technically a cluster weapon. During World War II several combatants used incendiary bombs that were dropped as bundles or in containers that opened after release.

Modern types of cluster weapons were developed in the 1950s and 1960s and placed in service on a large scale in the first place to compensate for inadequacies in targeting, or to spread the effects of large shells and bombs over a larger area in a short period of time.

Dropping large unitary shells or even 500- to 1000-pound bombs on a target will destroy it only if there is a direct or near-direct hit. This requires a high level of precision. Lack of precision is a problem in particular when the target is hardened (e.g. a tank), making it more resistant to a near hit or even a direct hit. Using unitary warheads against armour works in a direct fire role (with the shell, rocket or bomb following a line-of-sight trajectory against a visible target), but not in an indirect fire role (where there is no visual contact between shooter and target). While a 50-kg 155mm high-explosive is capable of destroying soft targets even when landing up to 25 meters away, even a very near miss can be expected to only damage an armoured vehicle. The more armies became armoured and the better the armour became, the less useful became unitary high-explosive bombs and shells.

In the absence of technical solutions for achieving a sufficiently high level of precision to put armoured vehicles out of action, other solutions had to be found. To compensate for the deficiency in accuracy bombs and later artillery shells were fitted with submunitions. Each submunition has the explosive power to destroy or at least seriously damage even a well-armoured tank, and with each bomb or shell spreading dozens or even hundreds of submunitions the chances of taking out the target increased dramatically (by up to 1,000 or 10,000 per cent).

Increased active protection of enemy troops (e.g. better air-defences, especially for front-line troops) requires aircraft to spend less time over the target, giving the pilots less time to identify and line up targets, therefore increasing the risk that more bombs will go astray.

Cluster weapons became a major asset mainly for Western countries in the 1960s for two very different reasons and in two very different contexts. In the Indochina war in the 1960s, the USA found area weapons such as anti-personnel cluster weapons and napalm to be more useful than other weapons against the elusive Vietcong and other anti-US forces.

During the same period cluster weapons became an important part of North Atlantic Treaty Organization (NATO) assets aimed at countering the perceived threat of an invasion by Warsaw Treaty Organization (WTO) forces. The WTO could mass armoured units protected by advanced and numerous air-defences. NATO aircraft would not have been able to stop WTO armour with normal bombs or shells. NATO aircraft would not only have had to cope with huge numbers of targets, but would have found those targets so well protected that NATO air attacks would have had to be low and fast and therefore inaccurate. In addition NATO would have to stop any attack in a rather short time since NATO in Central Europe did not have enough depth for a defence based tactical withdrawal. Using cluster weapons was seen to give NATO aircraft the possibility to compensate not only for their lack of precision, but also to counter the huge number of targets, as well as to compensate for the lack of time it had to stop an attack.[74]

A single cluster bomb, such as the CBU-87, spreads its 202 submunitions over an area of some 5,000m2 (the size of a football field), or one submunition for every 25m2. Tanks and armoured vehicles give a target of around 15m2. If several of them are spread

[74] The NATO doctrine to deal with a massive WTO invasion also foresaw the possible first use of tactical nuclear weapons to stop the attackers in time.

out over an area of 5,000m2, there is a good chance of hitting one or more of them with one single cluster bomb. Dropping one 1,000-pound bomb will seriously effect only a small part of the 5,000m2, most likely missing all, almost certainly not hitting more than one armoured vehicle.

However, statistics from recent military actions by Western countries show a major shift from 'dumb' air-delivered weapons to 'intelligent' guided air-delivered weapons. The military necessity for using cluster weapons appears to have decreased significantly.

In the Gulf War of 1991, Iraqi armoured units were significantly smaller than WTO forces. At the same time, Iraqi air-defences were by far not as advanced or dense as those of the WTO. Coalition aircraft had more possibilities to identify their often immobile targets, and had ample time to identify and target individual armoured vehicles and destroy them in what they termed "armour plinking" (using even rather unsophisticated laser-guided bombs).

During the war in Iraq in 2003 Coalition aircraft had even more time, less targets and certainly less air-defences facing them and could often take out Iraqi armour at leisure. At the same time guided weapons, both missiles and the much less expensive guided but un-powered bombs, were both more developed and available in larger numbers.

It can be expected that cluster bombs would have been used in significantly larger numbers if Iraqi armoured forces would have been more aggressive and have launched major attacks. Such attacks would probably have been defeated even without using cluster weapons, but Coalition forces would have been much more time-constrained to contain and defeat an attack. Any attack forces the other side to take rapid action. Staying on the defensive gives the other side time to slowly take out the defender's armour one-by-one.

2.3.2. Continued military utility?

Most official statements, papers on military doctrine and comments from experts on the usefulness of cluster weapons originate from a limited number of mainly Western countries. They foresee cluster weapons to have still some role to play, especially in a scenario of full-scale war.

Both the USA and the UK have in the past rejected calls to completely abandon the use of cluster weapons on the ground that they are the only effective way of dealing with particular threats such as those posed by armoured vehicles.

The Polish Ministry of National Defence stated in 2005:

> *"From a military perspective they offer unmatched cost-effectiveness in their ability to dispense carried submunitions/ bomblets over a broad area and attack multiple targets."*[75]

A French presentation at the CCW expert meeting on ERW in 2002 affirmed that

> *"from an operational point of view, they are particularly suited to the neutralisation of ground targets (vehicles, artillery batteries, temporary battlefield supply points, and so on) and are peerless in their efficiency. A state equipped with wide-dispersal cluster weapons which decided to do without them today would be agreeing to a major reduction in the operational capabilities of its armed forces."*[76]

In late 2003 the German Ministry of Defence contended that within the existing framework of military alliances the German armed forces must maintain cluster weapons in their inventory in order to be capable of responding to so called "symmetrical" threats - when the German forces confront a similarly organized force on the battle field.[77]

There is no doubt about the military utility of cluster weapons against large mechanized forces, especially those attacking or on the move. However, the relevance of such a scenario for a large number of countries, in particular Western countries, is debatable. Many Western countries agree that a full-scale war involving large armies is not a likely scenario. Most modern conflicts

[75] Polish Ministry of National Defense, communication to Pax Christi Netherlands, 14 Feb. 2005. The Ministry's view does not necessarily reflect the official position of Poland.

[76] France, Technical Improvements to Submunitions, CCW/GGE/II/WP6, 10 July 2002, Group of Governmental Experts of The Parties to the 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, 2nd Session, Geneva, 15-26 July 2002, available at URL http://www.ccwtreaty.com/KeyDocs/GGE2/CCW-GGE-II-WP6-E.pdf.

[77] "Im Rahmen der Bündnisverteidigung müsse die Bundeswehr derartige Waffen auf Lager haben, um auf so genannte "symmetrische Bedrohungen", wenn sich zwei Streitkrafte im Feld gegenüber standen, reagieren zu können." ARD (Ersten Deutschen Fernsehen), Bundeswehr besitzt tausende Streubomben, tagesschau.de, 17 Nov. 2003; available at URL http://www.tagesschau.de/aktuell/meldungen/0,1185,OID2697566,00.html.

are of a limited nature and are often peace-keeping or peace-enforcing scenarios where the use of indiscriminate weapons is not considered an option.

By their very nature peace-keeping and peace-enforcing operations are trying to protect the population in the conflict area. Wars aimed at neutralizing perceived threats - such as the recent military operations in Afghanistan and Iraq - pose similar requirements. Winning the war does not only mean defeating current enemy forces but also preventing future formation of enemy forces. It is therefore essential to win the confidence of the civilian population. Moreover, once the war is over the military is likely to operate in the former battlefield and will not want to encounter UXO resulting from the use of its own cluster weapons.
It appears that a significant number of states are reluctant to give up the option of using cluster weapons, even though they do not envisage any role for them in currently anticipated military operations. The debate in the UK about a possible replacement of the BL-755 cluster bomb can be considered indicative of Western thinking.

According to a Royal Air Force Captain statement in the 1970s the BL-755 was

> *"designed to replace high explosive (HE) bombs in attacks on armoured and soft-skinned vehicles, parked aircraft, antiaircraft batteries, radar installations, small ships and headquarters or maintenance areas."*[78]

Already in the early 1980s the UK Ministry of Defence initiated a project to develop and procure a new anti-armour weapon for its air force in response to the fact that the BL-755 was becoming ineffective against modern armour.[79]

In the mid-1980s the programme was put on hold due to an overall review of requirements and reinstated only in 1992.

In 1996 the contract for the development and production of a new precision anti-tank missile, the Brimstone, was awarded an industrial consortium. The weapon was originally planned to enter service with the UK air force in autumn 2001. However, due to programme delays the planned in-service slipped to March 2005.[80]

Another air-to-surface missile, the US produced Maverick was "considered for purchase under Urgent Operational Requirement procedure for operations in Kosovo. This was to fill a capability gap, namely the need to attack solitary armoured targets in an environment with a high risk of collateral damage and consequently restrictive Rules of Engagement."[81]

The debate surrounding the replacement of BL-755 cluster bombs leads to the conclusion that the military utility of cluster bombs for many countries may be questioned not only because the scenarios in which they may be used are unlikely but because cluster weapons are reportedly ineffective against modern types of armoured vehicles with advanced armour and modern countermeasures (e.g. Explosive-Reaction Armour, ERA) which can defeat most current anti-armour submunitions).[82]

All UK air forces' BL-755 cluster bombs are planned to be withdrawn from service by the end of the decade. While in 2001 and 2003 the UK Ministry of Defence stated that it saw continuing use for "cluster bombs against a concentration of lighter armoured vehicles and area targets such as surface-to-air missile sites and logistic storage depots"[83], there were no plans

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[78] Prokosh, Eric, 1995.

[79] Eurofighter Typhoon, MBDA/Boeing Brimstone, http://www.eurofighter.starstreak.net/common/AG/brimstone.html (accessed on 17 Dec. 2004).

[80] National Audit Office UK, Ministry of Defence: Major Projects Report 2004 Project Summary Sheets, 10 Nov. 2004, p. 7, at URL http://www.nao.org.uk/publications/nao_reports/03-04/03041159_II.pdf (accessed on 17 Dec. 2004).

[81] House of Commons, Public Accounts, Minutes of Evidence Taken Before The Committee Of Public Accounts Wednesday 9 February 2000, Appendix I, Supplementary Memorandum Submitted By Ministry Of Defence (PAC 1999-2000/101), at URL http://www.publications.parliament.uk/pa/cm199900/cmselect/cmpubacc/247/0020909.htm. Ministry of Defence, Kosovo: Lessons from the Crisis, Presented to Parliament by the Secretary of State for Defence by Command of Her Majesty, June 2000, Cm 4724, available at URL http://www.kosovo.mod.uk/lessons/.

[82] House of Commons, Committee on Public Accounts, Thirty-Third Report, Appropriation Account (Class XII, Vote 1) 1998-99: Central Government Administered Social Security Benefits And Other Payments, 2000, at URL http://www.publications.parliament.uk/pa/cm199900/cmselect/cmpubacc/247/24702.htm. Eurofighter Typhoon, MBDA/Boeing Brimstone, http://www.eurofighter.starstreak.net/common/AG/brimstone.html (accessed on 17 Dec. 2004).

[83] Sir Kevin Tebbit in Dec. 2003. See URL http://www.publications.parliament.uk/cgi-bin/ukparl_hl?DB=ukparl&STEMMER=en&WORDS=cluster+munit+&COLOUR=Red&STYLE=s&URL=/pa/cm200304/cmselect/cmdfence/57/3121706.htm#muscat_highlighter_first_match

for procurement of new cluster bombs by early 2005. The UK government envisages also the replacement of artillery-launched cluster weapons through precision weapons in the long term. According to a statement delivered in March 2005,

> *"Precision attack weapons, especially those that discriminately attack several targets within an area, will be able to achieve more than mere suppression. The present type of cluster munitions will eventually cease to be the most effective way of engaging area targets as precision weapons become more available."*[84]

Also a number of other armed forces are renouncing the use of some cluster weapons, as other weapons are viewed to provide an acceptable substitute for at least some of the capabilities previously covered by them. The following table provides an overview of armed forces known to have withdrawn cluster weapons from their inventories, or planning to do so in the near future.

Table 1: Available information about recent or planned withdrawals of cluster weapons

Country	Type of cluster weapon	Comment
Belgium	cluster bombs (BL-755)	all*
Canada	cluster bombs (Mk-20 Rockeye)	80 per cent
Denmark	cluster bombs (Mk-20 Rockeye)	all*
	artillery rocket (MLRS)	*all*[(a)]
France	cluster bombs (BLG-66)	all
Germany	cluster bombs (BL-755)	all, since 2001*
	submunition dispenser system (MW 1)	all between 2013 and 2015
The Netherlands	artillery rocket (M-26 for MLRS)	all*
	artillery shells (M-483)	part, planned
	cluster bombs (BL-755)	all
Norway	cluster bombs (Mk-20 Rockeye)	all*
	artillery rocket (MLRS)	*all, discussed*[(a)]
Poland	cluster bombs	residual stock not in service*
South Africa	cluster bombs (TIEKIE)	degraded for training use only
Switzerland	cluster bombs (BL-755)	all*
United Kingdom	cluster bomb (JP-233)	all*
	cluster bombs (BL-755)	all by 2010*
	artillery shells (M-483)	all

* No planned replacement through newer generations of the same type of cluster weapons.
(a) Denmark and Norway planned in the past to procure submunition-rockets, which were however never delivered, due to the fact that submunitions with self-destruct mechanisms were still under development.

[84] United Kingdom, Military Utility of Cluster Munitions, CCC/GGE/IX/WG.1/WP.1, 21 Feb. 2005, Group of Governmental Experts of the States Parties to the 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, 10th Session, Geneva, 7-11 Mar. 2005.

In 2004 the Netherlands withdrew its 22 MLRS launchers from service. The withdrawal appears to have been at least partly a response to the recognition that their inaccurate submunition rockets risked to cause disproportionate collateral damage. The weapon was therefore considered inadequate for being used in the conduct of peacekeeping or peace-enforcing operations.[85]

Denmark does not foresee having to counter large mechanized enemy forces in the near future, and has therefore decided not to replace the obsolescent Rockeye cluster bombs withdrawn in 2003 with more advanced cluster bombs.[86] Denmark also decided to withdraw its MLRS in mid-2004 and will therefore not procure submunition rockets for MLRS as planned in the past.[87] Norway can be expected to take a similar decision.

The Polish Ministry of National Defence stated in early 2005 that military doctrine does not envisage any role of cluster bombs in present and future military operations. The residual stock of cluster bombs which entered service in the 1980s are expected to be left untouched in their storage sites until their life span expires.[88] The German armed forces started withdrawing the BL-755 cluster bomb from service in 2001 "as a consequence of its unacceptable dud rate".[89] The withdrawal had not been completed by early 2005.

BL-775 CLUSTER BOMB: WITHDRAWALS AND HOLDINGS

The BL-755 cluster bomb was developed in the 1960s and produced by Hunting Engineering (United Kingdom) until the mid-1990s (RBL-755). BL-755 cluster bombs carry 147 BL-755 bomblets.

The failure rate of BL-755 in UK stockpiles is around 6 per cent according to the Ministry of Defence. Operational failure rates have been found to have been significantly higher.

BL-755 have been or are planned to be withdrawn from service by some of the 16 armed forces that are known to have procured the weapon. Five of the six West European countries known to have procured the weapon, have withdrawn it from service or are planning to do so (Belgium, Germany, The Netherlands, Switzerland, and the United Kingdom). No information is made available about Italian stockpiles.

BL-755 have also been procured by Eritrea, India, Iran, Nigeria, Oman, Pakistan, Saudi Arabia, Thailand, United Arab Emirates, and the former Yugoslavia.[90] They are likely to be still in service in most of these countries.

Cluster weapons are certainly not 'out of fashion' even in advanced Western forces. The MLRS is currently being equipped or planned to be equipped with new rockets with cluster warheads. However, the rockets are all guided instead of purely ballistic rockets, with greater precision. Israel is willing to invest US$250 million in 10 years just for new rockets for its MLRS.[91] It must be remembered that Israel is one of very few Western countries still facing a possibility of massive armoured attacks, a situation were cluster weapons have a major role.

[85] Former commander Pier Gonggrijp knows the prime reasons for which the MLRS had to be withdrawn. "Too much collateral damage" is according to him one of the most important reasons. Today bombardments have to be carried out with surgical precision and the Dutch MLRS cannot do that (unofficial translation). "Voormalig commandant en ranggenoot Pier Gonggrijp kent de voornaamste redenen waarom de MLRS het veld moet ruimen. "Teveel bijkomende nevenschade", noemt hij een van de belangrijkste. Tegenwoordig dienen bombardementen immers met chirurgische precisie plaats te vinden en dat lukt de Nederlandse MLRS'en niet." Defensie krant, 'Adieu Multiple Launch Rocket System', 26 Feb. 2004, pp.4-5, at URL http://www.mindef.nl/Images/DK08_tcm6-37796.pdf.

[86] "Der er ikke forløbig planer om at erstatte "Rockeye" med en af de mere "intelligente" og nyere clusterbomber. Hvis Danmark kommer til at stå overfor en fjende med store pansrede enheder, kan det blive relevant at anskaffe bomben igen." Forsvarets Oplysnings- og Velfærdstjeneste, Udskældt bombe sparet væk, FOV Nyhedsbrev nr.5, 2003, at URL http://www.fov.dk/arkiv/nyhedsbrev/2003/05/Farvel%20til%20udsk%E6ldt%20bombe.htm.

[87] DR Nyheder, 'Forsvarsforliget 2005-2009', 11 June 2004; at URL http://www.dr.dk/orientering/Temaer/siforsvarsforlig.shtm.

[88] Polish Ministry of National Defence, communication to Pax Christi Netherlands, 14 Feb. 2005. The Ministry's view does not necessarily reflect the official position of Poland.

[89] Germany, Reliability of Cluster Munitions, CCC/GGE/IX/WG.1/WP.4, 10 Mar. 2005, Group of Governmental Experts of the States Parties to the 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, 10th Session, Geneva, 7-11 Mar. 2005.

[90] Human Rights Watch, Worldwide Production and Export of Cluster Munitions, Briefing Paper, 7 Apr. 2005, avialable at URL http://hrw.org/backgrounder/arms/cluster0405/cluster0405.pdf.

[91] Jane's Defence Weekly, 17 Nov. 2004, p. 22.

M-26 MLRS SUBMUNITION ROCKETS: WITHDRAWALS AND HOLDINGS

The unguided 227mm M-26 rocket with 644 M77 DPICM (Dual-Purpose Improved Conventional Munitions) anti-personnel/anti-materiel grenades is the first rocket developed for the Multiple Launch Rocket System (MLRS). MLRS M-26 rockets were developed by Lockheed Martin (formerly Vought) since the late 1970s and were used during Operation Desert Storm in 1991.

According to the US government M-26 failure rates during tests varied between 5 and 10 per cent.[92] The US General Accounting Office reported different data in the early 1990s: "MLRS' acceptance tests showed that the M77 dud rate ranged from 2 percent to 23 percent, resulting in from 154 to 1,777 unexploded submunitions when tiring a full launcher load."[93]

Fourteen countries are known to have procured or ordered the MLRS: Bahrain, Denmark, France, Germany, Greece, Israel, Italy, Japan, South Korea, the Netherlands, Norway, Turkey, United Kingdom, and the USA.[94]

At least two of these, Denmark and Norway, ordered but never fielded M-26 submunition rockets. Denmark withdrew its MLRS from service. The decision is pending in Norway. Also the Netherlands withdrew their MLRS from service and are in the process of selling the launchers and their M-26 submunition rockets. Germany stated that use of M-26 rockets held by the German Army is envisaged only after their M-77 submunitions have been equipped with back-up mechanism to ensure a higher level of reliability.

MLRS can also fire Extended-Range (ER) rockets with 518 submunitions or AT2 rockets with 28 antitank mines, as well as Army Tactical Missile System (ATACMS) guided missiles (Block 1 missiles carry 950 submunitions). Under development are the extended range guided rocket (M-30) and a guided unitary warhead.

Multiple rocket launchers (MRLs) are among the simplest heavy artillery pieces available. MRLs have been and are developed and produced by a large number of countries across all regions. Examples of such systems are: the widely used Soviet/Russian BM-21 122mm (as well as Chinese, Czechoslovak, Egyptian and other countries' copies of it); the Russian BM-22 220mm and 9S52 Smerch 300mm; the Brazilian ASTROS 127mm, 180mm and 300m; the Chinese WM-70 273mm and WS-1 320mm; the small Belgian LAU-97 70mm; and the Israeli LAR-160mm.

For most MRLs, rockets carrying submunitions have been developed and produced either in the country producing the MRL or in other countries. Insufficient information is however available about whether users of the different MRLs have procured submunition rocket or rockets with unitary warheads.

Very few statements on military utility have come from non-Western countries. Many non-Western countries have cluster weapons in service or hold weapons (e.g. the BM-21 MRL is in widely in service) that are capable of using cluster weapons (and often used so).

Iran's recent efforts in cluster weapon production and development may be an indication of how non-Western countries with less developed forces (and a perceived threat of Western intervention) perceive cluster weapons as useful. Iran's experiences against Iraq in the 1980-1988 war, where it was fighting an enemy with strong air-defences in the front-line, was a prime reason for developing stand-off cluster weapon dispensers. Their recent Kite is a 15-km air-launched powered weapon carrying up to 172 anti-armour and area-denial submunitions. Recently Iran also developed the Zolfoqar anti-personnel/area-denial rocket with 'several warheads', a UAV-type guided weapon and cluster-shells for most of its artillery. [95.]

[92] Ingram, House of Commons, Written Answers to Questions, 16 June 2003; available at URL http://www.publications.parliament.uk/pa/cm200203/cmhansrd/vo030616/text/30616w15.htm.

[93] United States General Accounting Office, Operation Desert Storm: Casualties Caused by Improper Handling of Unexploded U.S. Submunitions, Report to Congressional Requesters, August 1993, p.4, at URL http://archive.gao.gov/t2pbat5/149647.pdf.

[94] MLRS, Multiple Rocket Launch System, army-technology.com, at URL http://www.army-technology.com/projects/mlrs/.

[95] AirForces Monthly, Dec. 2004, p. 37; 'Iran develops family of cargo projectiles', Jane's Defence Weekly, 20 Oct. 2004, p. 24.

2.3.3. Utility of anti-personnel cluster weapons?

Next to their common role as anti-armour weapons, cluster weapons are also used against 'soft' (non-armoured targets, often human) targets. Also here the reason for using cluster weapons lies in the problem of precise targeting.

US forces massively used cluster weapons in Vietnam and Laos in the 1960s and 1970s. They, together with napalm, were generally employed for what has been termed 'carpet bombing'. Even small combat aircraft could, if equipped with cluster weapons (or napalm) saturate a large area with explosives and shrapnel. If the same aircraft would have had to use normal bombs, some of the area would have been completely destroyed (with a large hole where the bomb hit), but most of the area would only be shaken.

Anti-personnel cluster weapons cannot be considered effective against mechanized forces, as infantry is often protected in armoured vehicles. Moreover, anti-personnel cluster weapons may also not be needed since targeting the larger pieces of heavy equipment or the logistic system with anti-armour munitions, the enemy forces are becoming so much destabilized that they are easily defeated.

Available government statements on the perceived military utility of cluster weapons and the possibility to employ alternative weapons with lower humanitarian costs commonly are of a very general nature. They fail to address the question of the type of military operations that are anticipated and the specific type of cluster weapons that are perceived as useful within such a specific context.

It is not always possible to differentiate between anti-armour and anti-personnel submunitions since some submunitions are 'dual-purpose' (e.g. the US Dual Purpose Improved Conventional Munition, DPCIM, which combines anti-armour with anti-personnel effects). However, available information suggests that the value of cluster weapons as anti-personnel weapons is seen by most Western to be low or negligible.

Only a statement by the Polish Ministry of National Defence emphasized that part of the military value of cluster weapons lies in their capability to destroy different types of targets:

> *"Additionally the submunitions/bomblets as a rule combine a fragmentary function for anti-personnel effect with a high-explosive, armour-piercing capability. It makes that they can be deployed against multiple target types including troops in the open, defensive position, rear echelon positions, armoured formations, convoys and stockpiled supplies. No doubt this possibility of the multi-mission usage from single munitions is very attractive for the military."*[96]

Other governments' statement however appear to refer primarily to the military utility of cluster weapons in their anti-armour role (see above).

2.3.4. Submunitions as deliberate de-facto landmines

Concerns about the unintended harm caused by submunition duds to civilians and soldiers are shared by humanitarian organizations, militaries and governments. At the same time, some argue that unexploded submunitions may have a military value as area denial weapons.

In a background paper on the use of submunitions to the Ministry of Defence of Argentina, the Armed Forces' research organization CITEFA emphasized that the self-destruct feature of submunitions that failed to explode on impact can be used for tactical and strategic purposes. According to CITEFA, internationally agreed reliability requirements should therefore leave open the option to let submunitions self-destroy after hours or even days.[97]

It appears that CITEFA suggests the use of submunitions with delayed self-destruct features as an area-denial weapon similar to landmines. It is not unlikely that other users may not so openly conceive of a similar use and find it convenient if at least some submunitions fail to explode on impact, creating a de facto minefield. Especially countries that envisage involvement in conflicts were they would be mainly on the defensive may see more advantages to a high dud-rate than to spending money on ensuring a low dud rate.

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[96] Polish Ministry of National Defence, communication to Pax Christi Netherlands, 14 Feb. 2005. The Ministry's view does not necessarily reflect the official position of Poland.

[97] CITEFA (Centro de Investigaciones Técnicas y Científicas de las FFAA), Informe referido a empleo de submuniciones, for the Ministry of Defence of Argentina, no date available, received through the Permanent Mission of Argentina in Geneva, communication to Pax Christi Netherlands, 15 Apr. 2005.

Table 2: Holdings of cluster weapons and submunitions by key technological features
(45 countries contacted for the purpose of this survey)

Holdings Planned upgrade Planned withdrawal

Country	CountryAir-delivered			Ground-delivered		
	Un-guided submunitions no sec. fuze	Un-guided submunitions sec. fuze	Guided submunitions sec. fuze	Un-guided submunitions no sec. fuze	Un-guided submunitions sec. fuze	Guided submunitions sec. fuze
Algeria						
Argentina **(a)**						
Australia **(b) (c)**						
Austria **(b)**						
Belarus						
Belgium						
Brazil						
Bulgaria						
Canada **(b) (d)**						
Chile						
China (PR)						
Czech Republic **(b)**						
Denmark **(b) (e)**						
Egypt						
Ethiopia **(f)**						
Finland **(b)**						
France						
Germany						
Greece						
India						
Indonesia						
Iran						
Israel						
Italy						
Japan **(b)**						
Libya						
The Netherlands **(b)**						
Norway						
Pakistan						
Poland **(b) (g)**						
Romania						
Russia						
Saudi Arabia						
Singapore						
South Africa **(b) (h)**						
South Korea						
Spain **(b)**						
Sweden **(b)**						
Switzerland **(b)**						
Taiwan **(i)**						
Turkey						
U Arab Emirates						
Ukraine						
United Kingdom						
USA						

Notes: The table summarizes information from a variety of sources including the following: responses by national government agency to the questionnaire of Pax Christi Netherlands; statements and working papers delivered by governments at the CCW GGE on ERW; military specialized journals (such as Jane's Information Group, Jane's Air-Launched Weapons); military specialized websites (such as army-technology.com and airforce-technology.com); and Human Rights Watch, A Global Overview of Explosive Submunitions, Memorandum to CCW Delegates, May 2002, available at URL http://www.hrw.org/backgrounder/arms/submunitions.pdf.

(a) Villada, Christian E., 'VII Brigada Aérea - Moron, Buenos Aires - Agosto del 2002', SAORBATS (South American Orders of Battle), at URL http://www.saorbats.com.ar/GaleriaSaorbats/FAAMoron02/VII%20Brigada%20Aerea.html (accessed on 8 May 2005). Villada, Christian E., 'Presente y futuro del Ejército Argentino', SAORBATS (South American Orders of Battle), at URL http://saorbats.com.ar/Ejercito%20Argentino.htm (accessed on 8 May 2005).

(b) Information on current holdings provided by a national government agency in response to the questionnaire of Pax Christi Netherlands.

(c) The military specialized press alleged in mid-2004 that Australia was in the process of acquiring Forges de Zeebruges 70mm submunition rockets for combat helicopters. The Australian Department of Foreign Affairs and Trade responded to Pax Christi Netherlands that the helicopter supplier had chosen the sub-munition version of the rocket for testing purposes only. Australian Department of Foreign Affairs and Trade, communication to Pax Christi Netherlands, 18 May 2005.

(d) Canada withdrew 80 per cent of its Mk-20 Rockeye cluster bombs and "has retained only a residual stock as a hedge against unforeseen operational circumstances that might necessitate their future use." Permanent Mission of Canada to the United Nations and the World Trade Organization, communication to Pax Christi Netherlands, 13 Jan. 2005.

(e) The Danish government issued a temporary ban on the use of all cluster weapons in late 2004 as a result of its restrictive submunition reliability requirement.

(f) Cluster bombs have reportedly supplied to Ethiopia by Israel (see Neff, Donald, 'It Happened in May', Washington Report on Middle East Affairs, May/June 1996, at URL http://www.washington-report.org/backissues/0596/9605036.htm).

(g) According to the Polish Ministry of National Defence the Polish Air Force holds a residual stock of old cluster bombs for which current military doctrine does not anticipate any use. Newly acquired (not yet delivered) Raytheon (USA) AGM-154A and AGM-154C are part of the F-16 package. AGM-154A carry 145 BLU-97/B submunitions.

(h) According to the South African Delegation to the Conference on Disarmament TIEKIE cluster bombs held by the Air Force have been "degraded for training use only". Communication to Pax Christi Netherlands, 19 Jan. 2005.

(i) Ching-Kuo (IDF) Indigenous Defence Fighter, Taiwan, airforce-technology.com, at URL http://www.airforce-technology.com/projects/ching/ching4.html.

3. TECHNOLOGICAL DEVELOPMENTS: WHAT RELEVANCE TO HUMANITARIAN CONCERNS?

"Weapons system requirements are based on military requirements. They determine whether a self-destruction or self-neutralization type of fuze will be selected for the ammunition or submunition respectively."[98]

"Enhancement of fuze performance requires technical solutions to improve fuze functioning reliability and safety. It is very easy to call for, but much harder to reach within the time frame, the funding restraints and all other design limitations."[99]

"Over the next 20 years the efficacy of UK submunition weapons will increase significantly while at the same time seeing a significant decrease in their humanitarian impact."[100]

There is no doubt about the fact that technological improvements can alleviate some of the humanitarian problems caused by less advanced types of cluster weapons. But it is important to remember that improvements in weapon design are driven first of all by military requirements.
There are however, three direct relations between military requirements and humanitarian concerns. Firstly, both civilians and military personnel suffer from UXO. Secondly, military effectiveness requires both reliable and accurate weapons. Finally, many military operations today are of a peace-keeping and peace-enforcing nature, were the risk of UXO and disproportionate collateral damage becomes a military concern.
A UK non-paper of March 2004 emphasized the overlap between military and humanitarian interests in improvements in submunitions reliability and accuracy: "The clear message is that increasing military effectiveness often coincides with reducing humanitarian impact."[101]
Technological improvements however are costly. As described above, technical specifications have been discussed within the framework of the meetings of governmental experts on ERW of states parties to the CCW Convention. They are driven as "best practices" by a number of states, but are opposed by others because of cost-implications and major differences across countries in technological capabilities.
This part describes improvements in weapon design that can be expected to alleviate the humanitarian problems caused by a continued use of cluster weapons. Such improvements include:

a) reducing the number of submunitions that can be expected to malfunction during use,
b) increasing the accuracy of submunitions, and
c) reducing the number of submunitions used.

Cluster weapons where the response to military requirements at a given level of technological development. Improvements in weapon design, in particular with regard to guidance and precision, raise questions about the continued military utility of cluster weapons. Alternative weapons are discussed in the third section of this part, followed by a summary of available information about technical and financial issues related to the destruction of cluster weapons that have been withdrawn from service.

3.1. Reliability: improve submunition functioning

"It's a sorry situation that we didn't have secondary fuzes on the artillery submunitions that were fired in the last several wars."[102]

There is grave awareness among both humanitarian and military organizations of the problems caused by unexploded ordnance. As a US Marine Corps training manual emphasizes "saturation of unexploded submunitions has become a characteristic of the modern battlefield. The potential for fratricide from UXO is increasing."[103]

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[98] Germany, Working Paper, Reliability, Safety, and Performance of Conventional Munitions and Submunition, CCC/GGE/IX/WG.1/WP2, 11 Nov. 2004, Group of Governmental Experts of the States Parties to the 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, 9th Session, Geneva, 8-16 Nov. 2004.

[99] Germany, Nov. 2004.

[100] UK non-paper, Humanitarian impact of potential improvements in future submunitions, CCW - GOGE, Geneva 8-12 Mar. 2004, available at URL http://www.fco.gov.uk/Files/kfile/20040225%20Technical%20improvements%20nonpaper%20March%20CPACIHL1_.pdf.

[101] UK non-paper, Mar. 2004.

[102] Retired Army Lt. Gen. Michael Davison, now president of the U.S. division of Israel Military Industries quoted in: Veterans for Peace, Thomas Frank, 'Officials: Hundreds of Iraqis Killed By Faulty Grenades', 23 June 2003, at URL http://www.veteransforpeace.org/Officials_Hundreds_062103.htm.

[103] US Marine Corps Training Manual, Multi-Service Procedures for Operations in UXO Environment, MCRP 3-17.2B, at URL http://www.tpub.com/content/USMC/mcr3172b/index.htm.

Failure rates of cluster weapons vary widely depending on a range of factors, such as weapon design, manufacturing processes, and operational factors such as delivery technique, age of the submunition, ambient air temperature and type of impact medium.[104] This section focuses on the first, summarizing the ongoing debate about technical specifications and the arms industry's response to it.

It needs to emphasised, that factors other than weapon design have a major impact on reliability, and need to be taken into full consideration. While reliability tests of the British BL-755 cluster bomb showed a failure rate of 6 per cent, the UN Mine Action Coordination Center found that as many as 11 per cent of the BL-755 submunitions from the BL-755 cluster bombs used in Kosovo, failed to explode. A recent statement by the Dutch agency responsible for clearance of UXO provides an estimate for BL-755 and CBU-87 cluster bombs failure rates, claiming a staggering 20 per cent of the submunitions were duds. The agency stressed that failure rates of up to 100 per cent have been found when cluster bombs were delivered in a wrong way.[105]

A key element for submunition reliability is their fuzing system. A survey of submunition holdings worldwide prepared in 2002 emphasised that "relatively inexpensive fuze and material are often used, resulting in submunition that could have a relatively high failure rate."[106] A former US Army lieutenant-colonel who managed the fuze program for the US arms producer Raytheon, has been quoted as saying: "They develop weapons, then they develop munitions, and after they develop munitions, the last thing they worry about is how to fuze them."[107]

There is sufficient information to conclude that fusing technology has been available over the past 10 years that can significantly increase the reliability of submunitions. However, information on the extent to which improved fusing systems actually equip current stocks of submunitions is fragmentary.
Possible improvements are twofold, or, firstly, upgrading of primary fuzes in order to reduce the occurrence of duds, and secondly, the installation of back-up systems which prevent duds from becoming a hazard to civilians and soldiers. Such systems are self-destruction fuzes, or self-deactivation and self-neutralisation mechanisms.

Self-destruct fuzes make the unexploded submunition explode at a pre-set time in case of a malfunction of the primary fuze.

Self-deactivation and **self-neutralization** devices are disabling mechanisms that deactivate the primary fuze through the exhaustion of an essential component, such as a battery, or neutralise the explosive by making an essential component of the submunition unworkable at a pre-set time (self-deactivation applies to electronic fuzes while self-neutralization applies to mechanical ones).

Among Western countries there is a clear trend towards equipping submunitions with back-up self-destruct systems, as discussed below. The accepted failure rate of primary fuzes remains relatively high. It is generally held that the incorporation of advanced technical solutions does not necessarily lead to increased reliability. Simpler fusing devices are deemed more reliable than complex types.[108] The US government, for instance, required the new fuze to be retrofitted to existing M-864 submunitions to have a primary function mode with a failure rate of 3 per cent or less. The Polish government issued a requirement of primary fuze failure of less than 2.5 per cent: "This high reliability has not been confirmed during operational use in real-world combat conditions up to now."[109]

3.1.1. Reliability policies

A number of countries have over the past four to five years formulated clear requirements with regard to submunition reliability and/or design features. Requirements for submunition reliability commonly refer to the combined reliability of primary fuzes and back-up systems and range from 99 per cent (e.g. USA) to 98 per cent (e.g. Switzerland). Design features commonly refer to back-up systems, or the

[104] A survey of submunition holdings world-wide compiled by Human Rights Watch in 2002 for the first meeting of the group of governmental experts on ERW provided a summary background analysis of the factors influencing submunition reliability. Human Rights Watch, May 2002.

[105] Explosievenopruimingsdienst (EOD), Koninklijke Luchmacht, Bespreking en verkenning Vlieland 12-13 jan 2005, 17 januari 2005; a copy of the letter is available at URL http://www.waddenvereniging.nl/HTML/Nieuws/munitie_vliehors.html.

[106] Human Rights Watch, May 2002.

[107] Veterans for Peace, Thomas Frank, June 2003.

[108] Polish Ministry of National Defence, communication to Pax Christi Netherlands, 14 Feb. 2005. The Ministry's view does not necessarily reflect the official position of Poland.

[109] Polish Ministry of National Defence, communication to Pax Christi Netherlands, 14 Feb. 2005. The Ministry's view does not necessarily reflect the official position of Poland.

inclusion in submunition design of self-destruct fuzes or self-neutralization/self-deactivation features (e.g. Norway and the United Kingdom).

Two countries, Denmark and Poland have formulated stringent requirements, which refer to the maximum allowed failure rate of primary fusing systems, and include the demand for a back-up system.

The Danish government issued a stringent requirement for submunition reliability in late 2004. According to this submunitions must not have a failure rate of more than 1 per cent and must at the same time be equipped with a back-up self-destruct or self-deactivation mechanism. The requirement was followed by a temporary ban on all use and procurement of cluster weapons, as mentioned above.[110] On the international level Denmark supports a ban of cluster bombs without self-destruct, self-deactivation or self-neutralization devices.[111]

Earlier, in 2003, Denmark had introduced a reliability requirement of 99.5 per cent or higher. According to information provided by the Danish government in 2004 the requirement has been implemented.[112] The Danish armed forces possess two types of 155mm artillery shells (with 63 and 49 submunitions respectively). Contracts for the supply of cluster weapon for the Danish MLRS had been signed, but deliveries have never been carried out, as submunition with a self-destruct mechanism was still under development.[113] In June 2004 Denmark decided to withdraw from service its 12 MLRS which had been acquired in 1998/1999.[114]

Table 3: Stated government policies on submunition reliability (a)

Country	Primary fuze	Secondary fuze	Overall reliability	Applied to holdings	Applied to acquisitions
Denmark	99%	yes		✓	✓
Poland	97.5%	yes		(✓) **(b)**	✓
Germany			99%	(✓) **(b)**	✓
South Africa			98%		✓
Switzerland			98%	✓	✓
USA			99%		✓
France		yes			✓
Norway		yes		✓	✓
UK		yes			✓
The Netherlands					✓
Sweden				✓	✓
China (PR)		no			
Russia		no			

(a) Information on submunition reliability requirements provided by a national government agency in response to the questionnaire of Pax Christi Netherlands prepared for the purpose of this survey, or submitted as working papers or statement within meetings of the CCW Convention Government Group of Experts on ERW.
(b) Holds obsolescent cluster weapons with high failure rates which are not in operational service or which are being withdrawn.

[110] Ministry of Defence Denmark (Forsvarsministeriet), communication to Pax Christi Netherlands, 16 Feb. 2005.

[111] Forsvarsministeriet, Notat Vedr. Regulering av klyngebomber, 13 Nov. 2003; available at URL http://www.folketinget.dk/img20031/udvbilag/lib0/20031_3680/20031_3680.pdf.

[112] Ministry of Foreign Affairs Denmark, Udenrigsministerens Besvarelse Af Folketingsforespørgsel Om Klyngeammunition (F 56), 20 Apr. 2004, available at URL http://www.um.dk/da/servicemenu/Nyheder/Udenrigspolitik/NyhedsarkivUdenrigspolitik/UDENRIGSMINISTERENSBESVARELSEAFFORESP%C3%98RGSELF56+AF20APRIL2004STILLETAFS%C3%98RENS%C3%98NDERGAARDELVILLYS%C3%98VNDALS.htm.

[113] Fokletinget, 'Om hvilke typer klyngebomber Danmark er i besiddelse af inden for alle værn', Spm. nr. S 2481, 8 Apr. 2004; available at http://www.ft.dk/samling/20031/spor_sv/s2481.htm. Fokletinget, 'Om erfaringerne med klyngebomber', Spm. nr. S 2482, 8 Apr. 2004; available at URL http://www.ft.dk/Samling/20031/spor_sv/S2482.htm.

[114] DR Nyheder, 'Forsvarsforliget 2005-2009', 11 June 2004; at URL http://www.dr.dk/orientering/Temaer/siforsvarsforlig.shtm.

Poland demands that primary fuzes of new submunitions must have a failure rate of less than 2.5 per cent. However Poland does not envisage any cluster weapon procurement in the near future. Ground launched cluster weapons in service with the Polish armed forces (122mm artillery rockets and dispensers for anti-tank mines) carry submunitions which include self-destruct or self-deactivation back-up systems.[115]

As mentioned above Switzerland proposed a reliability requirement of 98 per cent at the Second Review Conference of the CCW Convention in 2001, and has driven continued discussions about technical specifications at the meetings of governmental experts of states parties to the CCW Convention held since 2002.[116]

The Swiss armed forces procured ground-launched cluster weapons, 155mm artillery shells, in the late 1980s (155mm Kanistergeschoss 88). Procurement of more advanced 155mm artillery shells with 84 submunitions began in the late 1990s.[117] The Swiss armed forces also hold 120mm mortar shells with submunitions. All cluster weapons stockpiled carry submunitions equipped with self-destruct fuzes.[118] According to the Federal Department of Defence, Civil Protection and Sports, tests have shown that the failure rate of submunitions in service with the armed forces is as low as 0.01 per cent.[119]

Also South Africa introduced a reliability requirement for cluster weapons of 98 per cent. The 155mm artillery shells in service with the armed forces carry submunitions with a back-up self-destruct mechanism.[120]

In the USA a requirement for submunition reliability of 99 per cent or higher was introduced in 2001[121] and is to be applied to "future generation submunitions", or submunitions that enter full rate production in 2005. These have been reported to include the following: M-80 and XM-80 submunitions with M-234 and XM-234 for the Extended Range Guided Munition (ERGM) and the 155mm XM982 Excalibur guided artillery shell; M-77 and M-85 submunitions for Guided Multiple Launch Rocket System (GMLRS); M-73 submunitions for 2.75" Hydra-70 air-launched rockets; BLU-97 submunitions for air-launched Joint Stand-off Weapon (JSOW).[122] Waivers are possible but require specific approval.[123]

The government is reportedly studying the feasibility of retrofitting BLU-97 submunitions.[124] In December 2003 the US Air Force informed potential contractors of the existence of an interest in a safe-fuze for the BLU-97 submunitions used in existing CBU-87 and CBU-103 combined-effects cluster bombs by the government and exploring market interest and business capability, emphasizing that neither a definite plan nor funding existed to support such a programme.[125] Contracts for the upgrade of some existing artillery delivered submunitions have recently been awarded (105mm M-915 artillery shells) or are in the bidding stage (155mm M-864 artillery shells; M-26 artillery

[115] Polish Ministry of National Defence, communication to Pax Christi Netherlands, 14 Feb. 2005. The Ministry's view does not necessarily reflect the official position of Poland.

[116] Switzerland, Technical improvements and other measures for relevant types of munitions, including sub-munitions, which could reduce the risk of such munitions becoming ERW, Discussion Paper, Group Of Governmental Experts Of The Parties To The 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, CCW/GGE/I/WP.4, 8 May 2002; available at URL http://www.ccwtreaty.com/KeyDocs/GGE1/CCW-GGE-I-WP4-E.pdf.

[117] 'Präsentation des Rüstungsprogrammes 1999 in Thun', June 1999, at URL http://www.solog.ch/seiten/juni99/ruestung.html.

[118] Swiss Federal Department of Foreign Relations, Directorate of International Law, Section for Human Rights and Humanitarian Law communication to Pax Christi Netherlands, 7 June 2005.

[119] Schilling, Christoph, 'Streumunition made in Switzerland', Tages Anzeiger, 9 Apr. 2003; available at URL http://www.tagesanzeiger.ch/dyn/news/schweiz/270856.html.

[120] South African Delegation to the Conference on Disarmament, Geneva, communication to Pax Christi Netherlands, 19 Jan. 2005.

[121] See Anthony J. Melita, A Viewpoint from OSD, 16 Apr. 2001, presented at The 45th Annual Fuze Conference, available at URL http://www.dtic.mil/ndia/2001fuze/1Melita.pdf.

[122] Anthony J. Melita, A Viewpoint from OSD, 16 Apr. 2001, presented at The 45th Annual Fuze Conference, available at URL http://www.dtic.mil/ndia/2001fuze/1Melita.pdf.

[123] Hodson, David, OSD Representative to the CCW, Office of the Secretary of Defense, United States of America, Military Utility of Submunitions, Presentation to the International Workshop on Preventative Technical Measures for Munitions, 26 May 2004, available at URL http://www.auswaertiges-amt.de/www/de/aussenpolitik/friedenspolitik/abr_und_r/jab2003/7/thun_html.

[124] Hodson, David, May 2004.

[125] FBO Daily (FedBizOpps), Safe-Fuze fort he BLU-97, 12 Dec. 2003; available at URL http://www.fbodaily.com/archive/2003/12-December/04-Dec-2003/FBO-00479586.htm.

rockets with M-77 submunitions for use in GMLRS). A Defense Science Board (DSB) Task Force on Munitions System Reliability was established in April 2004 with the task to (1) conduct a methodologically sound assessment of the failure rates of US munitions in actual combat use; (2) review ongoing efforts to reduce the amount of unexploded ordnance resulting from munitions system failures, and evaluate whether there are ways to improve or accelerate these effort; and (3) identify other feasible measures the U.S. can take to reduce the threat that failed munitions pose to friendly forces and non-combatants (fuze systems and employment practices).[126] No information available is about the findings of the Task Force.

Germany "aims to achieve a maximum rate of dangerous duds of one per cent".[127] The withdrawal of cluster weapons which do not fulfil this requirement will accelerate as a result of a compromise reached between the government coalition partners in early 2005. According to the agreement BL-755 should we withdrawn at a faster pace than previously planned. The dispenser weapon system (MW-1) is planned to be taken out of service between 2013 and 2015 when Tornado fighters will be withdrawn.[128] M-26 rockets for MLRS will not be used before their submunitions will have been equipped with back-up self-destruct mechanisms.[129]

Germany supports an international agreement including a submunition reliability requirement of 99 per cent.[130]
Norway introduced a requirement for submunition design in 2001 according to which submunitions must include a self-destruct feature.[131] According to available information the only cluster weapon in service with the Norwegian armed forces are 155mm artillery shells with submunitions equipped with self-destruct mechanism. While the requirement at the time of procurement was for 98 per cent or higher reliability, test are said to have shown a reliability of more than 99 per cent.[132] Like Denmark, Norway has not procured cluster weapons for its MLRS because submunition with a self-destruct mechanism is still under development. [133]

According to information provided by the UK government "all UK tube artillery submunition rounds now have a self-destruct fuze. In future all new submunition systems designed for the UK, both ground and air launched, will be required to meet similar standards."[134] The following types of cluster weapons with known high failure rates are reportedly in service with the UK armed forces: BL-755 cluster bombs and M-26 rockets for MLRS.[135] According to an earlier report also 155mm M-483 artillery shells were in the inventory of the armed forces.[136]

Newer types of 155mm artillery shells carrying submunitions with self-destruct devices, Extended Range Bomblet Shells (ERBS), have been procured first in 1996 and more recently since 2002.[137] According to the Ministry of Defence, tests have shown a failure rate of no more than 2 per cent.[138] The requirement for a submunition with self-destruct fuze was reportedly one of the key requirements already in 1995.[139]

[126] Department of Defense, The Under Secretary of Defense, Memorandum For Chairman, Defense Science Board, Defense Science Board Task Force on Munitions Systems Reliability, 30 Apr. 2004, available at URL http://www.acq.osd.mil/dsb/tors/TOR-2004-04-30-Munitions_Failure_Rates.pdf.

[127] Germany, Mar. 2005.

[128] The part of the agreement refering to cluster weapons is available at Geopowers, Rüstung 2005, at URL http://www.geopowers.com/Machte/Deutschland/Rustung/Rustung_2005/rustung_2005.html.

[129] Germany, Mar. 2005.

[130] Ministry of Foreign Affairs Germany, communication to Pax Christi Netherlands, 29 Oct. 2004.

[131] "Norge har stilt et generelt krav om at bomblet-ammunisjon skal være slik konstruert at enheter som ikke eksploderer ved anslag på bakken, skal ødelegges ved selvødeleggelse." Forsvarsdepartementet, Budsjettforslag, Programområde 04 Militært forsvar, 2001-2002, available at URL http://odin.dep.no/fd/norsk/dok/regpubl/stprp/010001-030013/hov006-bn.html.

[132] Forsvarsdepartementet, Forsvarssjefens rapport - Bruk av klasebomber i Hjerkinn skytefelt, 30 Oct. 2002; available at URL http://odin.dep.no/fd/norsk/dok/andre_dok/utredninger/010011-210112/dok-bn!30090.html.

[133] Forsvarsdepartementet, Oct. 2002.

[134] UK non-paper, Mar. 2004.

[135] Ingram, House of Commons, Written Ansers to Questions, 29 Apr. 2003; available at http://www.parliament.the-stationary-office.co.uk/.

[136] Ingram, House of Commons, Written Answers to Questions, 14 Mar. 2003; available at http://www.parliament.the-stationary-office.co.uk/.

[137] Ingram, House of Commons, Written Answers to Questions, 17 Nov. 2003; available at http://www.parliament.the-stationary-office.co.uk/.

[138] Ingram, House of Commons, Written Answers to Questions, 16 June 2003; available at http://www.parliament.the-stationary-office.co.uk/.

[139] Foss, Christopher F., 'Army looks to Israel for artillery ammunition', Jane's Defence Weekly, 7 Oct. 1995.

Available information suggests that obsolescent submunitions will be gradually removed until the end of the decade. BL-755 cluster bombs are planned to be withdrawn from service over the next five years. M-26 rockets for MLRS are planned to be replaced by rockets carrying submunitions with self-destruct fuzes entering service in 2007.[140]
A paper presented in 2002 at the meeting of government experts of states parties to the CCW Convention suggests that France supports a requirement for submunitions to include self-destruct or self-deactivation/self-neutralization mechanisms. However, according to the paper "this requirement could be waived, on operational grounds, for high-precision submunitions used against defined targets, the reason being that, in the state of the art, effective self-destruction systems are more easily added to large, than to very small submunitions."[141]
No information is available about the extent to which current holdings of submunitions by the French armed forces have been equipped with back-up systems.

Limited information is available about Austria's requirements for submunition reliability. According to information from the Ministry of Defence cluster weapons in service with the armed forces are equipped with self-destruct devices: "Modernization is not possible given the current state of technological developments."[142]

Sweden does not have a formal requirement for submunition reliability. All weapons acquired by the Swedish forces are examined by a special delegation (Vapenprojekt-delegationen). The delegation is composed of members of the Ministry for Foreign Affairs, the Ministry of Defence, the Swedish Armed Forces, the Defence Research Establishment and the Swedish Defence Materiel Administration. It has the task of screening arms procurement projects against their compliance with the prescriptions of IHL, and in particular of Protocol I Additional to the Geneva Conventions of 1949.[143] If the delegation finds that it cannot approve a weapon from this perspective, it can request a modification in its design, suggest an alternative or restrict the operational use of the weapon. The Swedish Armed Forces and other authorities are obliged to report every project that includes the procurement of any arms to be used against persons.[144]

The only type of cluster weapon in service with the Swedish armed forces, the Dispenser Weapon System for Gripen combat aircraft, the DWS-39, is reported to carry submunitions with a self-deactivation device and a failure rate of less than 1 per cent.[145] Sweden also procured 155mm BONUS artillery shells carrying two guided submunitions.
Canada has not formulated a requirement for submunition reliability as the military requirement for cluster weapons is currently under review.[146]

Spain is currently undertaking efforts to improve the reliability of submunitions in the inventory of its armed forces. Insufficient information is however available about the national requirement for submunition reliability.[147]

Available information suggests that overall reliability of submunition holdings of the armed forces of a significant number of countries has increased over the past 5-10 years, and will further increase over the next few decades after the completion of ongoing modernization programmes. A survey of submunition holdings compiled by Human Rights Watch in 2002 found that at least eleven countries had developed or deployed submunitions with self-destruct or self-neutralization mechanisms.[148] Available information suggests that by early 2005 at least nine more countries have done so.

However, the focus of modernization programmes is on new weapons, while retrofitting of existing weapons is generally given minor consideration. Available information suggests that Denmark and Norway have applied their policies on submunition reliability to all submunitions held by their armed forces. Most countries focus their efforts to ensure

[140] Ingram, House of Commons, Written Ansers to Questions, 26 Jan. 2005; available at http://www.parliament.the-stationary-office.co.uk/.

[141] France, July 2002.

[142] Ministry of Defence Austria (Bundesministerium für Landesverteidigung, Rüstungskontrolle, Abteilung Militärpolitik), communication to Pax Christi Netherlands, 14 Jan. 2005.

[143] Förordning (1994:536) om folkrättslig granskning av vapenprojekt, available at URL http://www.notisum.se/rnp/sls/lag/19940536.HTM.

[144] Olof Carelius, Swedish Armed Forces, Expert on Mine Action, communication to Pax Christi Netherlands, 26 Nov. 2004.

[145] Ministry for Foreign Affairs Sweden, communication to Pax Christi Netherlands, 14 Jan. 2005.

[146] Permanent Mission of Canada to the United Nations and the World Trade Organization, Canadian Delegation to the Conference on Disarmament, communication to Pax Christi Netherlands 13 Jan. 2005.

[147] Mininstry of Foreign Affairs and Co-operation (Sub-department for International Disarmament), communication to Pax Christi Netherlands, 22 Mar. 2005.

[148] Human Rights Watch, May 2002.

a higher level of reliability on newly acquired submunitions. The Ministry of Defence of South Korea for instance stated that equipping old submunitions with self-destruct mechanisms was considered not feasible due to financial and technical difficulties.[149] Large stockpiles of obsolescent submunitions remain therefore even in the inventories of armed forces world-wide that have introduced or will introduce more reliable cluster weapons.

Some countries have stressed the need to pay attention to "the divergence in economic and technological capacity of different countries (…). Only in this way, the problems caused by ERW can be solved fairly and effectively."[150] Insufficient information is made available about the ways reliability policies are implemented and about their financial costs (see below). This type of information constitutes an important input into ongoing international negotiations.

A joint statement by Russia and China of July 2002 emphasized that

> *"If rigid technical specifications of certain types of weapons and munitions are set, which will in effect limit or deprive most developing countries of their legitimate rights for self-defence, they can hardly be acceptable to these countries." The conclusion is therefore that "for the above-mentioned reasons, for a number of countries, it makes little sense to equip munitions with the SD and SDA devices, including munitions in stockpile."*[151]

The government of Argentina contended that a successful approach to submunition reliability must be accepted by all countries that have the capability of producing submunitions. If this cannot be achieved two different but equally counter-productive trends may arise: either a limited access to the most advanced technologies or a world-wide proliferation of low-cost submunitions with a high failure rate.[152]

3.1.2. The arms industry's response

> *"IMI plans to widen its range of cluster bombs and submunitions, to be tailored for various types of bomb cases."*[153]

Military requirements translate into business opportunities for the producers of weapons. In response to military requirements for more reliable submunitions a number of arms producers offer new submunitions with back-up systems as well as back-up systems for existing submunitions. At the same time business considerations are also known to shape military requirements. Some consideration needs therefore to be given to the role of the arms industry in the ongoing debate.

This section does not provide a comprehensive overview of industrial capabilities in the field of advanced submunitions and back-up systems that increase submunition reliability. It summarizes available information - and wants to emphasize the need for access to more relevant and reliable information.

Few companies within Western arms industries appear to produce submunitions that meet strict reliability requirements. Self-destruct fuzes for submunitions have been developed or are under development by a limited number of companies, such as the US military electronics company L-3 Communications (KDI Precision Products and BT Fuze Products), and the German Diehl (Junghans) in collaboration with Giat Industries of France. A significant number of Western companies have acquired M-85 submunitions with self-destruct fuzes from Israel Military Industries (IMI) and integrated them into their own weapons.

According to its own information IMI is the

> *"only defense industry in the world whose systems experts and engineers have succeeded in developing a self-destructing mechanism, which*

[149] Official response received from South Korea, Ministry of National Defence, through the Permanent Mission of South Korea in Geneva, 3 June 2005.

[150] Russia and China, Technical Improvements of Ammunitions to Prevent and Reduce ERW, Joint Discussion Paper By China and the Russian Federation, Group Of Governmental Experts Of The Parties To The 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, CCW/GGE/II/WP.20, 23 July 2002, available at URL http://www.ccwtreaty.com/KeyDocs/GGE2/CCW-GGE-II-WP20-E.pdf.
See also Russian Federation, Discussion paper on the issue of the explosive remnants of war, CCW/GGE/I/WP.11, 23 May 2002; available at URL http://www.ccwtreaty.com/KeyDocs/GGE1/CCW-GGE-I-WP11-E.pdf..

[151] Russia and China, July 2002.

[152] Ministerio de Relaciones Exteriores, Comercio Internacional y Culto, communition to Pax Christi Netherlands, 14 June 2005 (through the Permanent Mission of the Republic of Argentina to the United Nations - Geneva).

[153] Eshel, Tamir, 'IMI Puts Its Aerial Firepower on Display', ShowNews Online Paris 2003, in Aviation Week & Space Technology; at URL http://www.aviationweek.com/shownews/03paris/hard14.htm.

leaves a totally clean area, protecting the lives of civilians and combat forces operating in the area."[154]

IMI announced to have produced more than 60 million M-85 submunitions by late-2002.

Since the mid-1990s the company, has reportedly sold M-85 submunitions or cluster weapons with M-85 submunitions to a significant number of Western countries, including Denmark, Finland, Germany, Norway, Switzerland, and the UK. IMI has also developed projectiles with M-85 submunitions for non-Western customers - but no information is available about actual procurements.[155]

IMI has marketed its cluster weapons outside Israel partly though the establishment of industrial alliances with major Western ammunition producers, such as the British BAE Systems, the German Rheinmetall[156], the Swiss RUAG[157] and the US Alliant Techsystems[158]. No information is available about industrial alliances in this field with non-Western producers of cluster weapons.

The air-delivered submunition replacing the highly unreliable BLU-97 bomblet is the BLU-108 (Skeet) submunition with self-destruct fuze produced by Textron Systems (USA) since the early 1990s:

"Unlike older, traditional 'cluster' weapons, each Skeet warhead features built-in, redundant, self-destruct logic. If the Skeet warhead does not detect a valid target over its lofted trajectory, it will self destruct. Each warhead also contains a timed self-deactivation mode which denies explosive activation should the self-destruct feature not occur. These safety features minimize post air strike hazards to non-combatants and civilians."[159]

Information about the reliability of cluster weapons produced by Western companies is fragmentary and often contradictory. Information about the reliability of cluster weapons produced by non-Western companies is extraordinarily scarce.

The Turkish ammunition producer MKEK appears to continue license production of obsolescent US-developed 155mm M-483 artillery shells.[160] MKEK also produces mortar shells carrying submunitions with self-destruct fuze, but it is unclear whether the submunitions are produced under license from IMI or imported.[161]

ST Kinetics, the land weapons division of Singapore's by far largest arms producer, Singapore Technologies Engineering, produces a 155mm artillery shell with submunitions with mechanical self-destruct fuze. According to the information provided by the company the dud rate has been reduced to 3 per cent and overall reliability is 99.9 per cent.[162] Also the South Korean Poongsaan[163] and the South African Denel[164] produce 155mm artillery shells that carry submunitions with self-destruct fuzes. No information is provided about their exact failure rates.

Insufficient information is available about the design features and reliability of cluster weapons produced by the largest ammunition companies in India (Indian Ordnance Factories) and Pakistan (Pakistan Ordnance Factories). No information is available about the reliability of cluster weapons produced by the Ammunition Industries Group (AMIG) of the Iranian Defence Industries Organisation (DIO). Neither is information available about submunition technology held by companies known to produce cluster weapons in other countries with highly in-transparent arms industries, such as Russia and China.

3.1.3. An adequate solution to humanitarian problems?

"From the humanitarian standpoint restrictions on the use of mines by changes in their construction

[154] Israel Military Industries, at URL http://www.imi-israel.com/ (accessed in Nov. 2004).

[155] Foss, Christopher F., 'Army looks to Israel for artillery ammunition', Jane's Defence Weekly, 7 Oct. 1995; Foss, Christopher F., 'Israel expands M85 bomblet family', Jane's Defence Weekly, 25 Sep. 2002. Veterans for Peace, Thomas Frank, June 2003.

[156] Jane's Information Group, 'Europe, Rheinmetall wins DM 662 shell contract', Jane's Defence Weekly, 15 Jan. 1997.

[157] Defense Update, 'Advanced 120mm Mortar Munition', 2004, Issue 1, at URL http://www.defense-update.com/features/du-1-04/mortar-munitions.htm.

[158] Israel Military Industries, 'IMI and ATK Announce Signing of Strategic Alliance', press release, 20 Feb. 2003, at URL http://www.imi-israel.com/imi/doa_iis.dll/Serve/item/English/1.1.4.20.html.

[159] Textron Systems, 'BLU-108 Submunition, Sensor fuzed submunition for strike weapons, missiles and UAVs', at URL http://www.systems.textron.com/pdf/products/blu108_datasheet.pdf.

[160] Makina ve Kimya Endüstrisi Kurumu (MKEK), 155 mm M483 A1 ICM Projectile, at URL http://www.mkek.gov.tr/english/company_introduction2.htm (accessed in Jan. 2005).

[161] Foss, Christopher F., 'Turkey details 120mm Automatic Mortar', Jane's Defence Weekly, 12 Nov. 2003.

[162] Singapore Technologies Kinetics, 155mm cargo round, at URL http://www.stengg.com/upload/195HAHMPUbQILMh46go.pdf (accessed on 21 Dec. 2004).

[163] Poongsan, Poongsan Defense, Howitzer ammunition, at URL http://poongsandefense.com/product03_1.htm (accessed in Jan. 2005).

[164] Foss, Christopher F., 'Denel finishes G6-52 gun platform, tests continue', Jane's Defence Weekly, 10 Dec. 2003.

are insufficient; the parameters of the proposed modification are not verifiable. (...) failures of self-destruct and self-deactivating mechanisms are inevitable."[165]

There is no doubt about the fact that technological developments will lead within the near future to the fielding of new cluster weapons with comparatively low failure rates. However, whether the addition of back-up systems to increase submunition reliability constitutes a satisfactory solution to the humanitarian problems caused by unexploded submunitions remains debatable for a number of reasons.

1. Even submunitions with low failure rates risk causing disproportionate human suffering if used in cluster weapons carrying them in large numbers, such as the various multiple rocket launch systems in service with the armed forces of a significant number of countries.

The Polish Ministry of National Defence maintains therefore that

"in view of humanitarian concerns it is a controversial approach to seek for any sufficient degree of cluster munitions reliability (...) one should rather aim at rendering these weapons absolutely reliable."[166]

As discussed above failure rates of primary fusing systems of less than 2.5 per cent have reportedly not yet been achieved. Back-up systems can significantly increase submunition reliability given "ideal" delivery techniques and conditions of use - but cannot eliminate failure.

2. Reliability rates provided by industry and referred to by governments are results obtained during testing. Testing parameters vary across countries as well as across time within countries. For instance the UK Ministry of Defence reported a change in failure rates during testing of BL-755 cluster bombs as a result of changes in testing parameters:

"(...)recent statistics show an overall failure rate of 6 per cent in line with expectations. We have previously stated a failure rate for the BL755 of 'approximately 5 per cent'; the figure has now increased not because the weapon is less reliable but because the parameters used to compile the statistics have changed."[167]

Most importantly, however, reliability rates provided by industry and referred to by governments commonly do not refer to "operational" reliability rates. Their relevance for actual conditions in wars is uncertain. Whenever investigations have been carried out "operational" failure rates have been found to be significantly higher.

3. Limited attention has been devoted up until now to the time limit for self-destruct fuzes. That secondary self-destruct fuzes are designed to detonate a submunition dud after a few seconds, rather than hours or days, is crucial in order to avoid the use of submunition duds as de-facto landmines as suggested by the Argentinean CITEFA (see above).

In this regard it is worrying that the concept of "non-persistency" has recently been introduced to the debate about measures to prevent UXO from submunitions, and that it has been suggested that "Cluster munitions should be equipped with mechanisms to limit their operational time after deployment against targets."[168] There is a clear risk that some countries may see this as an opportunity to use submunition duds as short-term de-facto landmines.

4. A 2003 report by Human Rights Watch about the conduct of war in Iraq confirmed concerns that the sense of reliability may encourage armed forces to employ cluster muntions in larger numbers:

"Ironically the promise of a lower dud rate may have made the British less careful about where they used the L20A1. 'There was less of a reluctance to use them because of the increased reliability," Colonel Baldwin said.' Efforts to reduce

[165] Goldblat, Jozef, 'Land-mines and Blinding Laser Weapons: The Inhumane Weapons Convention Review Conference', in SIPRI Yearbook 1996: Armaments, Disarmament and International Security, SIPRI, Oxford University Press, 1996, p. 758.

[166] Polish Ministry of National Defence, communication to Pax Christi Netherlands, 14 Feb. 2005. The Ministry's view does not necessarily reflect the official position of Poland.

[167] Ingram, House of Commons Hansard Written Answers for 29 Apr. 2003, at URL http://www.publications.parliament.uk/pa/cm200203/cmhansrd/vo030429/text/30429w04.htm.

[168] A recent working paper presented by Germany made use of the terms "limitation of operational time" and "non-persistency" when actually referring to the failure of submunition to function as intended. Germany, Mar. 2005.

the dud rate of cluster weapons should be commended; however, the rates must be made significantly lower and cluster munitions must be kept out of populated areas if humanitarian harm is to be minimized."[169]

Improvements in submunition reliability alone are certainly inadequate to solve the humanitarian problems related to UXO. At a minimum they have to be accompanied by clear restrictions on the use of cluster weapons. It is also important to remember that increased reliability addresses only one aspect of the humanitarian problems caused by the use of cluster weapons. The other concern - disproportionate collateral damage during use - is closely linked to the accuracy of weapons as discussed in the following section.

3.2. Accuracy: improve the precision of submunition carriers and submunitions

„Dabei besteht das größte Problem darin, das Ziel präzise zu treffen. Das hat in der Vergangenheit zur Entwicklung von Munitionssorten geführt, bei der die hohe Energie des Einzelschusses auf zahlreiche Tochtergeschoße (Submunition) aufgeteilt wird, die über dem Zielgebiet aus einem Trägerprojektil ausgestoßen werden (...) Der Trend geht jedoch eindeutig in Richtung Suchzünder-munition."[170]

"One of the reasons we are trying to do that is we have a significant inventory of cluster weapons. (...) By adding the [WCMD] tail kit, we have made a lot of those weapons more viable. Now, if we add a wing kit to them, we make even a greater portion of those weapons viable for future operations against more complex defence capabilities." [171]

The overwhelming part of cluster weapons currently in the inventories of armed forces world-wide are weapons that dispense a large number of unguided submunitions. Improved accuracy of submunitions has received limited attention within international arms control discussions as the debate about the humanitarian problems caused by the use of cluster weapons has largely been conducted within the framework of the CCW meetings of governmental experts on ERW related issues since 2001. Proposals for technical specifications focus on submunition reliability, not on accuracy.

Accuracy is a key requirement for military efficiency for any type of munition. There is also strong awareness among Western militaries of the political need to avoid disproportionate collateral damage. Technical improvements to the guidance system of weapons are driven by both these interests. A first generation of "smart" weapons was developed in the 1960s and used on a large scale for the first time during the Gulf War of 1991.

"SMART" MUNITIONS OR "PRECISION-GUIDED" MUNITIONS

Jane's Ammunition Handbook provides the following summary description of "smart" munition:

"The term `smart munitions' has been used in so many contexts that it has come to mean little. There are actually three distinct types of smart munitions. First, there are munitions that can be guided down onto a particular target by the actions of an observer. The most common of these are the Semi-Active Laser (SAL) guided rounds that home in on light energy reflected from the target being illuminated by a laser-equipped observer. The second type are sometimes called `brilliant munitions' because they function autonomously, seeking out targets on their own, using built-in sensors and pre-set algorithms to recognise particular target sets. The third group uses GPS or inertial navigation, along with control devices, to reduce normal gunnery errors."[172]

Laser-guided weapons were first used on a large scale during the Gulf War of 1991. However, as laser seekers require a clear line of sight, the usefulness of laser-guided weapons is directly linked to weather conditions and very limited in cloudy, dusty, or smoky conditions. The effectiveness of new generation of munitions, guided by satellite navigation systems, can be seriously limited by GPS jammers.

[169] Human Rights Watch, 'Explosive Remnants of War', in Off Target: The Conduct of the War and Civilian Casualties in Iraq, Dec. 2003; available at URL http://www.hrw.org/reports/2003/usa1203/6.htm.

[170] The biggest problem in this is to hit the target precisely. In the past this has led to the development of types of munition which distribute the high level of energy of one single shot on to a large number of submunitions. These are dispensed over the target area from the main projectile (...) The trend however is towards (the development/use) of sensor-fuzed munitions (unofficial translation). Oberst Rainer Karasek, 'Die Artillerie im Verbund mit Aufklärungsmitteln (II), Der Einsatz als "Präzisionswaffe" zur Vermeidung von Kollateralschäden, Informationssystem des Bundesministeriums für Landesverteidigung, Zeitschrift Truppendienst, Folge 275, Ausgabe 2/2004, available at URL http://www.bundesheer.at/truppendienst/ausgaben/.

[171] Sirak, Michael, 'USAF eyes extended-range cluster munitions', Jane's Defence Weekly, 16 Jan. 2002.

[172] Jane's Information Group, Jane's Ammunition Handbook, 2004, extract available at URL http://jah.janes.com/public/jah/additional_info.shtml.

During the Gulf War of 1991 smart bombs accounted for one tenth of the munitions used. Eight years later, in the Kosovo campaign of 1999, they accounted for 98 percent of munitions dropped by US aircraft.[173] A US Air Force commander reported in early 2005 that "not a single dumb bomb was used during the operation" in the Iraqi city of Fallujah.[174]

The requirement for a high level of accuracy raises particular concerns with regard to the use of area weapons. A working paper submitted by the CMC at the CCW expert meeting in 2004 referred to a series of statements by US and UK military officers expressing their concerns about the indiscriminate effects of submunitions during targeting.[175]

The following section provides a summary of the most advanced programmes - which at the moment few states possess the technological capabilities for and find "affordable".

3.2.1. "Smart" submunitions

Much hope was put in the development of "smart" submunitions in the 1990s. Of the US "smart" submunition programmes of the 1990s - Sensor Fuzed Weapon, Sense And Destroy Armor and Brilliant Anti-Tank - only one survived. West European programmes are the German SMArt and the French-Swedish BONUS.

The BLU-108 "sensor fuzed smart submunition" is produced by the US arms producer Textron Systems. Each submunition contains four "smart" warheads (called 'Skeet') with infrared as well as laser sensors to guide the submunition onto a target and with two built-in self-destruct features. According to the US Air Force the weapon has a computer memory that "prevents them from locking on to non-military targets, such as buses and tractors."[176] BLU-108 submunitions are in production since 1992 and are part of Textron's CBU-97/CBU-105 Sensor Fuzed Weapon programme. Each CBU-97 carries 10 BLU-108 submunitions. BLU-108 submunitions are also used in the JSOW (Joint Stand-Off Weapon) missiles and can, according to Textron Systems, be used in ATACAM and GMLRS rockets.[177]

The US Sense And Destroy Armor (SADARM) "smart" submunition programme was started in the mid-1980s and was characterized by delays and cost-overruns.[178] Submunition reliability in particular was a constant problem.[179] The programme was discontinued in 2001. Also the Brilliant Anti-Tank (BAT) "smart" submunition programme experienced technical problems, in particular submunition reliability below requirements, and cost-overruns and was terminated in late 2002.[180] Ongoing US programmes for the development of "affordable" and "smart" submunitions are the Low Cost Autonomous Attack System (LOCAAS) and the Common Smart Submunition (CSS).

West European arms producers have developed submunitions similar to the US SADARM. The French Giat Industries and the Swedish Bofors Dynamics (owned by the US company United Defense) merged two programmes to develop a 155mm artillery shell with two "smart" submunitions, BONUS.

The submunitions contain an infra-red sensor which can and search an area of 32,000m2 (about eight times the area covered by one cluster bomb). The on-board computer can select targets and "reject incorrectly sized objects". The submunitions are also equipped with two redundant self-destruct mechanisms.[181] BONUS has been acquired by the French and Swedish armed forces, has been tested in the UK and will be tested in the USA.[182]

The German Suchzündermunition Artillerie (SMArt) has been developed by Gesellschaft für Intelligente Wirksysteme mbH (GIWS), a joint venture company owned by Diehl, and Rheinmetall. Each 155mm shell contains two submunitions, equipped with sensors to search for targets and self-destruct mechanisms. According to the producer collateral damages in urban areas are drastically reduced as a result of both the small number of rounds per engagement

[173] Stern, Seth, 'Smart bombs' move to center stage in US arsenal', The Christian Science Monitor, 20 Mar. 2003; at URL http://www.csmonitor.com/2003/0320/p06s01-woiq.html.

[174] Ripley, Tom, 'Air power 'precise' during Battle of Fallujah, says USAF', Jane's Defence Weekly, 11 Feb. 2005.

[175] Cluster Munition Coaltion (CMC), The Concerns About Submunitions from a Military Perspective, Working paper submitted by the CMC, Geneva, 5 July 2004.

[176] Ripley, Tim, ''Smart' cluster bombs destroy Iraqi tanks', Jane's Defence Weekly, 9 Apr. 2003.

[177] Textron Systems, 'BLU-108 Submunition, Sensor fuzed submunition for strike weapons, missiles and UAVs', at URL http://www.systems.textron.com/pdf/products/blu108_datasheet.pdf.

[178] The programme was contracted to Gencorp's Aerojet and Alliant Techsystems (ATK).

[179] Director, Operational Test & Evaluation (DOT&E), 'Sense And Destroy Armor (SADARM)', in FY99 Annual Report; available at URL http://www.globalsecurity.org/military/library/budget/fy1999/dot-e/army/99sadarm.html.

[180] Northrop Grumman was the prime contractor of the programme.

[181] Foss, Christopher F., 'Added BONUS near for two armies', Jane's Defence Weekly, 7 July 2004.

[182] United Defense, 'United Defense Awarded Contract for Evaluation of BONUS Precision Munition', 19 Jan. 2005, in Forecast International, 19 Jan. 2005.

and the fact that the submunitions are configured as pure anti-armour warheads, confining damages to the armoured targets only.[183] SMArt has been acquired by the German, Swiss and Greek armies.

Also the Russian Splav State Research and Production Enterprise produces 122mm artillery rockets with 2 guided submunitions (9M217) for the widely used BM-21 (Grad) multiple rocket launcher. No information is available about whether the new artillery rocket has been exported.

Israel Military Industries (IMI) announced in late 2004 that it had developed a submunition "capable of differentiating between civilian and military targets and attacking only the latter." According to IMI the Miniature Intelligent Multipurpose Submunition (MIMS) can be pre-programmed to detect certain kinds of vehicles, based on size, form and speed and thereby allows to reduce significantly any collateral damage. In the future the company wants "to develop the capability of differentiating between belligerents and non-combatants, by detecting the amount of metal carried by the individual."[184]

3.2.2. "Smart" submunition carriers

The Wind Corrected Munitions Dispenser (WCMD) is a "low-cost" guidance kit, produced by the US company Lockheed Martin. Both existing CBU-87 cluster bombs (which carry bomblets with known high failure rates) and new CBU-97 cluster bombs (with submunitions equipped with self-destruct mechanisms) have been equipped with the WCMD. WCMD dramatically improves accuracy. "The WCMD is designed to deliver cluster weapons (...) within 30m of aim-point in all weather conditions and when dropped from high altitudes."[185]

CBU-105 cluster bombs - CBU-97 fitted with the WCMD - were for the first time dropped in Iraq in April 2004.[186] Forecast International commented: "While called by some a relic of the Cold War, the CBU-97/B (...) is still an ideal weapon for use against massed formations of tanks. The analysts of the Weapons Group only wondered whether a sufficiently rich target environment would appear in this war to allow this munition to be effectively used. But apparently this came to pass (...)"[187]

The German Lenkflugkörpersysteme (LFK), a subsidiary of EADS, produces the Autonomous Free-flight Dispenser System (AFDS), a "non-powered, gliding, intelligent submunition standoff weapon system."[188] The missile is a further derivative of a series of dispensers developed by the company since the 1960s, the MW-1 (Germany and Italy), the MDS and the DWS-24/39 (Sweden). The weapon is marketed under the timely but probably inept slogan "The Modular Stand-off Missile for Peace Enforcement".[189] Until now only Greece appears to have acquired the system.

Efforts to integrate a guidance package and extend the range of the widely used Multiple Launch Rocket System (MLRS) to more than 60 kilometres were initiated in the USA and in Germany in the 1990s. A joint US-European (France, German, Italy, and the United Kingdom) development programme was set up in the late 1990s. The US Army alone is expected to procure more than 100,000 missiles.[190] Aside from the five programme partners, Lockheed Martin claims that at least seven other countries have shown an interest in Guided MLRS (GMLRS).[191]

The GMLRS M-30 rockets use inertial and Global Positioning Satellite (GPS) guidance systems. As a result of increased accuracy the number of submunitions has been reduced from 644 M-77 to 404 M-85. Fewer submunitions per rocket and fewer rockets required to hit a target are expected to have a "major impact on logistics".[192]

A US programme for the development of "smart" submunitions for the GMLRS was abandoned in 1999.[193] By early 2005 contracts for the supply of submunitions with self-destruct fuzes had not yet

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[183] GIWS, 'The new Era for Artillery Ammunition: SMArt(r) 155', at URL http://www.giws.de/texte/english/smart.htm (accessed in Feb. 2005).

[184] Ben-David, Alon, 'IMI unveils 'intelligent' submunition', Jane's Defence Weekly, 3 Nov. 2004.

[185] Sirak, Michael, 'US Air Force moves forward with sensor-fuzed weapon upgrades', Jane's Defence Weekly, 28 Mar. 2001.

[186] Ripley, Tim, ''Smart' cluster bombs destroy Iraqi tanks', Jane's Defence Weekly, 9 Apr. 2003.

[187] Forecast International Weapons Group, 'First Use Of Sensor Fuzed Weapon Reported', Forecast International, 3 Apr. 2003.

[188] EADS/LFK, 'AFDS, Standoff guided missile system with submunition', at URL http://www.eads.net/frame/lang/en/800/content/0F00000000400004/1/83/559831.html.

[189] EADS/LFK, 'AFDS, Autonomous Free-flight Dispenser System', brochure, date unknown.

[190] Claremont Institute, 'Guided MLRS', in Missiles of the World, 2005; at URL http://www.missilethreat.com/missiles/guided-mlrs_usa.html.

[191] Foss, Christopher F., 'AUSA 2003 - Euro trio looks west for assembly of guided-rocket launcher', Jane's Defence Weekly, 15 Oct. 2003.

[192] Foss, Christopher F., 15 Oct. 2003.

[193] Claremont Institute, 'Guided MLRS', in Missiles of the World, 2005; at URL http://www.missilethreat.com/missiles/guided-mlrs_usa.html.

been awarded. Rockets with unitary warheads are under development in the USA (see below).
The "basic" MLRS has been supplied to a large number of countries, or eight countries next to the five programme partners. The German arms producer Rheinmetall has developed a guidance kit, the Contraves Rheinmetall Enhanced Correction of Trajectories (CORECT), which can be fitted also to existing rockets.[194]

Raytheon (USA) is also developing since the late 1990s a 155mm precision artillery shell, Excalibur, which is planned to carry submunitions as well as unitary warheads. Sweden (Bofors Defence) joined the programme in 2002.

3.2.3. An adequate solution to humanitarian problems?

"... even the best weapons are only as good as the human intelligence that guides them."[195]

The large number of submunitions carried by older types of cluster weapons was an answer not only to the anticipated multitude of targets but also to the lack of technology capable to allow precise targeting as well as to the high failure rate of submunitions. Improvements in submunition fuzing systems and in particular in the guidance systems of submunitions and cluster weapons have led to a drastic reduction in the number of submunitions carried by some new types of cluster weapons.[196] The German GIWS, producer of the SMArt 155mm projectile carrying two submunitions, aptly uses the slogan "replaces quantity by effectiveness".[197]

Technology allowing for precise targeting can reduce the humanitarian problems caused by unguided cluster weapons. Nevertheless, as with other types of "smart" or "precision-guided" munitions a number of factors need to be taken into consideration. Firstly, "smart" weapons are not 100 per cent "smart". Their precision depends on human intelligence for the identification of its targets. Secondly, as is the case with improved reliability, trust in the precision of the weapons and their capability to seek targets "independently" may encourage a less careful use of them.

Improvements in both accuracy and reliability are required in order to reduce the humanitarian problems caused by the use of cluster weapons. An assessment by Human Rights Watch of US procurement spending related to the acquisition of new and the retrofitting of existing cluster weapons, emphasized that equipping cluster bombs with known high failure rates (such as the CBU-87) with WCMD, may address accuracy, but is inconsistent with the 2001 DoD policy that requires improved submunition reliability.[198]

3.3. Financial costs

"Secondly, the cost of submunitions without SD&SDA is very low. If submunitions are produced in large amounts and installed with SD&SDA, the cost is very high." [199]

Improvements in weapon design are generally leading to higher weapon costs. Increases in submunition reliability and accuracy are no exception. Overall, the costs of improved fuzing systems are drastically lower than those for improved guidance. However, whether costs are deemed "affordable" depends on the measure applied. It goes without saying that financial costs alone should never gain higher priority than the security of civilians.

As discussed above, a significant number of states, in particular in Western states, support an international agreement on technical specifications that assure a higher level of submunition reliability. Others have emphasized the importance of taking into consideration differences across countries in technological capabilities and budgetary constraints. Increased accuracy of cluster weapons has received limited attention within ongoing arms control discussions. However, also the development of high-cost "smart" submunitions is driven by considerations of military effectiveness and political

[194] Foss, Christopher F., 'Defendory news: Trajectory correction module tested on MLRS', Jane's Defence Weekly, 13 Oct. 1004.

[195] Stern, Seth, 'Smart bombs' move to center stage in US arsenal', The Christian Science Monitor, 20 Mar. 2003; at URL http://www.csmonitor.com/2003/0320/p06s01-woiq.html.

[196] UK non-paper, Mar. 2004.

[197] Loske, Klaus, SMArt155 What is next?, presentation at the 6th International Cannon Artillery Firepower Symposium & Exhibition, Defense Technical Information Ceter (DTIC) and National Defense Industry Association (NDIA), 19-21 June 2000; at URL http://www.dtic.mil/ndia/cannon/loske.pdf.

[198] Human Rights Watch, Cluster Munitions Too Costly: Department of Defense FY 2005 Budget Requests Related to Cluster Munitions, June 2004; available at URL http://hrw.org/backgrounder/arms/clustermunitions/clustermunition.pdf.

[199] FU Zhigang, Favorable Technical Measure to Reduce Explosive Remnants of War, Speech by Mr. FU Zhigang, Counsellor of the Chinese Mission to UN Office in Geneva, on behalf of Chinese Military Experts, at the International Workshop on Preventive Technical Measures for Munitions, 26-28 May 2004, Thun, Switzerland; available at URL http://genevamissiontoun.fmprc.gov.cn/eng/65426.html.

necessity. At the same time a number of programmes initiated have been terminated largely as a result of huge cost overruns.

3.3.1. Improved fuzing systems

Priority is given, as desribed above, also within those states that have issued reliability requirements, to the acquisition of new submunitions. The Polish Ministry of National Defence contends that the cost of equipping new submunitions with back-up self-destruct or self-deactivation systems "can be very low. In contrast, the cost of retrofitting the secondary fusing systems into existing systems can be unacceptable."[200] Insufficient information is however available about the difference in costs.

The US Army estimated in 1994 that the cost of retrofitting or replacing submunitions to add self-destruct fuzes for the close to 1 billion submunitions in its stockpile would be about US$29 billion, or US$29 per submunition. In 1996 a different study estimated the cost to retrofit the stockpile to be $11-12 billion, less than half that amount.[201]

In 2004 the US government awarded L-3 Communications a contract for the supply of 500,000 electronic self-destruct fuzes for 105mm M-915 shells, for a total amount of US$4.6 million, or roughly US$10 per fuze.[202]

A working paper presented by the UK at a CCW Convention government expert meetings in 2004 estimated the cost of adding a self-destruct fuze to new submunitions to be around $5.[203] Also in 2004 China provided detailed information about the estimated financial costs of equipping or retrofitting submunitions with back-up self-destruct mechanisms. According to these estimates the cost of submunitions would increase by US$3, US$6 or US$8 if equipped with pyrotechnic, mechanical or electronic self-destruct devices respectively. The cost of a 155mm shell carrying 63 submunitions would therefore increase by US$189 to US$264, by US$378 to US$528, or by $504 to US$704, depending on the type of back-up system installed.

The Chinese government also pointed out that differences in technological capability will lead to differences in costs, in particular if more advanced electronic fuzes are to be installed.[204]

3.3.1.1. Costs and savings

Improvements in cluster weapon design are primarily driven by the demand for increased military effectiveness. Cost estimates for fitting back-up self-destruct/self-deactivation mechanisms vary from US$3-10 per submunitions. The cost of weapons carrying a large number of submunitions increases markedly.

Measured against gains in military effectiveness however, such costs have been deemed "affordable". The UK presentation at the CCW Convention government expert meeting in March 2004 concluded that the costs of replacing or retrofitting submunitions as measured against increased military effectiveness have to be considered low.

> *"From a military perspective, a high failure rate can be compensated for by either increasing the numbers of submunitions in each round or by firing more rounds. (...) However, if we can achieve (through technical improvements) 10 times the military capability at 5 times the cost of current systems then, in the long term, we spend less money to realise our objectives."*[205]

But it is not only and foremost increased military effectiveness that provides a financial incentive for investments in submunition reliability. Article 3.2 of the Protocol on ERW requires every state party to

> *"mark and clear, remove or destroy explosive remnants of war in affected territories under its control. Areas affected by explosive remnants of war which are assessed pursuant to paragraph 3 of this Article as posing a serious humanitarian risk shall be accorded priority status for clearance, removal or destruction."*[206]

Fewer duds and lower collateral damage will also result in lower financial costs for post-conflict

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[200] Polish Ministry of National Defence, communication to Pax Christi Netherlands, 14 Feb. 2005. The Ministry's view does not necessarily reflect the official position of Poland.

[201] U.S. Army Materiel Systems Analysis Activity, Unexploded Ordnance (UXO) Study, Technical Report No. TR-654 (Aberdeen Proving Ground, Md.: Apr. 1996) referred to in United States General Accounting Office (GAO), Military Operations Information on U.S. Use of Land Mines in the Persian Gulf War, Report to the Honorable Lane Evans, House of Representatives, September 2002; available at URL http://www.gao.gov/new.items/d021003.pdf.

[202] L-3 Communications, 'L-3 KDI fuze for US M915 artillery projectile', press release 26 June 2003.

[203] UK non-paper, Mar. 2004.

[204] FU Zhigang, May 2004.

[205] UK non-paper, Mar. 2004.

[206] See the full text of the Protocol on ERW is available at the ICRC website at URL http://www.icrc.org/ihl.nsf/WebFULL?openview.

humanitarian interventions. According to a GAO report of 2002, the US Army estimated that

"the cost to reduce the dud rate by adding self-destruct fuzes for the submunitions actually used on a battlefield was comparable to the cost to clean up duds left by unimproved submunitions. The Army further recognized that, while the costs of reducing and cleaning up duds may be similar, the detrimental battlefield fratricide and counter-mobility effects of duds also need to be considered, as well as humanitarian concerns."[207]

3.3.2. Improved guidance

According to information provided by the producing company, Gesellschaft für Intelligente Wirksysteme (GIWS), the German armed forces acquired 9,000 SMArt 155mm shell carrying two submunitions at a cost of US$56,000 per shell.[208] The US Excalibur 155mm shell is expected to cost at least US$30,000 per unit.[209]

A 2001 report by the US House of Representatives Committee on Appropriation referring to ongoing development programmes for GPS/INS guided munitions stated:

"The Committee is concerned that the Army has paid insufficient attention to the projected cost of its precision guided indirect fire munitions. The Committee cannot justify artillery rounds costing $25,000 to $35,000 per round given the number of rounds the Army needs for training and for the war fight. At these costs, the Army will never be able to integrate precision guided munitions into its warfighting doctrine and tactics for anything more than 'silver bullet' extraordinary requirements."[210]

The US government and industry are reported to pursue a new "affordable" alternative to high-cost precision guided submunition programmes, the Common Smart Submunition (CSS), which is expected to cost between US$5,000 and US$10,000 per unit.[211] No information is available about the reliability requirement for this new "affordable, multiple application precision munition".[212]

The cost of the US CBU-97 cluster bomb, often referred to as Sensor Fuzed Weapon (SFW), carrying 10 BLU-108 submunitions, amounts to around US$370,000 per unit. As mentioned above the US Air Force equips these and older cluster bombs with an additional guidance package, the Lockheed Martin produced WCMD. The WMDC has been described, by a US Air Force officer as a "low-cost" solution for "significantly improving cluster weapons effectiveness."[213] The unit price of the systems is reported to amount to between US$14,000 and US$20,000, depending on whether it is equipped with global positioning system (GPS) guidance. A new extended range variant of it, which was expected to enter production in 2005, was expected to cost up to US$60,000 per unit.[214]

3.4. Alternative weapons

"Alternative Waffen, welche dem Wirkungsgrad von Streumunition entsprechen gibt es derzeit nicht."[215]

"On current plans all stockpiles of the BL755 and the RBL755 cluster bomb will be withdrawn from RAF service before the end of the decade. (…) Based on current predictions these weapons will not be replaced. However, it is intended that the Brimstone advanced air-launched anti-armour weapon will replace the capability of the RBL755 in the anti-armour role."[216]

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[207] U.S. Army Materiel Systems Analysis Activity, Unexploded Ordnance (UXO) Study, Technical Report No. TR-654 (Aberdeen Proving Ground, Md.: Apr. 1996).referred to in United States General Accounting Office (GAO), Military Operations Information on U.S. Use of Land Mines in the Persian Gulf War, Report to the Honorable Lane Evans, House of Representatives, September 2002; available at URL http://www.gao.gov/new.items/d021003.pdf.

[208] Loske, Klaus, SMArt155 What is next?, presentation at the 6th International Cannon Artillery Firepower Symposium & Exhibition, Defense Technical Information Ceter (DTIC) and National Defense Industry Association (NDIA), 19-21 June 2000; at URL http://www.dtic.mil/ndia/cannon/loske.pdf.

[209] Erwin, Sandra I., 'Cannons, Rockets and Missiles: A Growth Industry in the Army', NDIA Business & Technology Magazine, Oct. 2004, at URL http://www.nationaldefensemagazine.org/issues/2004/Oct/Cannons_Rockets.htm.

[210] House of Representatives Committee on Appropriations, Department of Defense Appropriations Bill, 2002 and Supplemental Appropriations, 2002, 19 Nov. 2001; available at URL http://thomas.loc.gov/cgi-bin/cpquery/T?&report=hr298&dbname=cp107&.

[211] Erwin, Sandra I., Oct. 2004.

[212] Pearcy, Stephen R., Smart/Precision Munitions, Current trends and Objectives, RDECOM-ARDEC ARDEC, 8 July 2004; available at URL http://www.dtic.mil/ndia/2004precision_strike/Pearcypresentation.pdf.

[213] Bender, Bryan, 'US Air Force starts fitting smart bomb kits', Jane's Defence Weekly, 15 Nov. 2000.

[214] Sirak, Michael, 'Lockheed adds precision guidance to cluster bomb', Jane's Defence Weekly, 30 Apr. 2003.

[215] There are currently no alternattive weapons which have the same effect as cluster weapons (unofficial translation). Ministry of Defence Austria (Bundesministerium für Landesverteidigung, Rüstungskontrolle, Abteilung Militärpolitik), communication to Pax Christi Netherlands, 14 Jan. 2005.

[216] Mr. Ingram, House of Commons Hanserd Written Answer, 4 May 2004; available at URL http://www.publications.parliament.uk/pa/cm200304/cmhansrd/vo040504/text/40504w19.htm.

The question remains if cluster weapons, even if improved to the extent that less than 1 per cent of the submunitions will be a dud, are not becoming outdated, specially in an environment of peace-keeping and peace-enforcing operations and in an age were technical alternatives could be available. However, statements on the possibility of using alternative weapons, much more precise and reliable, sometimes not even lethal weapons are contradictory to say the least. Several countries maintain that there is no alternative for cluster weapons. A Polish statement goes even as far as suggesting that:

"Given that this system of weaponry can be deployed in a highly cost-effective way against multiple targets dispersed over a broad area, one might rather predict an opposite trend, i.e. the trend towards increased use of submunitions in the foreseeable future. It is even possible that virtually any munition that is dropped, fired or projected towards a target might be given the option of a submunition warhead."[217]

An argument commonly used is that cluster weapons are actually the better alternative also from a humanitarian point of view.

Canada stated in 2005:

"Without the Mk-20 Rockeye, the Canadian Forces will need to drop, for example, more 500-pound or 1000-pound general-purpose bombs to achieve the same results, potentially causing increased collateral damage."[218]

Also Denmark contended that

"the military value of cluster munitions lies mainly in their ability to deliver a direct hit on one or several targets through the use of far smaller quantities of ordnance than those required by means of traditional munitions."[219]

South Africa stated in early 2004 that at the current level of technology it

"cannot see effective replacements for cluster munitions other than the expenditure of greater numbers of single unitary bombs on targets to achieve desired outcome - with the risk of concomitant inefficiency, additional expense and increased risk of collateral and environmental damage."[220]

This argument was already used in the discussions on cluster weapons in the 1970s. In Eric Prokosh's account of the discussions at the 1974 conference of government experts on possible restrictions on certain conventional weapons (see above), a UK Air Force captain is referred to as saying that the alternative to a cluster bomb was to use several larger high explosive bombs. [221]

As Prokosh pointed out,

"from a humanitarian point of view, a better alternative to using an area weapon against a point target would be to improve the accuracy of delivery of a point weapon, a weapon which could destroy a tank without the side-effects of the BL-755."[222]

And that seems to be exactly the stage that has been reached now, at least in Western countries.
The development of cluster weapons was partly a response to the military requirement for weapons capable of targeting large standing or advancing armies, but was at the same time also the result of a given stage of military technological development, in particular in the field of electronic sensors.

Today technology has developed so far that such 'point weapons' have become a reality. Rapid

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[217] Polish Ministry of National Defence, communication to Pax Christi Netherlands, 14 Feb. 2005. The Ministry's view does not necessarily reflect the official position of Poland.

[218] Permanent Mission of Canada to the United Nations and the World Trade Organization, Canadian Delegation to the Conference on Disarmament, communication to Pax Christi Netherlands, 13 Jan. 2005.

[219] Ministry of Defence Denmark (Forsvarsministeriet), communication to Pax Christi Netherlands, 16 Feb. 2005.
"Der kan være forhold, hvor klyngebomber laver mindre skader end en stor bombe. Militære styrker på en bro, et dige eller en dæmning kan du eksempelvis bedre uskadeliggøre ved hjælp af en klyngebombe. En stor bombe på 200 pund vil ikke bare ødelægge de militære styrker, men også broen, hvorimod en klyngebombe vil uskadeliggøre de militære styrker, men ikke ødelægge broen og dermed reducere de humanitære følgevirkninger. Den militære overvejelse i sådan et tilfælde kunne være, at selv om det ville være mere effektivt at tage en stor bombe, så vil de humanitære følgevirkningerne være større end, hvis man bruger en klyngebombe." Jørgensen, Anders, 'Kontroversielt klyngebombenotat', 7 Nov. 2003; available at URL http://www.information.dk/Indgang/VisArkiv.dna?pArtNo=20031107152175.txt.

[220] South African Delegation to the Conference on Disarmament, Geneva, communication to Pax Christi Netherlands, 19 Jan. 2005.

[221] Prokosh, Eric, 1995, p. 154.

[222] Prokosh, Eric, 1995, p. 154.

advances in precision-weapons and in target-acquisition, have already led to a shift from dumb weapons to smart weapons. As discussed above, statistics on the use of air-delivered weapons show a marked shift over the last 10-15 years, from "dumb" to "precision-guided" weapons. While in the 1970s there might have been some support for the argument that only large 500 or 1,000-pound high explosive bombs would be an alternative to cluster weapons, technological developments have clearly eliminated the need for such drastic weapons.

A German statement at the most recent session of the CCW expert meetings emphasised that

> *"the size and amount of high explosives in a warhead is designed only to achieve penetration and deliver the required terminal effectiveness. From a safety point of view, an oversized amount of high explosive in a warhead is merely a poor design causing collateral damage."*[223]

The trend seems clearly to point in the direction of better designs leading to smaller warheads, with precision guided weapons also taking over part of the functions fulfilled by cluster weapons. As mentioned above, the UK is in the process of replacing cluster weapons in their anti-armour role by the Brimstone, a relatively small guided missile, considered up to 20 times more effective against tanks than the old cluster bombs.[224] This effectively underlines that the 1974 UK captain's statement is no longer valid.
In 2001 Jane's reported that "in recent years the DoD has begun developing unitary warheads for many of its strike weapons, at least partially due to pressure over submunition use."[225] Among other weapons it should be mentioned that the USA and European users of the MLRS will soon introduce the guided GMLRS with unitary warheads,[226] and that the US ATACM and JSOW missiles will also partly be equipped with unitary warheads.[227] Precision guided unitary alternatives have also been developed for smaller cluster weapons. Several designs for guided 152-155mm howitzer and 120mm mortar shells are being introduced.
Programmes have also been initiated to replace explosive lethal warheads with non-explosive and non-lethal warheads. Using non-explosive submunitions, such as steel rods is an option in some cases. The USA has already used a few CBU-105 dispensers with steel rods instead of explosive submunitions to attack soft (mainly radar) targets.[228] In a world ruled by electronics, one of the new warheads for the GMLRS will be an electro-magnetic weapon targeting enemy electronic systems (such as radar, computer and communication systems) that until now are one of the targets for cluster weapons.

However, alternative precision weapons are for now mainly an option for countries with an advanced technological base. There is little indication that developing countries or even some large developed countries (e.g. Russia) will in the near future be able to field technological advanced precision alternatives to cluster weapons. The joint Chinese-Russian statement of July 2002 mentioned earlier probably reflects exactly what most developing countries think if cluster weapons are limited by technical specifications: it will leave Western countries with their technically advanced alternatives in a position of superiority and deprive most developing countries of their legitimate rights for self-defence.[229]

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[223] Germany, Working Paper, Reliability, Safety, and Performance of Conventional Munitions and Submunition, CCC/GGE/IX/WG.1/WP.2, 11 Nov. 2004, Group of Governmental Experts of the States Parties to the 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, 9th Session, Geneva, 8-16 Nov. 2004.

[224] House of Commons, Committee on Public Accounts, Thirty-Third Report, Appropriation Account (Class XII, Vote 1) 1998-99: Central Government Administered Social Security Benefits And Other Payments, 2000, at URL http://www.publications.parliament.uk/pa/cm199900/cmselect/cmpubacc/247/24702.htm.
See also Hugh, Beach (General), Cluster Bombs: the Case for New Controls, ISIS Briefing Paper No. 25, Annex C. Alternatives To Cluster Bombs: The British Case, May 2001, available at URL http://www.isis-europe.org/ftp/download/bp-25.pdf.

[225] Jane's Information Group, 'Afghanistan: first lessons', Jane's Defence Weekly, 19 Dec. 2001.

[226] Lockwood, D., 'Lockheed Martin Wins SDD Contract for Single-Warhead GMLRS', Forecast International/Ordnance & Munitions Forecast, Forecast International, 14 Oct. 2003.

[227] Erwin, Sandra I., 'Army Pondering Alternatives For Tactical Missile Payload', National Defense, National Defense Industrial Association (NDIA), Apr. 2002, at URL http://www.nationaldefensemagazine.org/issues/2002/Apr/Army_Pondering.htm.
Raytheon, 'Raytheon Developing New Variant of Joint Standoff Weapon', 20 July 2004, in Forecast International, 21 July 2004.

[228] Human Rights Watch, June 2004.

[229] Russia and China, Technical Improvements of Ammunitions to Prevent and Reduce ERW, Joint Discussion Paper By China and the Russian Federation, Group Of Governmental Experts Of The Parties To The 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, CCW/GGE/II/WP.20, 23 July 2002, available at URL http://www.ccwtreaty.com/KeyDocs/GGE2/CCW-GGE-II-WP20-E.pdf.

4. FINDINGS

Already in 1976 a number of governments, significantly from various regions and with major differences in weapons holdings, procurement budgets and recent experience of armed conflict, called for a ban of anti-personnel cluster weapons. Yet after several decades of discussions no specific legal regime addressing the use of cluster weapons has been agreed upon.

The Protocol on ERW, and in particular its Technical Annex, addresses only one of the two aspects of the humanitarian problems caused by the use of cluster weapons - and does so in a insufficiently clear and strong language. State practice in the field of submunition reliability can be expected to generate stronger rules - but in the absence of continued efforts to reach an international agreement this process is bound to be very lengthy. At the same time, the issue of collateral damage resulting from inaccuracy or misuse remains under-addressed within international discussions.

Continued high military utility of cluster weapons is put forward by many states as a reason against international restrictions or prohibitions. At the same time a significant number of countries perceive the military utility of *specific* cluster weapons in armed conflicts they *anticipate* to be negligible or limited. It has been pointed out by many that military operations likely to be encountered today actually demand reliable and precise weapons, not unreliable area-attack cluster weapons.

Technical upgrades to cluster weapons, such as improved fuzing and guidance systems, and the use of alternative precision-guided single-weapons provide a partial solution to the humanitarian problems caused by the use of cluster weapons. However, severe concerns remain. Even low failure rates will still lead to a high number of unexploded ordnance for those weapons that carry submunitions in large numbers. Moreover, improvements in weapon design cannot solve problems caused by the inappropriate use of the weapons. Moreover, while such improvements and alternatives are available or in development, they require advanced technological capabilities and are costly.

A large number of the 56 countries that according to a Human Rights Watch Survey of 2002 have stockpiles of cluster weapons, can be expected to perceive technological improvements and alternative weapons, often not produced within their countries, to be “unaffordable” - even if measured against the military drawbacks of older types of cluster weapons. Also the political need to procure and use weapons that minimize the occurrence of duds and collateral damage can be expected to be minor in most of these countries.

There is a clear divide across countries and regions not only with regard to the perceived military utility of cluster weapons, but also with regard to their willingness and even ability to accept technical specifications for submunition reliability.

1. Countries with advanced military industries and high armaments spending, which have a military doctrine that envisages a direct military threat from large mechanized armed forces (Israel, Taiwan, South Korea), or that envisage interventions that could make them face such large forces (USA): These countries can be expected to seek to maintain the *option* to use cluster weapons, in spite of their ability to replace them with more reliable and precise weapons. They seek technical improvements to submunition reliability and accuracy. But given their large holdings they are unlikely to agree to international specifications with regard to reliability within the near future.

2. Countries with less advanced military industries and lower armaments spending in relation to their size, which have a military doctrine that envisages a direct military threat from large mechanized armed forces (China, Pakistan, Iran, Syria): These countries can be expected to seek to maintain the option to use cluster weapons, viewed as a force-multiplier. They are unlikely to be willing to invest in costly increased submunition reliability or accuracy.

3. Poor countries with relatively small and technically primitive armed forces, facing a direct military threat from (or actually being engaged in armed conflict with) similar small and primitive forces (a number of African countries as well as some poor Asian countries): These countries may view anti-personnel cluster weapons as a useful, but not absolutely necessary, force-multiplier. They cannot be expected to be willing to invest in increased submunition reliability or accuracy, accuracy, but may be induced to give up what little cluster weapons they have.

4. Countries with advanced military industries and high armaments spending, which have a military doctrine that does not envisage a direct military

threat from large mechanized armed forces nor interventions that could make them face large armed forces. Intervention is anticipated as mainly peace-keeping and limited peace-enforcing missions (the majority of European countries, Canada, South Africa). Cluster weapons can be expected to be given up almost completely. Concerted action within Europe could significantly facilitate and such a process. Current policies support internationally agreed technical specifications.

5. Countries with less advanced military industries and comparatively low armaments spending, which have a military doctrine that does not envisage a direct military threat from large mechanized armed forces nor interventions that could make them face large armed forces (South American countries). Cluster weapons can be expected to be given up almost completely.

Our analysis of states positions as made public by mid-2005 suggests that there is insufficient support for a ban of all cluster weapons. We do however believe that discussions about a legal regime on the use of cluster weapons can move forward. Available information suggests that there are strong grounds for (a) a ban of anti-personnel submunitions and (b) an arms-control regime for anti-armour submunitions. A ban of anti-personnel cluster weapons could follow the logic and momentum of the Anti-personnel Mine Ban Treaty. Technically it would not be more difficult to separate anti-personnel submunitions from anti-armour submunitions than it was to separate anti-personnel land-mines from anti-armour land-mines. So called 'multi-function' submunitions would either be banned or need to be modified. From a military operational point of view losing the anti-personnel function would do little to change military balances. Technology is available that can improve both submunition reliability and accuracy, and drastically reduce the number of submunitions required to hit a specific target. International support for action against both the military and the humanitarian problems caused by unexploded submunitions is strong. International humanitarian organizations have drafted a series of recommendations applicable to submunitions reliability and the use of cluster weapons in or near populated areas. These could serve as a guideline for an international agreement on a legal regime for the use of anti-armour submunitions.

As has been emphasized by many states parties to the CCW Convention and by NGOs military and humanitarian concerns with regard to the use of cluster weapons can be expected to call for similar solutions. In early 2004 a UK presentation at the CCW expert meeting contended that within the next 20 years the efficiency of UK submunitions would increase significantly resulting also in a significant decrease in their humanitarian impact. However, a time frame of 20 years must be considered unacceptable from a humanitarian point of view.

Discussions on the problems caused by the use of cluster weapons have so far built upon limited information, especially with regard to the specific utility of cluster weapons within current military doctrines, many of which have seen significant changes in the post-Cold War period. If relevant national authorities were to give higher priority to national assessments of the actual role of cluster weapons currently in service with their armed forces and be willing to discuss these within international forums such as the CCW Convention significant progress towards a solution to widely shared humanitarian problems could be achieved.

APPENDIX I. STATES CONTACTED FOR THE PURPOSE OF THIS SURVEY

The governments of 45 countries have been contacted for the purpose of this survey. We chose to contact these countries either because they have used cluster weapons, because their military doctrine is likely to anticipate the use of cluster weapons, or because they have been particularly active in ongoing international discussions about the possibility of restricting or prohibiting the use of cluster weapons.

Region/ Country	Response	Region/ Country	Response	Region/ Country	Response
Africa		**Europe**		**Middle East**	
Algeria	-	Austria	✓	Egypt	-
Ethiopia	-	Belarus	-	Iran	-
Libya	-	Belgium	-	Israel	-
South Africa	✓	Bulgaria	-	Saudi Arabia	-
America		Czech Rep.	✓	UA Emirates	-
Argentina	✓	Denmark	✓		
Brazil	-	Finland	✓		
Canada	✓	France	-		
Chile	-	Germany	✓		
USA	-	Greece	-		
Asia & Oceania		Italy	-		
Australia	✓	The Netherlands	✓		
China	-	Norway	✓		
India	-	Poland	✓		
Indonesia	-	Romania	-		
Japan	✓	Russia	-		
Pakistan	-	Spain	✓		
Singapore	-	Sweden	✓		
South Korea	✓	Switzerland	✓		
Taiwan	-	Turkey	-		
		Ukraine	-		
		United Kingdom	✓		

✓ response received - no response received

Only eighteen countries responded to our inquiry up to mid-June 2005. For a limited number of countries which have not provided a reply, some relevant information on holdings, perceived military utility and submunition reliability policies is available from open sources. This is the case for instance for France and the USA. Countries have failed to respond for different reasons. As mentioned in the introduction to this survey, discussions on military utility and legality of cluster weapons are ongoing in a number of countries and policies have not yet been formulated. Very few countries have so far actively participated in the discussions ongoing since 2001 within the framework of the CCW Convention. A common reason for having failed to provide a response seems to be the lack of resources allocated in many countries to the discussions on cluster weapons and support of the relevant departments within Ministries of Foreign Affairs and Ministries of Defence. Officials in several of the countries contacted for the purpose of this survey were unable to provide information about their government's position on the use of cluster weapons due to the lack of expert knowledge on the issue. This may to some extent also be a reflection of a lack of co-ordination, communication and co-operation between different departments or even with departments. Some governments appear unwilling to share information because of a deep-rooted tradition of secrecy in military matters. The willingness to disclose details about the types and quantities of cluster weapons in service with national armed forces varies considerably across countries. Some governments, such as the Dutch governments[230], have disclosed the type and quantity of cluster bombs held, others, such as the government of South Korea[231], clearly state the secrecy of such information (as essential to national security). It is likely that, as in other arms-control issues, more information is shared between governments than is provided to the general public.

[230] Ministerie van Defensie, 'Nota over het wetsvoorstel Begrotingsstaat Defensie', 25 Oct. 2002, at URL http://www.mindef.nl/nieuws/parlement/kamervragen/251002_begrotingsstaat.html.

[231] Official response received from South Korea, Ministry of National Defence, through the Permanent Mission of South Korea in Geneva, 3 June 2005.

APPENDIX II. QUESTIONS ASKED TO STATES CONTACTED FOR THE PURPOSE OF THIS SURVEY

The governments of the countries listed in appendix II have been asked to provide information about their position with regard to the military utility of cluster weapons as perceived by their armed forces; as well as submunition reliability and cluster weapon accuracy in light of the humanitarian concerns raised by their use and available technologies. We asked governments also to provide information on how positions assumed have been or are planned to be implemented.

The following questions have been sent to representatives of states' missions in Geneva, Ministries of Foreign Affairs and/or Ministries of Defence:

a) What type of cluster weapons are in service with your country's armed forces?
b) What position does your government assume with regard to submunition reliability?
c) What is the reliability of submunitions in the inventory?
d) What concrete efforts are or are planned to be undertaken to increase reliability?
e) What position does your country assume with regard to the accuracy of cluster weapons?
f) What is the military utility of cluster weapons as perceived by your country's armed forces?
g) What alternative weapons could be employed to replace all or some of the specific capabilities of cluster weapons?

APPENDIX III. ARMS PRODUCING COMPANIES CONTACTED FOR THE PURPOSE OF THIS SURVEY

The focus of this survey was on government positions on the use of cluster weapons and efforts aimed at alleviating the humanitarian problems caused by such use. In order to be able to better assess government positions with regard to technical improvements of cluster weapons we have also approached some arms producing companies known to produce cluster weapons and submunitions or components thereof.

We have contacted 13 producers[232] asking for information about the safety and guidance features of the weapons produced as well as about the recipients of these weapons. Only 3 companies have provided some information in response to our request. Two of the three replies contradict information available form open sources.

a) RTG Euromunition is a joint venture between Diehl and DaimlerChrysler Aerospace (now EADS) which was set up in 1996 for the production of submunitions, including "smart" submunitions for dispenser systems and rockets.
Company brochures published in 2000 and the company website until December 2004 provided information about products offered.[233]
In response to our request for information the company stated that "no new types of submunitions are developed, produced or sold" by the company. The last delivery programme is said to have been concluded in 1994, two years before the establishment of the company.[234]

b) The German company Diehl, formerly or presently involved in the production of submunitions within RTG Euromunition (see above) is a 50 per cent partner of Gesellschaft für Intelligente Wirksysteme (GIWS), which produces the SMArt 155mm sensor-fuzed projectile carrying two submunitions with self-destruct mechanism.
A subsidiary of Diehl, Junghans Feinwerktechnik, competes also for the contract award for submunition fuzing systems for US and European cluster weapon programmes, such as the GMLRS.[235] As mentioned in the survey each 'cluster' GMLRS rocket will carry 404 submunitions. The submunition variant of the GMLRS rocket remains a wide-area cluster weapon, in spite of improved targeting and the planned integration of self-destruct fuzes into its submunitions.

In its response to our request for information about the company's involvement in the production of cluster weapons, submunitions and parts thereof, the company stated the following (unofficial translation):

The development and production of area weapons was directly linked to the Cold War scenario, within which the West was confronted with a 10-times larger enemy force. A qualitative superiority in military equipment was required in order to compensate for the quantitative superiority (of the enemy). The balance of (military) power that was

[232] Aerojet, Alliant TechSystems (ATK), Atlantis Corp., Denel, Diehl, Gesellschaft für Intelligente Wirksysteme (GIWS), Insys, Israel Military Industry (IMI), L-3 Communications, Pakistan Ordnance Factories (POF), Poongsan, RTG Euromunition, and Singapore Technologies Engineering.

[233] RTG Euromunition website at URL http://www.rtg-e.de/products.htm (accessed on 20 Dec. 2004).

[234] RTG Euromunition, communication to Pax Christi Netherlands, 14 Feb. 2005.

[235] Harbrecht, Rudolf, Pyrotechnic Bomblet Self Destruct Fuze (SDF) for GMLRS, presentation for 48th Annual Fuze Conference, Apr. 26th - 28th, 2004, available at URL http://www.dtic.mil/ndia/2004fuze/harbrecht.pdf.

achieved through this, and the Western determination to assert itself that supported it, did actually contribute significantly to ending the confrontation between East and West.
The area weapons which were then in use are by now obsolescent. Modern "asymmetric" threats require precise point-weapons. We have therefore not foreseen any requirement for area weapons for some time and do not foresee any for the future.[236]

[236] Diehl, communication to Pax Christi Netherlands, 27 Oct. 2004: Diehl zu den Themen Streubomben und Landminen.

APPENDIX IV. AVAILABLE INFORMATION ABOUT CLUSTER WEAPONS/SUBMUNITION PRODUCERS

The following list of producers of cluster weapons/submunitions is not a comprehensive inventory of all producers of cluster weapons/submunitions and parts thereof operating in the countries covered in this survey. The list provides merely a summary of available information from open sources as a starting point for further investigations.

AFRICA

South Africa — **Naschem**, a division of **Denel**: Produces 155mm HCHE cluster M1 and M1A2 Wasp artillery shells with 56 submunitions with self-destruct fuze.[237]

AMERICA

Argentina — **CITEFA** (Centro de Investigaciones Técnicas y Científicas de las FFAA): Developed the CME 155mm artillery shell.[238]

DIGID (Dirección General de Investigación y Desarrollo): Developed the FAS cluster bombs.

Brazil — **Target Engenharia e Comércio**: Produces cluster bombs (BLG-120 and BLG-252) for the Brazilian Air Force[239] (around 70 per cent) and for other Latin American countries.[240]

Canada — **Bristol Aerospace**, part of **Magellan Aerospace Corp.**: Produces the CRV7 Rocket Weapon System (RWS) for 70mm unguided rockets,[241] including a variant with 9 M-73 submunitions (M261).[242]

Chile — *Past producer: **Industrias Cardoen** produced cluster bombs (delivered in large numbers to Iraq in the 1980s). The company changed name to Metalnor in the early 1990s.*

USA — **Aerojet**, owned by **GenCorp**: Aerojet assembles submunitions and integrates them into the warhead of the AGM-154 Joint Standoff Weapon (JSOW, see Raytheon below).

Produced CBU-87 cluster bomb carrying 202 BLU-97 submunitions[243], CBU-89 (Gator mine system) cluster bombs carrying 72 BLU-91/B anti-tank mines and 22 BLU-92/B anti-personnel mines, and CBU-78 cluster bombs carrying 45 anti-tank and 15 anti-personnel mines.

Alliant Techsystems (ATK): Produces the rocket motor for BLU-108 submunitions and HYDRA-70 rockets.

In 2000 ATK signed a teaming agreement with Israel Military Industries (IMI) to co-produce IMI's M971 l20mm Dual-Purpose Improved Conventional Munition (DPICM) mortar cargo ammunition for sale in the USA.[244] In 2003 ATK signed a co-operation agreement with IMI for the production of IMI self-destruct fuzes, including the M-85 self-destruct fuze, in the USA.

Produced CBU-87 cluster bombs with 202 BLU-97 submunitions. [245]

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[237] Jane's Ammunition Handbook 2003, Jane's Information Group.

[238] CITEFA (Centro de Investigaciones Técnicas y Científicas de las FFAA), Informe referido a empleo de submuniciones, for the Ministry of Defence of Argentina, date of publication unknown, received through the Permanent Mission of Argentina in Geneva, communication to Pax Christi Netherlands, of 15 Apr. 2005.

[239] Associação Brasileira das Indústrias de Materiais de Defesa e Segurança, 'Declarações de Exclusividade emitidas de 2000 até abril/2005', at URL http://www.abimde.com.br/declaracoesprodutos.htm.

[240] Ministério do Desenvolvimento, Indústria e Comércio Exterior, Mar. 2002, at URL http://www.desenvolvimento.gov.br/arquivo/sdp/proAcao/forCompetitividade/anaComSetEstrategicas/estudounbaeroespacial.pdf.

[241] Magellan Aerospace Corp., at URL http://www.magellanaerospace.com/aerorocket_space_rocketweapon.htm (accessed on 11 May 2005).

[242] Bristol Aerospace, at URL http://www.bristol.ca/Warheads.html (accessed on 11 May 2005).

[243] CBU-87/B Combined Effects Munitions (CEM), GlobalSecurity.org, at URL http://www.globalsecurity.org/military/systems/munitions/cbu-87.htm.

[244] 'ATK, IMI to co-produce 120mm mortar cargo ammunition for sale in US', 22 June 2000, Defense Systems Daily, at URL http://defence-data.com/eurosatory2000/pagees24.htm.

[245] CBU-87/B Combined Effects Munitions (CEM), GlobalSecurity.org, at URL http://www.globalsecurity.org/military/systems/munitions/cbu-87.htm.

General Dynamics Armament and Technical Products, part of **General Dynamics**: Produces 70mm Hydra-70 unitary and submunition rockets.[246]

General Dynamics Ordnance and Tactical Systems, part of **General Dynamics**: Produces the 105mm shell carrying 6 anti-material anti-personnel submunitions; the 155mm M-864 artillery shell with 72 submunitions.

Produces components for the CBU-87 cluster bomb and for the CBU-97/CBU-105 cluster bomb.[247]

L-3 Communications: Produces self-destruct fuzes for submunitions within its divisions **BT Fuze Products** and **KDI Precision Products**.[248]

Lockheed Martin: Produces a guidance package, the Wind Corrected Munition Dispenser (WCMD) tail kit, for CBU-87, CBU-89, and CBU-97 cluster bombs (CBU-97 cluster bombs are re-designated CBU-105 when equipped with the WCMD tail kit).[249]

Northrop Grumman: Developed the BAT brilliant anti-armour submunition.

Raytheon: Produces the AGM-154 Joint Standoff Weapon (JSOW) with unitary warheads or warheads carrying 145 BLU-97 (AGM-154A) or 6 BLU-108 (AGM-154B) submunitions.[250]

Textron Systems: Produces CBU-97/CBU-105 cluster bombs carrying guided BLU-108 submunitions equipped with self-destruct fuzes. Developed the Selectively Targeted Skeet (STS) Submunition.[251]

ASIA

China

China North Industries Corporation (NORINCO), state-owned: Produces the 155mm ERFB ICM and the ERFB ICM BB artillery shells.[252] Has developed 122mm artillery shells (standard and BB) with 33 anti-armour/anti-personnel submunitions.[253]

India

Armament Research and Development Establishment (under the Ministry of Defence): Developed Pinaka multi rocket launchers and their submunition rockets.

Indian Ordnance Factories, state-owned: Produces cluster bombs with 147 submunitions.[254]

Tata Group: Participates in the production of Pinaka multi rocket launchers.[255]

Pakistan

Pakistan Ordnance Factories (POF), state-owned: 155mm M-483 artillery shell.[256]

Singapore

Singapore Technologies Engineering, part of **Singapore Technologies**: Produces a 155mm artillery shell with 64 submunitions.[257]

South Korea

Poongsan: Produces the 155mm Based Bleed DPICM artillery shell K310 with 49 submunitions with self-destruct fuze.[258]

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[246] General Dynamics, at URL http://www.gdatp.com/Products/PDFs/APKWS(Hydra%20refresh).pdf.

[247] General Dynamics, at URL http://www.gd-ots.com/.

[248] L-3 Communications, at URL http://www.l-3com.com/divisions/.

[249] Lockheed Martin, at URL http://www.missilesandfirecontrol.com/our_products/strikeweapons/WCMD/product-WCMD.html.

[250] Raytheon, JSOW, at URL http://www.raytheon.com/products/stellent/groups/public/documents/content/cms01_055754.pdf.

[251] Textron Systems, at URL http://www.systems.textron.com/ under Products, Precision Strike.

[252] Jane's Ammunition Handbook 2003, Jane's Information Group.

[253] Jane's Defence Weekly, 12 Jan. 2005, p. 15.

[254] Ordnance Factory Board, at URL http://www.ofbindia.com/defence_sector/ammunition_explosives/ammunition.htm (accessed on 10 May 2005).

[255] Rajesh Unnikrishnan, 'Tatas, L&T ready for new era in defence production', Defence India, 1 Apr. 2005, at URL http://www.defenceindia.com/company_news/news42.html.

[256] Jane's Ammunition Handbook 2004, Jane's Information Group.

[257] Singapore Technologies Engineering, at URL http://www.stengg.com/CoyCapPro/detail.aspx?pdid=151 (accessed on 13 May 2005).

[258] Poongsan, at URL http://poongsandefense.com/product03_1.htm (accessed on 13 May 2005).

	Hanwha Corp.: Develops a 70mm multi-barrel rocket launcher (MBRL) for unitary, submunition and flechette rounds.[259]
Taiwan	**Chung Shan Institute of Science and Technology (CSIST)**, military-run: Developed the RT-2000 or Thunder-2000 Artillery Multiple Launch Rocket System for rockets with unitary or submunition warheads.[260] CSIST is likely to have developed since 1996 Wan Chien air-launched missile (with a probable range of over 200 km) which according to Taiwanese sources is a dispenser weapon with submunitions.[261]
EUROPE	
Belgium	**Forges de Zeebrugge**, a subsidiary of **TDA**, which is a 50/50 joint venture between **Thales** and **EADS**: Produces air-to-ground rockets, including submunition variants. *Past producer: PRB SA*
Bulgaria	*Past producer - current status unknown:* ***Vazovski Mashinostroitelni Zavodi (VMZ)*** *- Vazov Engineering Plant (state-owned being privatised).*
Finland	**Patria**, partly state-owned: Participated in a cooperation programme with RUAG/IMI for the development of the AMOS (Advanced Mortar System) with 120 mm mortar cargo bomb - whereby the AMOS system was developed by Patria and the mortar bomb by RUAG (Switzerland) and IMI (Israel).[262]
France	**Giat Industries**, state-owned: Developed the 155mm BONUS artillery shell carrying 2 guided submunitions with self-destruct fuze in collaboration with Bofors Defence (Sweden).[263] Giat Industries produced also the 155mm Ogre artillery shell with 63 submunitions.[264] Giat Industries developed, together with Junghans Feinwerktechnik (Germany), a self-destruct fuze for the submunitions for GMLRS rockets.[265] **MBDA**, owned by **BAE Systems** (UK), **EADS** (France, Germany, Spain), Finmeccanica (Italy): Predecessor companies were partners in the European production under US license of the M-26 rockets for MLRS. MBDA participates in the development of GMLRS rockets. MBDA produces the Apache missile. **TDA**, owned by **Thales** and **EADS Deutschland**: Produces artillery shells and mortar bombs with submunition warheads.[266] Controls the Belgian Forges de Zeebrugge (see above).
Germany	**Diehl**: Diehl is a partner in the European production under US license of the M-26 rockets for MLRS. Diehl participates in the development of GMLRS rockets. **Gesellschaft für Intelligente Wirksysteme mbH (GIWS)**, owned by **Rheinmetall** and **Diehl**: GIWS produces SMArT artillery shells carrying 2 guided submunitions.[267]

[259] Karniol, Robert, 'Hanwha reveals multiple rocket launcher', Jane's Defence Weekly, 3 Nov. 2004.

[260] Hsu, Brian, 'Institute Promotes Weapons System', Taipei Times, 23 April 2001. Republic of China, Government Information Office, The Republic of China Yearbook - Taiwan 2002, at URL http://www.gio.gov.tw/taiwan-website/5-gp/yearbook/2002/chpt08-6.htm. Jane's Ammunition Handbook 2004, Jane's Information Group.

[261] Jane's Defence Weekly, 13 Apr. 2005, p. 5.

[262] Patria, 'A successful weapon system from Patria Hägglunds Oy and SM Swiss Ammunition Enterprise Corp.', press release, 3 Apr. 200, at URL http://www.patriahagglunds.fi/03042000.html.

[263] Giat Industries, at URL http://www.giat-industries.fr/asp/fr/prod_bonus.asp (accessed on 10 May 2005).

[264] Giat Industries, 'La révolution de l'artillerie', at URL http://www.giat-industries.fr/asp/fr/dossier.asp?id=14&idc=19 (accessed on 13 May 2005).

[265] Giat Industries, Eurosatory 2004 - Munitions Information File, at URL http://www.giat-industries.fr/DossierPresse/VA_munitions.pdf.

[266] TDA Armements SAS, at URL http://www.tda-arm.com/fr/accueil.htm.

[267] GIWS, at URL http://www.giws.de/ (accessed on 10 May 2005).

	Junghans Feinwerktechnik, owned by **Diehl**: Produces ammunition fuzes including fuzes for submunitions.[268] The company developed, together with Giat Industries (France), a self-destruct fuze for the submunitions for GMLRS rockets.[269] **Lenkflugkörpersysteme (LFK)**, majority owned by **EADS** (France, Germany, Spain): Produces the Autonomous Free-flight Dispenser System (AFDS) submunition dispenser, and submunitions.[270] **Rheinmetall DeTec**, part of **Rheinmetall**: Produces DM-632/642 and DM-652 artillery shells for M-85 submunitions imported from IMI (Israel).[271]	Poland	**Bumar Group**: Produces 122mm rockets for BM-21/RM-70 launchers, including rockets with submunition warheads.[274] *Past producer: **Pressta SA** developed in the early-1990s a new 122m rockets with 3 different warheads, including a cargo round called F-M-21 MK or Platan with 5 Polish (BZU Belma) anti-tank mines, and a cargo round called F-M-21 K1 with 42 Polish AT/AP submunitions.[275] Pressta went bankrupt but part of its assets appear to have been transferred to a reorganized ammunition, rockets and armour group, Bumar Group (see above).[276]*
Greece	**Hellenic Defence Systems**, state owned, was formed in 2004 through the merger of EBO (Hellenic Arms Industry) and PYRKAL (Greek Powder And Cartridge Company): PYRKAL produced 155mm artillery shells with 49 submunitions and 107mm artillery rockets with 20 submunitions.[272]	Romania	**Aerostar** co-operates with IMI (Israel) on the LAROM 160mm multiple rocket launcher, a modified 122m launcher with Israeli 160mm rockets, including submunition rockets with 104 IMI AT/AP submunitions with self-destruct fuze.[277]
Italy	**Avio**, owned by **The Carlyle Group** (70%) and **Finmeccanica** (30%): Is part of the European GMLRS industrial team. *Discontinued: Simmel Difesa recently announced that although the company has the capacity to produce cluster weapons, it had not done so since it assumed its new structure in 2000, and intended to delete cluster weapons from all company sales catalogues.[273]*	Russia	**Russian Federal State Unitary Enterprise "Splav State Research and Production Enterprise"**[278]: Produces GRAD, URAGAN and SMERCH Multiple Rocket Launcher Systems. GRAD: 122mm artillery shells (9M218 with 45 submunitions; and 9M217 with 2 guided submunitions). URAGAN: 220mm 9M27K rocket with 30 fragmentation submunitions; 220mm 9M27K2 rocket with 24 AT mines; 220mm 9M59 rocket with 9 AT mines.

[268] Junghans Feinwerktechnik, at URL http://www.junghans-fwt.de/.

[269] Giat Industries, Eurosatory 2004 - Munitions Information File, at URL http://www.giat-industries.fr/DossierPresse/VA_munitions.pdf.

[270] German Aerospace Industries Association (BDLI), 2005, at URL http://www.bdli.de/index.php/component/option,com_bdli_member/act,actMember/id,181/Itemid,65/lang,en/ (accessed on 23 May 2005).

[271] Rheinmetall DeTec, Artilleriemunition, at URL http://www.rheinmetall-detec.com/index.php?lang=2&fid=1062&action=pd.

[272] PYRKAL, at URL http://www.ebo.gr/pyrkal/index.htm (accessed on 10 May 2005).

[273] Simmel Difesa, at URL http://www.simmeldifesa.com/ (accessed on 11 May 2005).

[274] FTC Bumar Ltd, at URL http://www.phzbumar.com.pl/ENG/sprzetwojstrzelecki.html.

[275] Jane's Armour and Artillery 2004-2005, Jane's Information Group, pp. 887-888.

[276] Ministry of the Treasury, Department of European Integration and Foreign Relations, Privatization Poland 1990-2004, at URL http://www.osec.ch/~0xc1878d1b_0x0001c11f/polen/wirtschaftsdaten/privatisierungspolitik_in_polen/en/privpoland04_vog_050107.pdf.

[277] Jane's Armour and Artillery 2004-2005, Jane's Information Group, pp. 869-870.

[278] Russian Federal State Unitary Enterprise "Splav State Research and Production Enterprise", at URL http://www.splav.org/en/ (accessed on 10 May 2005).

	SMERCH: 300mm 9M55K rocket with 72 fragmentation submunitions; 300mm 9M55K1rocket with 5 guided submunitions; 300mm 9M55K4 rocket with 25 anti-tank mines; 300mm 9M55K5 with 646 fragmentation submunitions.
Spain	**Instalaza**: Produces the MAT-120 mortar shell next to other infantry weapons.[279] *Past producer: **Expal**, owned by Unión Española de Explosivos (UEE) produced BME-330 cluster bombs, next to other military explosives (closed in 2004).*
Sweden	**Bofors Defence**, owned by **United Defense** (USA): Developed the 155mm BONUS artillery shell carrying 2 guided submunitions with self-destruct fuze in collaboration with Giat Industries (France). **Saab Bofors Dynamics**, part of **Saab**: Co-developed, with EADS-LFK (Germany) the submunition dispenser system for Swedish JAS/Gripen combat aircraft (Bk-39 Bombkaspsel M/90 Mjölner or DWS-39). No information is available about ongoing production.
Switzerland	**RUAG**, a private stock company majority owned by the Swiss federal government: Produces 120mm mortar shells carrying 32 dual purpose anti-personnel and anti-armour grenades equipped with a back-up self-destruct fuze.[280]
Turkey	**Makina ve Kimya Endustrisi Kurumu (MKEK)**, state-owned: Produces the M-483 155mm artillery shell with 88 submunitions and 120mm mortar shells with 16 M-85 submunitions.[281] **Roketsan:** Produces the T-122 Multi Barrel Rocket Launcher for 122mm rockets, including a submunition variant, TRK-122 with 50 APAM and 6 incendiary submunitions.[282]
United Kingdom	**BAE Systems**: Produces and co-produces artillery systems and has acquired ERBS shells for the UK armed forces from Israel Military Industries. **Insys** (formerly Hunting Engineering): Provides technical support (testing) for the BL-755 cluster bombs to the UK Ministry of Defence Defence Logistics Organisation. UK BL-755 cluster bombs are being withdrawn from service.
MIDDLE EAST	
Egypt	Sakr Factory, part of Arab Organization for Industrialization (AOI): Produces 122mm artillery rockets with submunitions, Sakr-18 with 72 submunitions, Sakr-36 with 98 and Sakr-45 with 72.[283]
Iran	**Ammunition Industries Group (AMIG)** part of the Iranian **Defence Industries Organization** (state-controlled): Produces 105mm, 130mm and 155mm cargo projectiles.[284]
Israel	**Israel Military Industries (IMI**), state owned: Produces cluster bombs (ATAP 500 and ATAP 1000 anti-tank/anti-personnel cluster bombs; RAM anti-runway cluster bombs) and a range of ground-launched cluster munitions with M-85/87 submunitions with self-destruct fuze (such as 155mm M395 artillery shell with 63 submunitions; 155mm M396 artillery shell with 49 submunitions). M-85/87 submunitions have been integrated into artillery shell and mortar bombs produced by a number of other manufacturers. IMI has also developed a smaller submunition, the

[279] Instalaza, at URL http://www.instalaza.es/ (accessed on 10 May 2005).

[280] RUAG, at URL http://www.swissmun.com/d/about/mortarammunation/MortarCargoRound_120mm.pdf.

[281] MKEK, at URL http://www.mkek.gov.tr/english/company_introduction2.htm (accessed on 13 May 2005).

[282] Roketsan, at URL http://www.roketsan.com.tr/122eng.html (accessed on 13 May 2005).

[283] Foss, Christopher, 'Egypt markets longer-range 122 mm rockets', Jane's Defence Weekly, 26 Jan. 2005.

[284] Foss, Christopher, 'Iran develops family of cargo projectiles', Jane's Defence Weekly, 20 Oct. 2004, p. 24.

Hornet-5 SD (self-destruct), for use in 105mm artillery shells.[285]

IMI developed also a Miniature Intelligent Multipurpose Submunition (MIMS).

[285] Foss, Christopher F., 'Israel expands M85 bomblet family', Jane's Defence Weekly, 25 Sep. 2002. See also 'Private firms vie for defence contracts', Hindustan Times, 7 Febr. 2004, at URL http://www.tata.com/tata_motors/media/20040207.htm.