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Drawing the line:

Regulation of “wide area” riot control agent delivery mechanisms under the Chemical Weapons Convention

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Acknowledgements and information about the author and organisations

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Bradford Non-Lethal Weapons Research Project (BNLWRP) is part of the Bradford Disarmament Research Centre (BDRC) of Bradford University. Its primary objectives are to explore and compile open source information on so called “non-lethal” or “less lethal” weapons, to objectively analyse the implications of their development, proliferation, use and potential misuse for international peace, human security and human rights; and to develop strategies for regulating or prohibiting the introduction and potential use of the most dangerous of these weapons. For further information see: <http://www.brad.ac.uk/acad/nlw/>.

The Omega Research Foundation conducts research on the development and transfer of conventional arms and related security equipment. It promotes effective mechanisms to prevent the proliferation and misuse of such weapons. For further information see: <http://www.omegaresearchfoundation.org/>.

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Executive Summary

The use of riot control agents (RCAs) as a method of warfare is prohibited under the Chemical Weapons Convention (CWC). The Convention, however, permits the employment of such chemicals for law enforcement including domestic riot control purposes, provided they are used in “types and quantities” consistent with such purposes.

Whilst CWC States Parties are prohibited from developing RCA munitions for use in armed conflict, they may manufacture, acquire and utilise delivery systems to disseminate appropriate types and quantities of RCAs for law enforcement. However, there is continuing ambiguity as to the type and specifications of those means of delivery that are prohibited under the Convention. This ambiguity has potentially dangerous consequences, allowing divergent interpretations, policy and practice amongst States Parties to emerge.

Of particular concern are the implications for regulation of large calibre munitions and delivery systems that can be utilised for dispersing significant amounts of RCA over wide areas and/or over extended distances. Inadequate control of such “wide area” means of delivery has potentially grave consequences, including;

Employment in armed conflict: Historically, “wide area” RCA means of delivery were used by State military forces in large scale armed conflict to drive enemy combatants from fortified positions; to incapacitate large numbers of combatants; or in conjunction with conventional arms as a “force multiplier”. More recently, a range of contemporary “wide area” RCA means of delivery have been promoted for use in counter-insurgency operations or urban warfare.

Potential use in chemical weapons programmes: A range of “wide area” delivery mechanisms such as cluster munitions, mortar shells or large calibre projectiles that are ostensibly designated as RCA munitions could instead be used to disperse incapacitants or classic chemical warfare agents. Consequently, States might seek to evade CWC prohibitions by camouflaging illicit chemical weapons production under the guise of RCA law enforcement munitions programmes.

Proliferation to and misuse by a range of non-State actors: including armed opposition forces, unregulated private military and security companies, and terrorist organisations.

Employment of inherently inappropriate munitions in law enforcement: resulting in the serious injury or death of bystanders as well the targeted individuals or groups.

Misuse to facilitate “large scale” human rights abuses by either State or non-State actors: This could include the blanket application of significant quantities of RCAs against large peaceful gatherings or demonstrations resulting in *en masse* ill-treatment; or the employment of such means of delivery as a “force multiplier” in conjunction with firearms or other lethal force, making such force more deadly.

This report highlights the development, testing, production and promotion by State or

commercial entities of a range of “wide area” RCA means of delivery including: large smoke generators, backpack or tank irritant sprayer devices; large calibre under-barrel and rifle grenade launchers; multiple munition launchers; automatic grenade launchers; rocket propelled grenades; mortar munitions; large calibre aerial munitions; heliborne munition dispensers; cluster munitions; unmanned aerial vehicles; unmanned ground vehicles; vehicle protection and area denial munitions.

Certain forms of “wide area” RCA means of delivery may have utility in large scale law enforcement situations provided they meet the CWC “types and quantities” provision and are employed in conformity with human rights standards; however some of these could also be readily misused in armed conflict, thereby breaching the CWC. Such means of delivery should be stringently regulated to prevent misuse.

Other forms of “wide area” RCA means of delivery are completely inappropriate for any form of law enforcement, having possible utility only in armed conflict. Such means of delivery inherently breach the CWC “types and quantities” provision and/or the prohibition on use of RCAs as a “method of warfare”. They should be considered to be chemical weapons and treated accordingly.

Despite the development and promotion of a range of “wide area” RCA means of delivery potentially in conflict with the Convention, none of the OPCW policy making organs have effectively addressed this situation to date. Given the evident dangers arising from the unregulated production, proliferation and misuse of such means of delivery, Bradford Non-Lethal Weapons Research Project (BNLWRP) and the Omega Research Foundation (ORF) believe that the OPCW should address this issue as a matter of urgency.

BNLWRP and ORF recommend that the relevant policy making organs of the OPCW – namely the Executive Council and the Conference of States Parties – in consultation with the Technical Secretariat should:

- Develop a process for determining prohibited means of RCA delivery;
- Develop a clarificatory document detailing prohibited RCA means of delivery;
- Strengthen existing RCA declaration and reporting measures, and explore the feasibility and utility of introducing appropriate monitoring and verification measures.

In addition, States Parties should utilise existing CWC consultation, investigation and fact - finding mechanisms where activities of potential concern come to their attention, such as the reported development, marketing, transfer, stockpiling or use of prohibited means of RCA delivery.

1. Introduction

1.1. "Wide area" riot control agent means of delivery: definition and concerns.

The use of riot control agents (RCAs), such as 2-chlorobenzalmalonitrile (CS), dibenzoxazepine (CR) and 1-chloroacetophenone (CN) as a method of warfare is prohibited under the Chemical Weapons Convention (CWC)¹ which came into force in 1997. The Convention, however, permits the use of such chemicals for law enforcement including domestic riot control purposes, provided they are used in "types and quantities" consistent with such purposes.

Consequently, whilst States Parties to the CWC would be prohibited from developing RCA munitions for use in armed conflict, they may manufacture, acquire and utilise delivery systems to disseminate appropriate types and quantities of RCAs for law enforcement purposes. However, there is continuing ambiguity as to the type and specifications of those means of delivery that are prohibited under the Convention.

Of particular concern are those large calibre munitions and delivery systems that can be utilised for delivering significant amounts of RCA over wide areas and/or over extended distances. A range of "wide area" RCA means of delivery have been developed by States and/or commercial entities and include: large smoke generators, backpack or tank irritant sprayer devices; large calibre under-barrel and rifle grenade launchers; multiple munition launchers; automatic grenade launchers; rocket propelled grenades; mortar munitions; large calibre aerial munitions; heliborne munition dispensers; cluster munitions; unmanned aerial vehicles; unmanned ground vehicles; vehicle protection and area denial munitions.

Although even those delivery mechanisms that disperse small amounts of RCAs over short distances and with a very limited coverage area could still be inappropriately employed in contravention of the Convention, the implications for the proliferation and misuse of "wide area" RCA means of delivery are far graver. Such dangers include:

Employment of inherently inappropriate munitions in law enforcement: Certain forms of "wide area" RCAs means of delivery are inherently inappropriate and could never legitimately be used for law enforcement due to the dangers of serious injury or fatality to the targets and/or to uninvolved bystanders. Of particular concern are delivery mechanisms that: disperse RCAs in quantities that risk asphyxiating or poisoning the targets; do not provide sufficient levels of targetability or discrimination; or that risk causing casualties or fatalities due to their design or physical characteristics not directly related to RCA toxicity e.g. through the impact of the high velocity munition, sub-munition, components or shrapnel.

Proliferation to and misuse by non-State actors: Although, to date, there have been few confirmed cases of the use of RCA means of delivery by non-State actors in armed conflict²;

¹ Organisation for the prohibition of chemical weapons (OPCW) Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction (Chemical Weapons Convention), 1997, <http://www.opcw.org/chemical-weapons-convention/articles> (accessed 14th February 2013).

² See for example: Cameron, G., Pate, J., McCauley, D. & DeFazio, L. 1999 WMD Terrorism Chronology: Incidents Involving Sub-National Actors and Chemical, Biological, Radiological, and Nuclear Materials, *The Non-proliferation Review*, Summer 2000, volume 7, number 2, available from: <http://cns.miis.edu/npr/72toc.htm> (accessed 14th

the current commercial availability of a wide range of such means of delivery raises the danger of their acquisition and employment by a range of non-State actors including armed opposition forces, unregulated private military and security companies, and terrorist organisations.

Misuse to facilitate “large scale” human rights abuses: Whilst “limited area” RCA means of delivery, such as hand held irritant sprayers, could be misused by law enforcement officials or non-State actors for human rights abuses against individuals; the inappropriate employment of “wide area” RCA means of delivery potentially facilitates human rights abuses on a far greater scale. This could include the blanket application of significant quantities of RCAs against large peaceful gatherings or demonstrations resulting in *en masse* infliction of cruel, inhuman or degrading treatment or punishment. Alternatively RCA means of delivery could be employed as a “force multiplier” in conjunction with firearms or other lethal force, making such force more deadly.

Employment in armed conflict: There is a long history, dating back to the First World War, of the use of “wide area” RCA means of delivery by State military forces in large scale armed conflict. In previous conflicts “wide area” RCA means of delivery were employed to drive enemy combatants from entrenched, underground, enclosed or fortified positions; for subsequent area denial; to disable and incapacitate large numbers of combatants; or in conjunction with conventional arms as a “force multiplier”. More recently, a range of contemporary “wide area” RCA means of delivery have been promoted for use in counter-insurgency operations or urban warfare.

Potential use in chemical weapons programmes: A range of “wide area” delivery mechanisms such as cluster munitions, mortar shells or large calibre projectiles that are ostensibly designated as RCA munitions could instead be filled with other toxic chemicals and employed to disperse agents such as the incapacitant BZ or classic chemical warfare agents. Given the limited declaration and transparency mechanisms applicable to RCAs under the CWC, there is a danger that certain States might seek to camouflage illicit chemical weapons production under the guise of RCA law enforcement munitions programmes.

Following a brief historical review, this report surveys the contemporary range of large caliber RCA munitions and other means of “wide area” RCA delivery and dispersal developed or under development by States or commercial entities. The report then explores the current limited discourse concerning the regulation of RCA munitions under the CWC, and concludes with a series of recommendations for CWC State Parties in this area.

1.2. Lessons from history: development and use of RCA means of delivery in armed conflict

Prior to the Chemical Weapons Convention coming into force in 1997, certain States including Iraq, South Africa, the United States, the USSR and Yugoslavia undertook research and development of a range of large calibre munitions or other means of delivering RCAs

February 2013); Pate, J., Ackerman, G., and McCloud, K.. *2000 WMD Terrorism Chronology: Incidents Involving Sub-National Actors and Chemical, Biological, Radiological, and Nuclear Materials*, April 2001, available from the website of the Monterey Institute’s Center for Non-proliferation Studies, <http://cns.miis.edu/reports/cbrn2k.htm> (accessed 14th February 2013).

over long distances and/or wide areas.³ A number of such large calibre RCA munitions and “wide area” means of RCA delivery were reportedly utilised in armed conflicts, most notably by the US in Vietnam and by Iraq in its conflict with Iran.

United States: During the 1960s the U.S. developed and/or held a range of Tactical CS munitions which included devices dispersing significant quantities of RCAs over wide areas and/or extended ranges; and Riot Control CS munitions normally dispersing smaller quantities over shorter distances or narrower areas. Tactical CS (TAC CS) munitions developed by the U.S. reportedly included: M54 grenades, M651 40mm cartridges, 66mm shoulder-fired rockets, M8 16 tube 35mm cartridge launchers, M4 and M5 bulk (helicopter) agent dispersers, XM99 2.75 inch folding-fin aircraft rockets, M630 4.2 inch mortar cartridges, XM629 105mm howitzer cartridges, XM-631 155mm projectiles, XM15 50 lb cluster canisters, CBU-30/A 500lb dispenser munition systems, CBU-19/A, BLU-52A/B 750lb bombs, XM28 1000lb dispensers and bagged agent.⁴

The United States employed a variety of RCA munitions and means of delivery in its conflict with Vietnam⁵. In its 1971, report SIPRI stated: “*Almost every type of weapons delivery system in Viet-Nam had a CS capability, so that CS could swiftly be spread over almost any size of target area, at any range and, if necessary, in close coordination with other forms of firepower.*”⁶ In their 2003 analysis, Meselson and Perry Robinson reported that: “*25 different types of weapon disseminating the irritant agent CS, including heavy munitions ranging up to 155mm artillery shell and 750-pound aircraft bombs, were used in Viet Nam. Ultimately more than 15 million pounds of CS were dispensed in these munitions.*”⁷

According to Furmanski “*use of irritant chemical agents in Vietnam became routine [and] grew to massive levels...*”⁸ The U.S. military used irritant chemical agents to “*complement or increase the lethality of conventional munitions and in circumstances that did not serve to protect civilians.*” This included the “*blind aerial dropping of massive amounts of irritant chemical agents in target areas immediately prior to carpet-bombing with conventional munitions, in order to force persons out of bomb shelters into the open.*”⁹ The U.S. military also attempted to use RCAs to clear “*caves, bunkers and tunnel systems, forcing occupying*

³ See for example: Stockholm International Peace Research Institute/Perry Robinson, J. and Leitenberg, M., *The problem of chemical and biological warfare, Volume 1: The rise of CB weapons*, Stockholm, Sweden, 1971; Stockholm International Peace Research Institute/Perry Robinson, J., Hedén, C. and von Schreeb, H. *The Problem of Chemical and Biological Warfare Volume II, The problem of chemical and biological warfare, CB Weapons Today*, Stockholm, Sweden: SIPRI, 1973; Pearson, A., Chevrier, M. and Wheelis, M. (eds), *Incapacitating Biochemical Weapons*, Lanham, United States: Lexington Books, 2007.

⁴ Stockholm International Peace Research Institute/Perry Robinson, J. and Leitenberg, M. (1971) *op.cit.*, pp.192-193; Howard, P.L. Operational Aspects of Agent CS, USATECOM Desert Test Center technical report DTC-FR-S700M, April 1973 [columns 1,2,3 and 5]. As cited in Perry Robinson, J. *Disabling Chemical Weapons, A Documented Chronology of Events, 1945-2011*, Harvard Sussex Program, DRAFT of 20 November 2012 (copy provided by the author).

⁵ Stockholm International Peace Research Institute/Perry Robinson, J. and Leitenberg, M. (1971) *op.cit.*; Meselson, M. and Perry Robinson, J. 'Non Lethal' weapons and implementation of the Chemical and Biological Weapons Conventions, 20th Pugwash Workshop Study Group on the implementation of the CBW Conventions, Geneva, Switzerland, 8th-9th November 2003.

⁶ Stockholm International Peace Research Institute/Perry Robinson, J. and Leitenberg, M. (1971) *op.cit.*, p.190.

⁷ Meselson, M. and Perry Robinson, J. (2003) *op.cit.*

⁸ Furmanski, M. Historical military interest in low-lethality biochemical agents, in: Pearson, A., Chevrier, M. and Wheelis, M. (eds) *Incapacitating Biochemical Weapons*, Lanham: Lexington Books, 2007, p.47.

⁹ Furmanski, M. (2007) *op.cit.*, p.47.

combatants into conventional zones of fire.”Furmanski highlighted the “*extensive use of irritant chemical agents to drive enemy troops from cover...in urban fighting against regular enemy troops in Hue and Saigon during the Tet offensive.*”¹⁰ RCAs were also employed “*defensively to break off ambushes, or protect fixed bases from infiltration*” and to “*suppress ground fire during rescues of downed U.S. pilots*”.¹¹ According to Furmanski “*massive amounts of persistent irritant chemical agent preparations were used in attempts to deny enemy reoccupation of underground facilities and to attempt to interdict enemy transportation routes by aerial contamination.*”¹²

Although the U.S. TAC munitions were primarily intended for the dispersal of RCAs, it appears that consideration was given by the military to exploring their utility as means of delivery for other toxic chemicals, notably incapacitants. In 1973, in testimony before the U.S. Senate Committee on Armed Services, then conducting hearings relating to authorization for military procurement, research and development, the U.S. Army stated that: “*A new [incapacitant] agent, EA 3834..., has been accepted for weaponization. The agent has essentially the dissemination properties of standard riot control agent CS, which will enable the weaponization of EA 3834 to piggyback on the technologies developed for the current family of tactical riot control agent munitions.*”¹³

Iraq: During the 1980s, Iraq developed a range of chemical weapons that it subsequently employed in its conflict with Iran, this included weaponised RCAs. In its *Compendium* of documents detailing Iraq's chemical weapons programme¹⁴, the United Nations Monitoring and Verification Committee (UNMOVIC) stated that: “*Despite the classification of CS as riot control agent it was widely used by Iraq for military purposes.*”¹⁵ UNMOVIC noted that because of its ability to “*hinder unprotected personnel for short periods of time (several minutes) when exposed to the requisite concentration, CS according to Iraq's declarations was used in conjunction with other chemical agents and conventional ammunition to cause confusion among enemy ground troops during [the] Iran-Iraq war.*”¹⁶

With regard to the range of RCA means of delivery developed by Iraq, UNMOVIC stated that: “*From 1984 until 1985, an unknown number of “RPG-7” [rocket propelled] grenades, and over 1,000, 82mm, and 20,000 120mm mortars were filled with CS.*”¹⁷ In addition, a “*few hundred*” BR-250 and AALD-250 bombs which had a capacity of 60 litres of agent, and a “*few hundred*” BR-500 and AALD-500 bombs which had a capacity of 120 litres of agent, “*were filled with CS*”.¹⁸

¹⁰ Furmanski, M. (2007) *op.cit.*, p.47.

¹¹ Furmanski, M. (2007) *op.cit.*, p.47.

¹² Furmanski, M. (2007) *op.cit.*, p.47.

¹³ 93rd US Congress, 1st Session, Senate, Committee on Armed Services, hearings *Fiscal Year 1974 Authorization for Military Procurement, Research and Development ...*, committee print, Washington, DC: U.S. Government Printing Office (1973) at part 5, *Research and Development*, p.3880. As cited in Perry Robinson, J. *Disabling Chemical Weapons, A Documented Chronology of Events, 1945-2011*, Harvard Sussex Program, DRAFT of 20 November 2012 (copy provided by the author).

¹⁴ United Nations Monitoring and Verification Committee [UNMOVIC], *Compendium, The Chemical Weapons Programme*, undated, www.un.org/depts/unmovic/new/pages/compendium.asp (accessed 14th February 2013).

¹⁵ United Nations, UNMOVIC, *Compendium, The Chemical Weapons Programme*, (undated) *op.cit.*, p.1110.

¹⁶ United Nations, UNMOVIC, *Compendium, The Chemical Weapons Programme*, (undated) *op.cit.*, p.95.

¹⁷ United Nations, UNMOVIC, *Compendium, The Chemical Weapons Programme*, (undated) *op.cit.*, p.176.

¹⁸ United Nations, UNMOVIC, *Compendium, The Chemical Weapons Programme*, (undated) *op.cit.*, p.158.

One of the clear lessons UNMOVIC highlighted in its report analysing its activities in Iraq, was “do not downplay riot agents”¹⁹ The report explained that because of the nature of CS, its widespread use as a riot control agent and the uncertainty as to whether it could be considered as a chemical weapons agent and therefore part of Iraq’s weapons of mass destruction programme, “Iraq’s CS was not given sufficient attention by U.N. verification and monitoring activities in the period 1991 to 2003.”²⁰

¹⁹ United Nations, UNMOVIC, *Compendium, The Chemical Weapons Programme*, (undated) *op.cit.*, p.1110.

²⁰ United Nations, UNMOVIC, *Compendium, The Chemical Weapons Programme*, (undated) *op.cit.*, p.1109.

2. Contemporary “wide area” RCA means of delivery

The following sections illustrate the variety of “wide area” means of delivery that are reportedly being developed or have been developed, promoted or held since the Chemical Weapons Convention (CWC) came into force in 1997. Research in this area has proven difficult, often being curtailed by issues of commercial confidentiality and national security. Consequently, this review is by no means exhaustive, and the spread and frequency of States/commercial entities cited is not representative of the countries and companies developing, holding or utilizing such means of delivery – but instead reflects the open source information that could be obtained by the researchers at this time. Prior to publication, attempts were made to contact States and companies detailed in the report to provide them with an opportunity for clarification; substantive responses are cited, as appropriate.

2.1. RCA smoke generators, foggers, large backpack or tank irritant “sprayer” devices

A range of RCA smoke generators, foggers, or spraying devices have been developed, some of which have the capacity to deliver significant amounts of RCAs over a wide area, potentially affecting a large number of people.

M835A1 CS Irritant Smoke Generator [South Africa]



The M835A1 CS Irritant Smoke Generator originally manufactured by Denel. Image taken from an undated Denel brochure available on Tecna Corporation website.

The South African manufacturer, Denel, developed and promoted the M835A1 CS Irritant Smoke Generator. According to Denel marketing literature this munition; “*is remotely activated for use from vehicles, helicopters or other mobile means for large scale clearance operations where the movement of vehicle dictates the dispersion of the CS Smoke.*”²¹ [Emphasis added]. The M835A1 munition had a total weight of 1.584 kg, which included 1kg of agent.²² In 2008, Denel merged with the German manufacturer Rheinmetall, the combined company - Rheinmetall Denel Munition (Pty) Ltd - does not produce or promote this munition.²³

²¹ Hand Grenades, CS Smoke Generators and Aerosols, in: Riot Control Systems And Pyrotechnics, Denel, undated. Copy of brochure available on Tecna Corporation website: http://www.tecnacorp.com/pdfs/LS_PyrotechnicsAntiRiot.pdf (accessed 14th February 2013).

²² Denel brochure (undated) *op.cit.* See also *Jane’s Police and Homeland Security Equipment Handbook 2005 – 2006*, IHS. Jane’s, Coulsdon, United Kingdom, 2005, p.547.

²³ Rheinmetall Denel Munition (Pty) Ltd was established on 1st September 2008 when the Denel divisions comprising Somchem (Somerset West and Wellington sites), Swartklip, Boksburg and Naschem became part of the Rheinmetall Defence Group. For further information see: http://www.rheinmetall-defence.de/en/rheinmetall_defence/company/divisions_and_subsidiaries/rheinmetall_denel_munition/index.php (accessed 14th February 2013).

In correspondence to BNWLRP and ORF, dated 2nd April 2013, the South African OPCW Ambassador stated that “*We have established that...all...production [of the munition] was halted in 1989*”.²⁴ Correspondence received from the Chief Executive Officer of Rheinmetall Denel Munition on 3rd April 2013 stated that the M835A1 was “*phased out of product range in 1994*”.²⁵

Although production of the munition appears to have halted some time ago, promotion of this product subsequently continued.²⁶ The Tecna Corporation - which manufactures and/or markets a wide range of products including military equipment, and which has offices in the US, Pakistan, South Africa, China and Russia²⁷ - continued to promote the M835A1 CS Irritant Smoke Generator on its website until at least 14th February 2013.²⁸

On 27th March 2013, in correspondence with BNWLRP and ORF, the Chairman of Tecna Corporation stated: “***Tecna Corporation stopped marketing of Denel Munitions products shortly after their merger with Rheinmetall in 2008. The M835A1 CS Irritant Smoke Generator has not been available since that time. Our company Website is in the process of being updated.***”²⁹ [Emphasis added].

According to the South African OPCW Ambassador:

“Denel's relationship with Tecna Corporation as Denel's Technical Advisor for specific products ended on expiry of the contractual agreement on 1 February 2012. As part of this termination all representation on behalf of Denel should have ceased at that time. Denel will request Tecna Corporation to immediately withdraw brochures relating to its products from their website, including the outdated marketing brochure containing the M835A1.”³⁰[Emphasis added].

In addition, the CEO of Rheinmetall Denel Munition (RDM) has stated that: “*RDM has no agreement whatsoever with Tecna Corporation to promote any of its products and as such Tecna Corporation has no legal right to promote and/or market any of RDM's products.*”³¹

²⁴ Correspondence from Ambassador Peter Goosen, Permanent Representative of South Africa to the OPCW, to BNWLRP and ORF, 2nd April 2013, (copy held by author).

²⁵ Correspondence from Schulze, N. Chief Executive Officer, Rheinmetall Denel Munition, to BNWLRP and ORF, 3rd April 2013, (copy held by author).

²⁶ An entry for this product was contained in *Jane's Police and Homeland Security Equipment Handbook 2005 – 2006*, IHS. Jane's, Coulsdon, United Kingdom, 2005, p.547.

²⁷ Tecna Corporation, Company Profile, <http://www.tecnacorp.com/home.html> (accessed 14th February 2013).

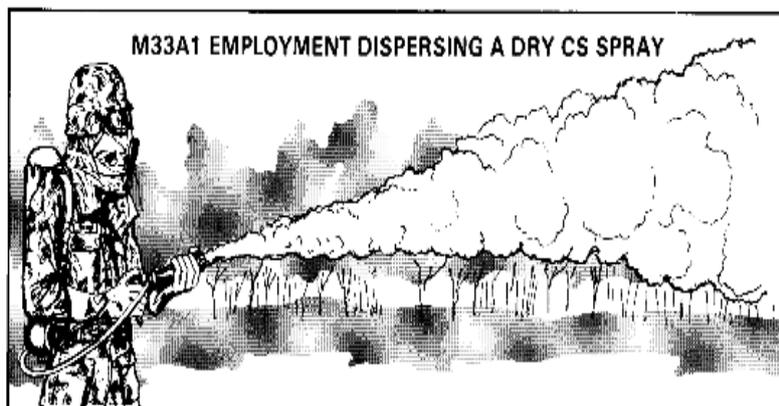
²⁸ Denel brochure (undated) *op.cit.*

²⁹ Correspondence from Durrani, S. Chairman, Tecna Corporation, to BNWLRP and ORF, 27th March 2013, (copy held by author).

³⁰ Ambassador Goosen, P. (2013) *op.cit.*

³¹ Schulze, N. (2013) *op.cit.*

M33A1: Squad Riot Control Agent Dispenser [United States]



The M33A1 squad riot control dispenser (left) from a 2004 NIJ report, and an artist's impression of the dispenser in use (right) from global security.org

According to a 2004 U.S. National Institute of Justice (NIJ) report,³² the U.S. Armament and Chemical Acquisition and Logistics Agency (ACALA) manufactured and promoted the M33A1: Squad Riot Control Agent Dispenser. The NIJ report stated that the dispenser was “capable of projecting a ballistic stream of Riot Control Agent beyond 25 feet in up to 25 half-second bursts. It can be loaded with commonly used crowd control agents and is rechargeable at the unit level.”³³ Technical and operator manuals state that the M33A1 dispenser has a capacity of 3 gallons (11.4 litres), can hold 26 pounds (11.8 kgs) of CR solution and can fire to a maximum range of 40 feet for 60 seconds.³⁴ Alternatively, the M33A1 can hold 8 pounds (3.6 kgs) of dry CS-1 and can fire to a maximum range of 40 feet in still air, for 40 seconds.³⁵

The 2004 NIJ report stated that: “The M33A1, Squad Riot Control Agent Dispenser, is designed to provide crowd control and protection at the squad level.”³⁶ Similarly, a Field Manual for Military Police dated 2002, stated that the M33A1 “is primarily used by formations conducting crowd control tactics... It is intended to provide a small unit with self-defense capabilities from large crowds out to 15 meters (100 meters is possible based on wind speed and direction).”³⁷ In addition, the Military Police Field Manual also stated that the M33A1 can be used “offensively to clear crowds from critical areas.”³⁸ A 2003 Military Field Manual describing policy and appropriate munitions to be employed by U.S. military

³² U.S. Department of Justice, Office of Justice Programs, National Institute of Justice, (produced by National Security Research, Inc) *Department of Defense Non-Lethal Weapons and Equipment Review: A Research Guide for Civil Law Enforcement and Corrections*, Document No.: 200516, October 2004, <https://www.ncjrs.gov/pdffiles1/nij/205293.pdf> (accessed 14th February 2013).

³³ National Institute of Justice (2004) *op.cit.*, p.19.

³⁴ See for example: United States Headquarters, Department of the Army, Army Equipment Data Sheets, Chemical Weapons and Munitions, Change No.4, TM 43-0001-26-2, Washington DC, 7th August 1991, p.3-10. Available from: http://64.78.11.86/uxofiles/enclosures/TM_43-0001-26-2.pdf (accessed 14th February 2013).

³⁵ US Department of the Army (1991) *op.cit.*, pp.3-10.

³⁶ National Institute of Justice (2004) *op.cit.*, p.19.

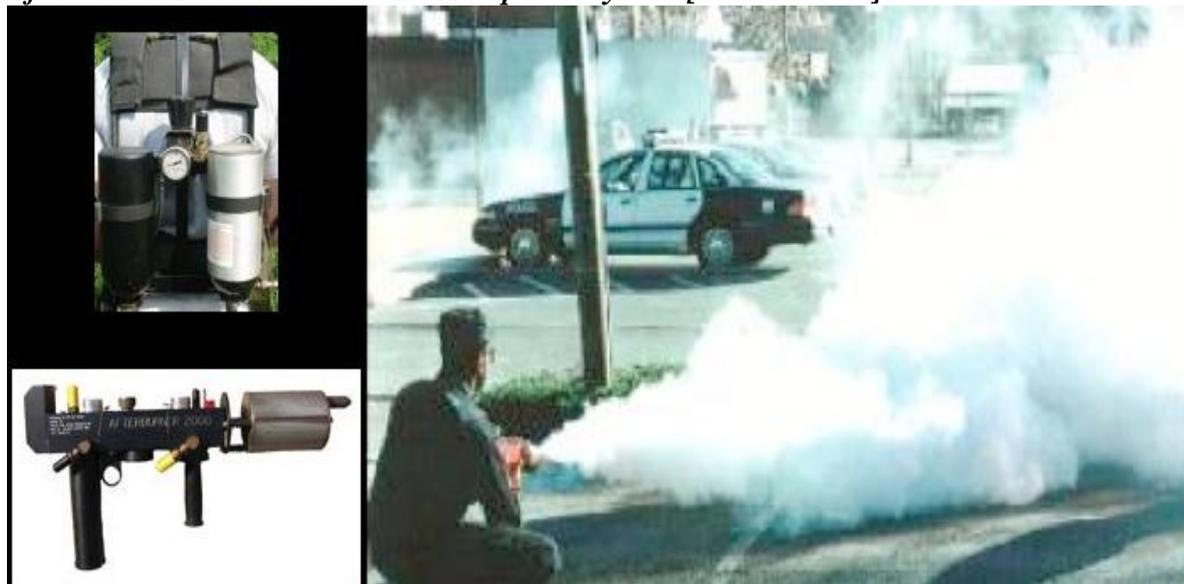
³⁷ *Military Police Leaders Handbook*, FM 3-19.4 (FM 19-4), Headquarters, Department of the Army Washington, DC, 4 March 2002, Available from Washington Research Library Consortium at: <http://dspace.wrlc.org/doc/get/2041/63497/00258display.pdf> (accessed 14th February 2013), Appendix L, p.6.

³⁸ Department of the Army, *Military Police Leaders Handbook* (2002) *op.cit.*, Appendix L, p.6.

forces in *Flame, Riot Control Agent and Herbicide Operations*, highlighted the following potential operational scenarios: “*The M33 and M33A1 are best used in small unit operations against small area and point targets. They can be very effective in reducing resistance from fortifications, tunnels, and urban complexes.*”³⁹ [Emphasis added].

Although there is no information concerning which (if any) US military units currently possess M33A1 dispersers nor in what quantities, on 11th April 2003, the US military TACOM contracting office issued a tender solicitation for 75 to 225 Refill Unit for the Squad Riot Control Agent Dispenser (M33A1) and/or the Midsized Riot Control Agent Dispenser (M37).⁴⁰

Afterburner 2000 smoke and RCA dispersal system [United States]



Images of Afterburner 2000 taken from MSI Delivery Systems Inc, website.

Marketing material produced by U.S. manufacturer MSI Delivery Systems Inc, described the Afterburner 2000 as a “*robust multi-mission, multi-purpose smoke generator capable of rapidly blanketing large areas with dense smoke. The smoke solution can be mixed with specific chemicals to upgrade the mission requirements...*”⁴¹ Company information detailing mission specific formulations stated that the Afterburner 2000 is capable of “*dispensing many less-than-lethal formulations in a high density aerosol form*”. In particular: “**Standard non-toxic training smoke mixed with irritants such as OC, CS, or Pepper upgrades the capabilities to include: Crowd Control and Civil Unrest, SWAT Teams and Tactical**

³⁹ Department of the Army, United States Marine Corps, *Flame, Riot Control Agent and Herbicide Operations*, FM 3-11.11/MCRP 3-3.7.2, C1, Field Manual, No. 3-11.11, Headquarters, Department of the Army, Marine Corps Reference Publication United States Marine Corps, No. 3-3.7.2 Washington, DC, 10 March 2003. This paper is an amended version of a policy document previously distributed on 19th August 1996. Manual is available from <http://www.fas.org/irp/doddir/army/fm3-11-11-excerpt.pdf> (accessed 14th February 2013), Appendix B, p.B-7.

⁴⁰ FBO Daily Issue of April 13, 2003 FBO #0499, Solicitation Notice, 47 -- M254 Service Kit for the dispenser, riot control agent, portable, <http://www.fbo.gov/contracts/2003/04-April/13-Apr-2003/FBO-00301890.htm> (accessed 14th February 2013).

⁴¹ MSI Delivery Systems, Inc, The AB2K, Multi-Mission Aerosol Delivery System, <http://www.msi-deliverysystems.com/Products/page9/page9.html> (accessed 14th February 2013).

*Incursions, Corrections Dept. (Riots / Prisoner Extraction), Less-lethal Terrorist Suppression, Urban Warfare (MOUT / COIN) ...*⁴² [Emphasis added].

Although the Afterburner 2000 was designed and promoted as being capable of providing RCA delivery in urban warfare scenarios, the company stated: *“MSI Delivery Systems only provides the non-toxic training smoke. Additives for “Irritants” are provided by the customer through their local suppliers. Additives for “Specialized Deployments” are under development by 3rd party manufacturers.”*⁴³ Furthermore, the product white paper stated: *“Irritants are purchased from local suppliers. Undiluted irritant is mixed with a gallon of High Performance Liquid Smoke Solution and loaded in the system for deployment. The amount of undiluted irritant mixed with the smoke solution is determined by the end user.”*⁴⁴

The company further stated:

*“A one second trigger burst releases over 1,500 cubic feet of smoke (42.5 cubic meters) with a range greater than 100 feet (30 meters). The standalone version of the Afterburner 2000™ expels 50,000 cubic feet (1,416 cubic meters) of smoke on a single charge. The dependent version with high-capacity backpack expels 320,000 cubic feet (9,061 cubic meters) of smoke on a single charger”*⁴⁵ ... *“which is approximately a 20 minute deployment.”*⁴⁶

According to company literature, the capacity of the Afterburner 2000 could be further enhanced by *“A field deployable portable recharge station ... that is easily loaded into civilian or support vehicles for deployment. This field deployable portable recharge station is capable of delivering over 30 refills for the standalone version, or six refills of the high-capacity backpack version.”*⁴⁷ Although there is no information publicly available concerning which (if any) law enforcement and military entities in the U.S. or elsewhere have purchased this product, the manufacturer has stated that *“MSI Delivery Systems Inc...has commenced volume production and sales”*⁴⁸

2.2 Under-barrel and rifle grenade launchers

A number of manufacturers have developed rifle-mounted launching mechanisms capable of utilising a variety of lethal or “less lethal” munitions, including RCA projectiles. Certain launchers and RCA munitions have been promoted for use by police forces whilst others are intended primarily for employment by military forces.

⁴² MSI Delivery Systems.Inc, Mission Specific Formulations, <http://www.msi-deliverysystems.com/Products/page8/page8.html> (accessed 14th February 2013).

⁴³ *Ibid.*

⁴⁴ MSI Delivery Systems.Inc, Afterburner 2000 smoke delivery system, white paper, 25th January 2010, <http://msi-deliverysystems.com/Products/Downloads/files/AB2K%20White%20Paper.pdf> (accessed 14th February 2013), p.2.

⁴⁵ MSI Delivery Systems.Inc, The AB2K, Multi-Mission Aerosol Delivery System, <http://www.msi-deliverysystems.com/Products/page9/page9.html> (accessed 14th February 2013).

⁴⁶ MSI Delivery Systems.Inc, Afterburner 2000 smoke delivery system, white paper (2010) *op.cit.*, p.4.

⁴⁷ MSI Delivery Systems.Inc, Afterburner 2000 smoke delivery system, white paper (2010) *op.cit.*, p.5.

⁴⁸ MSI Delivery Systems.Inc, Afterburner 2000 press release, 10th January 2010, <http://www.msi-deliverysystems.com/Products/Downloads/files/Press%20Release%20Intro.pdf> (accessed 14th February 2013).

Grenade Launcher and 40mm Smoke CS-M99 Munition [Serbia]



Images from Yugoimport-SDPR marketing brochure of the 40mm under-barrel grenade launcher (top and bottom left) and a range of 40mm grenades including the 40mm Smoke CS – M99 munition (below centre).



The Serbian manufacturer Yugoimport-SDPR developed a 40mm under-barrel grenade launcher, which according to marketing material distributed in 2013, was “intended for integration with Kalashnikov design. The proven launcher design features “high reliability, simplicity, high rate of fire... and high combat versatility...”⁴⁹ The company also developed a “Russian Standard Family” of “40mm Grenade Launcher Ammunition”. This “40mm cartridge family now includes a spectrum of capabilities including...smoke, gas...”⁵⁰

In 2013, Yugoimport-SDPR also promoted a family of 40mm NATO standard grenades including the 40mm Smoke CS – M99 munition. According to the company “*Though it is a multipurpose round, the GRENADE 40mm x 46 SMOKE CS – M99 is most effective for riot control and in military operations on urbanized terrain (MOUT)* [Emphasis added].⁵¹ Furthermore, “*This chemical round is used to drive the enemy from bunkers or enclosed positions in built-up areas. It produces a white cloud of CS gas on impact*” [Emphasis added]. The weight of the round is 201 grammes and that of the grenade is 158 grammes. It has a maximum range of 400 metres.⁵²

⁴⁹ Yugoimport-SDPR, 40mm Grenade Launcher Ammunition, Russian Standard Family, undated brochure, distributed at (International Defence Exhibition and Conference) IDEX 2013, Abu Dhabi, United Arab Emirates, 17th – 21st February 2013. [Copy held by author], p.1.

⁵⁰ Yugoimport-SDPR, 40mm Grenade Launcher Ammunition, Russian Standard Family (undated) *op.cit.*, p.1.

⁵¹ Yugoimport-SDPR, 40mm x 46 (Low Velocity, Grenade Launcher Ammo, NATO Standard) Family, undated brochure, distributed at (International Defence Exhibition and Conference) IDEX 2013, Abu Dhabi, United Arab Emirates, 17th – 21st February 2013. [Copy held by author], p.4.

⁵² Yugoimport-SDPR, 40mm x 46 (Low Velocity, Grenade Launcher Ammo, NATO Standard) Family, brochure (undated) *op.cit.*, p.4.

M651 40mm irritant smoke cartridge [United States]

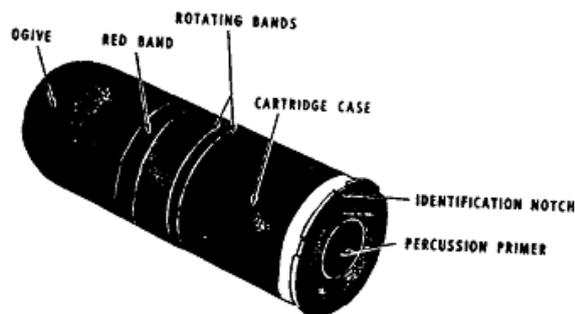


Image of M651 40mm irritant smoke cartridge taken from a 2003 US Military Field Manual

The M651 40mm tactical CS round was developed by U.S. Army Ordnance and manufactured by Pine Bluff Arsenal. It is described as a “*multi-purpose round intended for riot control and MOUT (Military Operations in Urban Terrain)*”.⁵³ According to *Jane’s Ammunition Handbook, 2010-2011*, it is in “*standard U.S. service.*”⁵⁴ It can be fired from the M79 or M203 low velocity grenade launchers, the latter of which is currently in service with the U.S. Army and U.S. Marine Corp.⁵⁵ The M651 is a burning type riot control grenade, weighing 250 grams and contains 53 grams of CS composition. On impact it emits a cloud of CS smoke from an aperture in the base “*for 20 to 30 seconds, covering 120 metres*”.⁵⁶ It has a maximum range of 200 metres for point targets and 400 metres for area targets. According to a 2003 U.S. Military Field Manual, the M651 “*can penetrate window glass or up to 3/4 inch-thick pine at 200 meters and still release CS... Two cartridges effectively placed will incapacitate 95 per cent of unmasked personnel in an enclosure of 15 by 30 by 20 feet within 60 seconds after functioning.*”⁵⁷

40mm and 60mm CS rifle grenades [Serbia]

Serbian manufacturer, Yugoimport-SDPR has developed a variety of munitions containing riot control agents. Marketing brochures distributed during 2005 (entitled *Infantry Ammunition*)⁵⁸ and 2009 (entitled *Weapons and Equipment for Rapid Deployment Forces*)⁵⁹ included information on a 40 mm CS rifle grenade weighing 0.41 kg that has a maximum range of 460 metres, and a 60mm CS rifle grenade of unspecified weight and range.

⁵³ *Jane’s Ammunition Handbook, 2010-2011*, eds Ness, L and Williams G., IHS. Jane’s, Coulsdon, United Kingdom, 2010, p.216.

⁵⁴ *Jane’s Ammunition Handbook, 2010-2011*, IHS. Jane’s (2010) *op.cit.*, p.216.

⁵⁵ Although there are no details of M651 transfers to other countries, the M203 grenade launcher is reportedly in use at in at least 38 other countries. See: *Jane’s Infantry Weapons 2008-2009*, IHS. Jane’s, Coulsdon, United Kingdom, 2009, pp.349-350.

⁵⁶ *Jane’s Ammunition Handbook, 2010-2011*, IHS. Jane’s (2010) *op.cit.*, p.216.

⁵⁷ Department of the Army, United States Marine Corps, Flame, Riot Control Agent and Herbicide Operations, FM 3-11.11/MCRP 3-3.7.2, C1, Field Manual, No. 3-11.11, Headquarters, Department of the Army, Marine Corps Reference Publication United States Marine Corps, No. 3-3.7.2 Washington, DC, 10 March 2003. This paper is an amended version of a policy document previously distributed on 19th August 1996. Manual is available from <http://www.fas.org/irp/doddir/army/fm3-11-11-excerpt.pdf> (accessed 14th February 2013), Appendix B, pp.B2-3.

⁵⁸ Yugoimport-SDPR, “Infantry Ammunition”, undated catalogue distributed at Latin America Aero and Defence (LAAD) 2005, 26th – 29th April 2005, Rio de Janeiro, Brazil, (copy held by author).

⁵⁹ Yugoimport-SDPR, “Weapons and Equipment for Rapid Deployment Forces”, undated catalogue distributed at Defense and Security, Bangkok, Thailand, 4th-7th November 2009 (copy held by author).

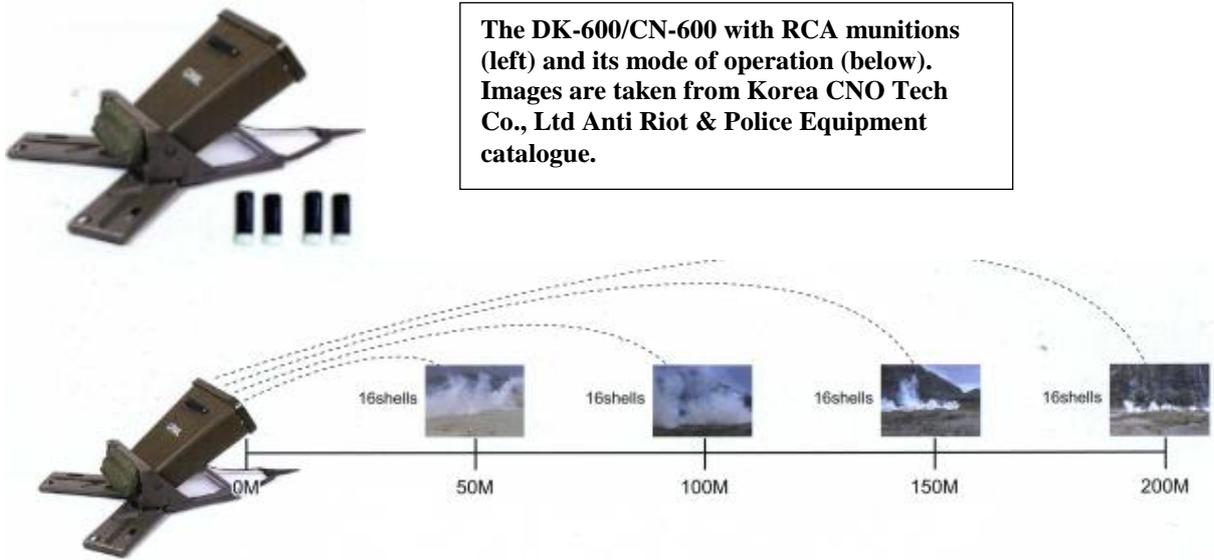


Images above of 40mm and 60mm CS rifle grenades taken from YugoImport's "Weapons and Equipment for Rapid Deployment Forces" catalogue distributed at Defense and Security exhibition, Thailand, 2009.

2.3. Multiple “less lethal” munition launchers

A range of multiple launchers have been developed, some intended solely for firing RCA munitions whilst others are capable of employing a variety of “less lethal” projectiles. Such launchers and associated RCA munitions can be employed to blanket wide areas, cumulatively delivering significant amounts of RCAs and potentially affecting large numbers of people. They vary in number of projectiles launched, rapidity and mode of fire, range, area coverage as well as in terms of the calibre, weight, and agent fill of the munitions utilised.

DK-600 (35mm) tear gas multiple launcher [Republic of Korea]



The DK-600/CN-600 with RCA munitions (left) and its mode of operation (below). Images are taken from Korea CNO Tech Co., Ltd Anti Riot & Police Equipment catalogue.

According to marketing material produced by Korean manufacturer, Dae Kwang Chemical Corporation, the DK-600 is a “multiple launcher for DK-100 CS tear gas”. The launcher

fires a total of 64 tear gas shells within 20 seconds.⁶⁰ The DK-100 CS tear gas munitions utilised in the launcher, also produced by Dae Kwang Chemical Corporation, are 35mm shells comprised of rubber and plastic, weighing 82 grammes.⁶¹ The launcher has an effective firing range of between 50-200 metres.⁶² A second company, Korea CNO Tech Company Ltd, markets an identical product, designated CN-600.⁶³

It appears from demonstration videos on the Dae Kwang Chemical Corporation website⁶⁴ and from Korea CNO Tech Company Ltd marketing material, that the 64 shells can be fired in consecutive batches of 16 shells at 50 metres, 100 metres, 150 metres and 200 metres, effectively covering this entire area in a 20 second period.⁶⁵ The launcher is promoted for the suppression of large illegal demonstrations.⁶⁶ It can be carried by hand or attached to a vehicle.

Agni Varsha (38mm) multi-barrel launcher [India]



Images taken from Tear Smoke Unit brochure.

Image on left shows launcher with a range of TSU munitions including CS grenades and a CR shell.

The Indian Border Security Force Tear Smoke Unit (TSU) developed the Agni Varsha multi-barrel launcher in the late 1990s with the intention of “*augmenting the fire power of the*

⁶⁰ Dae Kwang Chemical Corporation website, DK-600, <http://www.dkc21.com/e03gas06.html> (accessed 14th February 2013).

⁶¹ Dae Kwang Chemical Corporation website, DK-100, <http://www.dkc21.com/e03gas01.html> (accessed 14th February 2013).

⁶² Dae Kwang Chemical Corporation website, DK-600, <http://www.dkc21.com/e03gas06.html> (accessed 14th February 2013).

⁶³ Korea CNO Tech Co. Ltd, Anti-riot and police equipment, p.2, undated catalogue distributed at, (International Defence Exhibition and Conference) IDEX 2013, Abu Dhabi, United Arab Emirates, 17th – 21st February 2013. Copy held by the author. A similar version of the catalogue is also available on the company website http://www.cnotech.com/en/bbs/board.php?bo_table=catalogue&wr_id=2 (accessed 14th February 2013) In these catalogues the launcher is called the CN-600 and the ammunition is CN-100, but both appear to have the same specifications as the respective DK-600 and DK-100.

⁶⁴ Dae Kwang Chemical Corporation website, DK-600, http://www.dkc21.com/wmv/e03_06.wmv (accessed 14th February 2013).

⁶⁵ Korea CNO Tech Co. Ltd (undated) *op.cit.*

⁶⁶ Korea CNO Tech Co. Ltd (undated) *op.cit.*

*Security Forces.*⁶⁷ The manufacturers stated that: “For a successful tear smoke action it is essential that the entire target area be saturated simultaneously with tear smoke.”⁶⁸ The Agni Varsha can launch seven tear smoke shells simultaneously or singly, and can be used either from ground level or by fitting on a vehicle. A fast reloading system and simple electric firing mechanism ensure a high rate of fire.⁶⁹ In its standard configuration the launcher can fire a variety of 38mm TSU munitions. The TSU developed a range of munitions containing CN, CS or CR and it appears that shells with these payloads can be utilised in the launcher.⁷⁰ In a modified version, the Agni Varsha could fire three tear gas grenades along with four shells,⁷¹ in this configuration the relevant barrels were reportedly “fitted with cup dischargers to fire oversize (62mm) canister-type grenades.”⁷²

The Agni Varsha has a range of 90-135 metres and can blanket an area of approximately 100 metres x 60 metres in a seven launch salvo, which the manufacturers have claimed make the launcher “effective for covering large areas simultaneously.”⁷³ According to the manufacturers, the Agni Varsha can be used for: “dispersal of violent mobs; ...flushing out terrorists from fields/dense jungles/broken ground;” and in the “conduct of vehicle mounted operations.”⁷⁴ According to *Janes*, the Agni Varsha “entered police service” in 1997⁷⁵, and the launcher was, as of 2009-2010, still “in production and in service.”⁷⁶ The full range of Indian security forces that currently employ the launcher is unknown. In correspondence dated 2nd April 2013, the Indian Government stated that “In our view, the items/activities pertaining to India detailed in the [BNLWRP/ORF] report are not in contravention of the Chemical Weapons Convention. In any event, the munitions listed have mainly formed part of capability demonstration by Indian security agencies.”⁷⁷

⁶⁷ Tear Smoke Unit, BSF Tekanpur Multi Barrel launcher Agni Varsha product brochure (undated), Gwalior India, (copy held by author).

⁶⁸ *Ibid.*

⁶⁹ Tear Smoke Unit, BSF Tekanpur Multi Barrel launcher Agni Varsha product brochure (undated), Gwalior India, (copy held by author). See also: *Jane’s Police and Homeland Security Equipment, 2009-2010*, Coulsdon: Jane’s Information Group, Coulsdon, 2009, p.379.

⁷⁰ Tear Smoke Unit, BSF Tekanpur Multi Barrel launcher Agni Varsha product brochure (undated), Gwalior India; Tear Smoke Unit, BSF Tekanpur, Non-lethal munitions, product information (undated). Copies of both brochures held by author. Details of CR and CN munitions produced by the Tear Smoke Unit are no longer available on the TSU website. However, according to *Jane’s Ammunition Handbook 2009-2010* the Tear Smoke dual shell (Dhoom Ketu) which contains “CN/CR/CS” can be launched from the Agni Varsha launcher. *Jane’s Ammunition Handbook 2009-2010*, Coulsdon: Jane’s Information Group, 2009, p.211.

⁷¹ *Jane’s Police and Homeland Security Equipment, 2009-2010*, Coulsdon: Jane’s Information Group, 2009, p.379.

⁷² *Jane’s International Defence Review*, volume 31, issue 5, Weapons and equipment, multi-barrel launcher has warlike potential, 1st May 1998, p.18.

⁷³ Tear Smoke Unit, BSF Tekanpur Multi Barrel launcher Agni Varsha product brochure (undated), Gwalior India, copy held by author.

⁷⁴ *Ibid.*

⁷⁵ *Jane’s International Defence Review*, volume 31, issue 5, Weapons and equipment, multi-barrel launcher has warlike potential, 1st May 1998, p.18.

⁷⁶ *Jane’s Police and Homeland Security Equipment, 2009-2010*, Coulsdon: Jane’s Information Group, 2009, p.379.

⁷⁷ Correspondence from Menon, S. First Secretary (Pol & OPCW), Embassy of India, to BNLWRP and ORF, 2nd April 2013, (copy held by author).

VENOM 38mm non-lethal tube launched munition system (NLTL/MS) [United States]



Images above downloaded from Combined Systems Inc website showing the venom modular launcher (left), venom launchers mounted on humvees (centre) and on the Gladiator UGV.

The VENOM launcher was developed by Combined Systems, Inc. (CSI) for use by military or security forces in a variety of scenarios. According to CSI: *“The CTS VENOM is a platform mounted high-capacity variable payload launching system for early warning signals at vehicle checkpoints, moving convoys or for determining the intent of approaching marine vessels. It is effective as a force multiplier, capable of precise area delivery of munitions while enhancing the capabilities of area denial and force escalation in riot control situations.”*⁷⁸

The CTS VENOM is a modular launching system which accepts three cassettes, each loaded with ten 38mm cartridges.⁷⁹ The 30 cartridges are contained in three levels at 10, 20, and 30 degrees elevation, and can be fired in immediate succession. Each cartridge is assigned an IP address allowing individual cartridge or desired sequence firing from a fire control panel, communicating via cable or wireless device. VENOM is capable of delivering a variety of payloads including 38mm *“multi-7 smoke CS”* munitions which have a maximum range of 150 metres.⁸⁰

CSI previously attempted to integrate VENOM on unmanned vehicles such as the Gladiator TUGV [Tactical Unmanned Ground Vehicle] to *“further enhance Venom capabilities and keep warfighters out of harms way in urban battlefields.”*⁸¹ The Gladiator TUGV was intended for use by the US Marine Corps⁸², however the research and development

⁷⁸ Combined Systems Inc. Product Catalogue, Venom launching systems, undated, catalogue distributed at IDEX 2013, Abu Dhabi, United Arab Emirates, 17th – 21st February 2013. Also available at: https://www.combinedsystems.com/userfiles/pdfs/CSI_MIL_Product_Catalog_2010.pdf (accessed 14th February 2013), p.4.

⁷⁹ Combined Systems Inc. Product Catalogue (undated) *op.cit.*, p.4.

⁸⁰ See Combined Systems Inc. Product Catalogue (undated) *op.cit.*, p.4; Non-lethal tube launched munition systems, Venom, V-10, Combined Systems, Inc. (undated)

https://www.combinedsystems.com/userfiles/pdfs/NLTMS_Brochure_092410.pdf (accessed 14th February 2013).

⁸¹ Combined Systems Inc, Venom Launcher, <http://www.combinedsystems.com/section/products/venom/index.html> (accessed 24th October 2008). This information has subsequently been removed. Copy held by author.

⁸² See for example: Carnegie Mellon, United Defense To Provide TUGV's for US Marine Corps, Space Daily, 14th February 2005, <http://www.spacedaily.com/news/robot-05g.html> (accessed 14th February 2013); Gladiator Tactical Unmanned Ground Vehicle, <http://www.globalsecurity.org/military/systems/ground/gladiator.htm> (accessed 14th February 2013).

programme was later cancelled.⁸³ VENOM was subsequently mounted on the Provectus Robotics AMSTAF unmanned ground vehicle.⁸⁴ This system was show-cased at the North American Technology Demonstration⁸⁵ held in Canada in October 2011, which was sponsored by the North Atlantic Treaty Organisation (NATO) and the U.S. Joint Non-Lethal Weapons Directorate (JNLWD).⁸⁶ Although details of U.S. or foreign military, security or police forces that have acquired VENOM are scarce, a contract to provide the US Marine Corp with 225 VENOM launchers and 75,000 flash-bang stun munitions was awarded in June 2011.⁸⁷

IronFist 38mm nonlethal weapon system [United States]

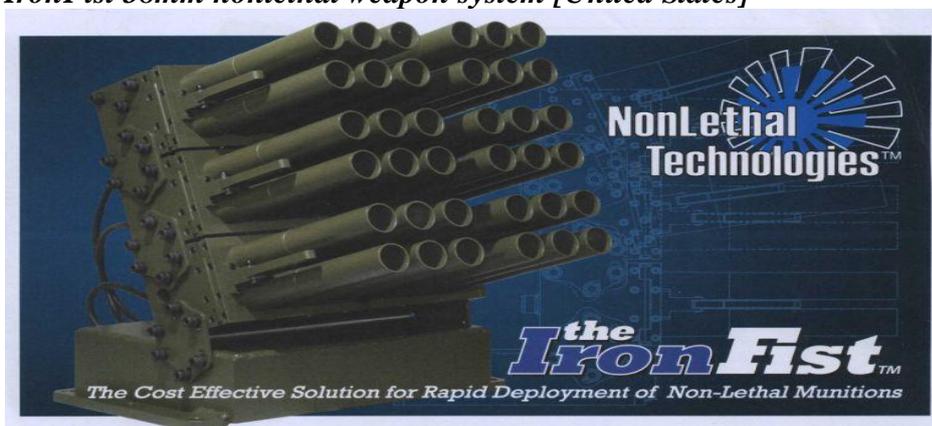


Image of the Iron Fist 38mm non-lethal weapon system taken from NonLethal Technologies brochure

According to marketing material distributed in 2013 by US manufacturer, NonLethal Technologies⁸⁸, the IronFist is “a new 38mm weapon system with up to 36 barrels...[intended] to rapidly deploy a blanket of less lethal munitions into, or over, a hostile

⁸³ Schactman, N. Bad Eyes Keep Unmanned Infantry Out of the Fight, 11th August 2011, *Wired, Danger room*, <http://www.wired.com/dangerroom/2011/08/bad-eyes-keep-unmanned-infantry-out-of-the-fight/#more-54419> (accessed 14th February 2013).

⁸⁴ For details of Provectus Robotics AMSTAF 6x6 Autonomous Unmanned Ground Vehicle see: <http://www.provectus-robotics.com/6x6.html> (accessed 14th February 2013).

⁸⁵ For further details about this event see: NATO, Non-lethal weapons – the latest technology in defence products, 7th November 2011, http://www.nato.int/cps/en/natolive/news_80558.htm (accessed 14th February 2013).

⁸⁶ Video footage of this demonstration is available via the websites of CSI North American Technology and Provectus Robotics. See: Demonstration, a NATO and JNLWD sponsored event in Canada, Connaught Ranges, Eastern Ontario, Canada, 25th – 27th October 2011, <http://www.youtube.com/watch?v=641y4EYk4wE&list=UU9ZxYiN5pIXxI54AUufoEmw&index=7&feature=plcp> (accessed 14th February 2013); and also <http://www.provectus-robotics.com/news.html> <http://youtube/taojwQCMBOQ> (accessed 14th February 2013).

⁸⁷ Combined Systems Awarded VENOM System Contract, News Release, 16th June 2011, https://www.combinedsystems.com/userfiles/pdfs/NL_TLMS_VENOM_Press_Release_6_15_2011.pdf (accessed 14th February 2013).

⁸⁸ IronFist, NonLethal Technologies, undated brochure, distributed at IDEX 2013, Abu Dhabi, United Arab Emirates, 17th – 21st February 2013. The International Defence Exhibition and Conference (IDEX) 2013 was held in Abu Dhabi, United Arab Emirates from 17th – 21st February 2013. According to the conference organisers “*IDEX is the only international defence exhibition and conference in the MENA region demonstrating the latest technology across land, sea and air sectors of defence. It is a unique platform to establish and strengthen relationships with government departments, businesses and armed forces throughout the region.*” For further details see: <http://www.idexuae.ae/page.cfm/link=20> (accessed 28th February 2013).

crowd.”⁸⁹The IronFist can employ “*standard conventional 38mm less lethal CS, flashbang, and colored smoke rounds...or...NonLethal Technologies’ specially designed 10 inch 38mm rounds with higher capacity CS...*”⁹⁰

When the IronFist 36 barrel system is loaded with high capacity 10 inch CS rounds (each with 7 mini-grenades) “*it can rapidly deploy over 250 mini-grenades into the crowd within 2 minutes from... up to 150 metres. Two such configured systems mounted on one armoured vehicle can deploy over 500 CS mini-grenades, or a mix of CS mini-grenades and flashbang-distraction projectiles downrange in that...time...now that is nonlethal firepower!*”⁹¹ [Emphasis added].

The IronFist system is designed to be hard-mounted on a wide range of land vehicles and marine vessels, or to permanent structures “*such as prisons, government buildings, military base perimeters, or embassy compounds.*”⁹² [Emphasis added].

Firestorm 40mm multi-barrel launcher [Australia/United States]

The Firestorm 40mm launcher, developed by Australian-U.S. company, Metal Storm, was: “*A flexible multi-barrel 40mm Remotely Operated Weapon System (ROWS) that delivers a scalable lethal or non-lethal response for Defence, Security and Law Enforcement operators. The system can be mounted to fixed or mobile platforms to provide mission support for operations including: Military Operations in Urban Terrain (MOUT), Reconnaissance and Border Patrols, Critical Infrastructure Protection, Crowd Control Missions.*”⁹³ [Emphasis added].

Metal Storm Inc. – the US office of Metal Storm - developed and promoted a range of lethal and “less lethal” 40mm munitions for this delivery system, which included: “*Frangible nose blunt impact chemical dispersion rounds [which] combine single target blunt impact with an area dispersion of an irritant or marker dye.*”⁹⁴ In addition “*a chemical payload round was adapted for delivering tear gas or other payloads in stacked munition Metal Storm launchers.*”⁹⁵ [Emphasis added]. According to the Metal Storm 2008 Annual Report these “*two round types were delivered [by Metal Storm Inc.] as ammunition with FireStorm for the Marine Corps Systems Command Market Research Demonstration, and all have been successfully demonstrated at other test firings through the second half of 2008.*”⁹⁶

⁸⁹ IronFist, NonLethal Technologies, undated brochure, distributed at IDEX 2013, Abu Dhabi, United Arab Emirates, 17th – 21st February 2013.

⁹⁰ IronFist, NonLethal Technologies (undated) *op.cit.*

⁹¹ IronFist, NonLethal Technologies (undated) *op.cit.*

⁹² IronFist, NonLethal Technologies (undated) *op.cit.*

⁹³ Metal Storm, Firestorm brochure, 12th November 2010, http://www.metalstorm.com/component/option,com_docman/task,doc_download/gid,68/Itemid,170/ (accessed 14th February 2013).

⁹⁴ Metal Storm, 2008 Annual Report, 9th April 2009, available from the US Securities and Exchange Commission archives at: <http://www.sec.gov/Archives/edgar/data/1119775/000095012309022347/y78238e20vf.htm> (accessed 14th February 2013), p.17.

⁹⁵ Metal Storm (2008) *op.cit.*, p.17.

⁹⁶ Metal Storm (2008) *op.cit.*, p.17. The 2008 Annual Report further stated that: *In September 2008 Metal Storm Inc. provided FireStorm™ to the U.S. Marines for test firing by their personnel under a contract with the Marine Corps Systems Command. Less-lethal chemical payload rounds and frangible nose blunt impact chemical dispersion rounds were fired during the test.* [See Metal Storm (2008) *op.cit.*, p.16].

In correspondence with BNLWRP and ORF, the Director General of the Australian Safeguards and Non-Proliferation Office stated:

*“We have been informed that Metal Storm’s Australian operations are developing core launching technologies and taser projectiles, and that the Firestorm launcher is currently under development and not yet commercially available. Metal Storm’s Australian office has confirmed that it has no involvement in the development or testing of any projectiles (including 40mm projectiles) suitable for containing or releasing chemical agents of any type.”*⁹⁷ [Emphasis added].

The Metal Storm 2009 Annual Report stated that “...*Metal Storm Inc. (MSI)* [the US office of Metal Storm] *has continued development on a range of 40mm less lethal rounds including improvements to the chemical cargo and frangible nose round designs.*”⁹⁸ Further testing by U.S. armed forces of the Firestorm system with munitions containing chemical irritant simulants took place in 2009.



Images of Firestorm demonstrations using munitions with simulant chemical payloads taken from (left) 2010 U.S. Navy promotional video and (right) 2009 Metal Storm promotional video.⁹⁹

Metal Storm reported that during 2009, a 40mm 4 barrel FireStorm system fitted to an iRobot 710 Warrrior unmanned ground vehicle was demonstrated at the Naval Air Warfare Center Weapons Division at China Lake¹⁰⁰ “*where the system was tested in a climate and terrain similar to Afghanistan.*”¹⁰¹ Scenarios included crowd control and a road clearing

⁹⁷ Correspondence from Director General, Australian Safeguards and Non-Proliferation Office, to BNLWRP and ORF, 21st November 2011. See also 27th March 2013, (copies of both letters held by author).

⁹⁸ Metal Storm, 2009 Annual Report, 20th April 2010, available at:

<http://investor.metalstorm.com.au/IRM/Company/ShowPage.aspx/PDFs/1836-33832100/2009AnnualReport> (accessed 14th February 2013), p.5.

⁹⁹ US Navy promotional video, 10th March 2010, originally available on Metal Storm website

<http://www.metalstorm.com/release/video/2010MarNAWCWDEmpireVideoh.html> (last accessed 7th October 2011).

Although removed from the Metal Storm website, it is still available on:

http://www.youtube.com/watch?v=nDXQiCJssAM&feature=player_embedded (accessed 14th February 2013); Metal Storm, Firestorm promotional video, May 2009, <http://www.metalstorm.com/release/AGM2009-2.html> (last accessed 7th October 2011). This has since been removed from the Metal Storm website.

¹⁰⁰ See Metal Storm (20th April 2010) *op.cit.*, p.9, and Metal Storm Weapons Participate in UGV Live-Fire Scenario, Metal Storm Press Release, 12th March 2010, available from: <http://uk.reuters.com/article/2010/03/12/idUS41298+12-Mar-2010+MW20100312> (accessed 14th February 2013).

¹⁰¹ Metal Storm (20th April 2010) *op.cit.*, p.9.

demonstration and the trial included “*semi-automatic and automatic fire using Less than Lethal (LTL) frangible nose projectiles*”¹⁰² which contained “*a simulated irritant.*”¹⁰³

The standard FireStorm launcher had four barrels each with a capacity to hold six rounds per barrel, allowing 24 shots before reloading. According to Metal Storm¹⁰⁴ and industry publications¹⁰⁵, the company also developed a 30 barrel version of the launcher capable of carrying “*both non-lethal and lethal ammunition in different barrels at the same time*”.¹⁰⁶

Due to financial difficulties, Metal Storm was placed in voluntary administration in July 2012.¹⁰⁷ In November 2012, *Jane’s Defence Industry* reported that it was set to be restructured.¹⁰⁸ It is assumed that relevant launcher and RCA munitions development has been suspended or terminated.

Cougar 12 and CHOU-K 56mm multiple launchers and associated munitions [France]



Images of Cougar 12 multiple launcher (left and centre) from SAE Alsetex brochure distributed at SOFEX 2012, and (right) CHOU-K launcher displayed on SAE Alsetex stand at Eurosatory 2008.

According to the French manufacturer, SAE Alsetex¹⁰⁹, the Cougar 12 is designed for “*any law enforcement and public order operations in urban and rural environments*”.¹¹⁰ It is a 12 barrelled launcher that can be used on the ground or from a vehicle. It fires 56mm calibre munitions, in single shot fire, or in a 4 or 12 grenade salvo. The launcher has an effective

¹⁰² Metal Storm (20th April 2010) *op.cit.*, p.9.

¹⁰³ Metal Storm (12th March 2010) *op.cit.*

¹⁰⁴ Metal Storm Limited, CEO Bulletin, 17th June 2011, available from:

http://web.archive.org/web/20120320154051/http://www.metalstorm.com/component/option.com_docman/task.cat_view/gid_37/dir.ASC/order.date/limit.15/limitstart.15/ (accessed 14th February 2013), p.3.

¹⁰⁵ Metal Storm launches new FireStorm FURY Weapon Systems, *Aerospace and Defence News*, 18th May 2011, http://www.asdnews.com/news/35518/Metal_Storm_launches_new_FireStorm_FURY_Weapon_Systems.htm (accessed 14th February 2013).

¹⁰⁶ Metal Storm Limited, CEO Bulletin (17th June 2011) *op.cit.*

¹⁰⁷ Metal Storm, Appointment of voluntary administrator, 26th July 2012, <http://www.metalstorm.com/IRM/Company/ShowPage.aspx/PDFs/2275-48332737/AppointmentofVoluntaryAdministrator> (accessed 14th February 2013).

¹⁰⁸ *Jane’s Defence Industry*, Australia’s Metal Storm to restructure after failing to attract bids from buyers, 28th November 2012.

¹⁰⁹ SAE Alsetex is part of Groupe Etienne LaCroix. For more information see company organisation and history sections of Groupe Etienne LaCroix website, <http://www.etienne-lacroix.com/index.php> (accessed 14th February 2013).

¹¹⁰ Law Enforcement 56mm Range, SAE Alsetex, (undated) catalogue distributed at the Special Operations Forces Exhibition and Conference (SOFEX) 7-10th May 2012, Amman, Jordan, p.26. (Copy held by author).

firing range of between 50-200 metres. The maximum rate of fire is 12 grenades launched in less than a minute, which according to the company, allows “full coverage over a wide area”.¹¹¹ The Cougar 12 appears to be similar to the CHOU-K 12 barrelled 56mm vehicle launcher, promoted by SAE Alsetex as “being tailored for law enforcement *and peacekeeping support*”.¹¹²[Emphasis added].

According to the manufacturers, the CHOU-K can fire “all types of riot control grenades equipped with 50,100, 200m DPR [delayed fuse propellants]”¹¹³, whilst the Cougar 12 can utilise the full range of SAE Alsetex 56mm grenades.¹¹⁴ Consequently, both launchers could potentially employ the Alsetex CM 10 Tear Gas Grenade which comprises 10 CS capsules containing a total of 140g 10% CS tear gas smoke mixture and has a coverage area of approximately 1,300 m² to a height of 3 to 5 metres.¹¹⁵ A 12 grenade salvo of such munitions from either the Cougar 12 or CHOU-K 12 launchers would potentially result in high levels of CS tear gas smoke mixture being dispersed over a wide area.

64mm tear gas munition and launcher [China]



Images of the vehicle mounted 64mm anti-riot launcher mounted (above left and centre), and (above right) the 64mm tear gas munition taken from marketing material by China Ordnance Equipment Research Institute.

China Ordnance Equipment Research Institute (No.208 Research Institute of China Ordnance Industries) has promoted a 64mm six barrel launch system¹¹⁶ which has been developed in three versions suitable for use on vehicles, marine vessels or in a man-portable variant. The land based versions are intended for the dispersal of “large-scale illegal grouping, riot mass,

¹¹¹ SAE Alsetex, Law Enforcement 56mm Range, (undated) catalogue, *op.cit.*, p.26.

¹¹² The CHOU-K multiple launcher and an associated information poster were displayed on the SAE Alsetex stand at Eurosatory 2008, Paris, 16th - 20th June 2008. See also Lacroix Defence & Security Catalogue, p.14, catalogue distributed at Milipol 2011, Paris 18th – 21st October 2011.

¹¹³ The CHOU-K multiple launcher and an associated information poster were displayed on the SAE Alsetex stand at Eurosatory 2008, Paris, 16th - 20th June 2008. See also Lacroix Defence & Security Catalogue, p.14, catalogue distributed at Milipol 2011, Paris 18th – 21st October 2011.

¹¹⁴ SAE Alsetex, Law Enforcement 56mm Range, (undated) catalogue, *op.cit.*, p.26.

¹¹⁵ SAE Alsetex, Law Enforcement 56mm Range, (undated) catalogue, *op.cit.*, p.26.

¹¹⁶ Information taken from a China Ordnance Equipment Research Institute, undated catalogue, distributed at China (Beijing) International Exhibition and Symposium on Police and Anti-Terrorism Technology and Equipment (CIPATE 2011) [Information is from an unofficial translation of the Chinese original on file with the author].

who are not easy to reach by the police from long-distance.”¹¹⁷ The system can fire six munitions singly or continuously, and has an effective range of between 200 and 350 metres. The delivery system is designed to utilise the 64mm tear gas munition also promoted by China Ordnance Equipment Research Institute. This munition comprises four sub-munitions carrying CS which explode in the air above the target group. This munition weighs 500 grammes and has an effective area coverage of 600 m².¹¹⁸

2.4. Automatic Grenade launchers

Certain automatic grenade launchers can utilise a range of “less lethal” rounds including RCA munitions. Given their high rate of fire, they are potentially capable of blanketing wide areas, cumulatively delivering significant amounts of RCAs and potentially affecting large numbers of people.

30mm grenade round and launcher [Russian Federation]

According to the 2009 English language version of the 2006 “*Ordnance and munitions*” volume of “*Russia’s Arms and Technologies*,”¹¹⁹ a Russian company developed a 30-mm grenade round filled with irritant action pyrotechnic composition designed for the AGS-17 automatic grenade launcher. The 30mm munition weighs 350 grammes, and when employed in the AGS-17 has a maximum firing range of 1,700 metres and a maximum rate of fire of between 350-400 rounds per minute. It can be used to “temporarily incapacitate armed lawbreakers on the open or rough terrain and those hiding in buildings, various structures and vehicles.” Furthermore, “[i]t can also be used to harass armed offenders”.¹²⁰



Images of the 30mm chemical irritant grenade (left) designed for AGS-17 automatic grenade launcher (centre and right). All images from www.arsenalrus.com

¹¹⁷ China Ordnance Equipment Research Institute, undated catalogue, *op.cit.*

¹¹⁸ China Ordnance Equipment Research Institute, undated catalogue, *op.cit.*

¹¹⁹ Non-lethal munitions section, *Volume 12 “Ordnance and Munitions” (English language version)*, “*Russia’s Arms and Technologies. The XXI Century Encyclopedia*”, version 2006.1eng, Arms and Technologies Publishing House, 5th May 2009, (copy held by the author).

¹²⁰ Arms and Technologies Publishing House (2009) *op.cit.*

ZLZ94 35mm grenade launcher and munitions [China]

According to the Chinese company, Zhejiang XianFeng Machinery Co. Ltd, the ZLZ94 vehicular grenade launcher is a riot control weapon which fires 35mm ammunition and can be used to disperse a “troublous [sic] and disorderly crowd.”¹²¹ The ZLZ94 can be utilised in either single fire or automatic fire modes. According to Zhejiang Xian-Feng Machinery Co. Ltd, the launcher “is capable of firing low-propulsion ammunitions continuously.”¹²² The ammunition is fed by a link feed with 25 rounds available per cartridge box. The ZLZ94 has a maximum theoretical rate of fire of 58 rounds per minute and an effective range of between 100-200 metres. The company has also stated that: “The design was finalized in 1994. Now it comes into service in People’s Army Garrison Troops in Hong Kong and Macao.”¹²³

Zhejiang Xian-Feng Machinery Co. Ltd has not described the types of 35mm ammunition that could be utilised in the ZLZ94, in any publicly available documents. However in 2012 a second Chinese company, Hubei Handan Mechatronics, Co. Ltd. promoted the FKB09 35mm 601 tear gas grenade and the FKB10 35mm tear gas grenade which they have stated can both be fired from a number of launchers including the “Type ZLZ94 35mm vehicular automatic anti-riot grenade launcher.”¹²⁴ Both munitions weigh approximately 145 grammes and have a maximum range of greater than 300 metres. The effective coverage area of the FKB09 is 300 m² and that of the FKB10 is 250 m².¹²⁵



Image of ZLZ94 grenade launcher and munitions, originally downloaded from Zhejiang Xian-Feng Machinery Co. Ltd website (left). Images of the FKB09 and the FKB10 tear gas grenades from Hubei Handan Mechatronics Co., Ltd. brochure (below).



¹²¹ ZLZ94 35mm Vehicular Grenade Launcher, Zhejiang XianFeng Machinery Co. Ltd, undated, <http://www.xian-feng.net/en/p1a.htm> (Last accessed and copy saved by author on 9th December 2010. This information has subsequently been removed from the manufacturer’s website).

¹²² ZLZ94 35mm Vehicular Grenade Launcher, Zhejiang XianFeng Machinery Co. Ltd (undated) *op.cit.*

¹²³ ZLZ94 35mm Vehicular Grenade Launcher, Zhejiang XianFeng Machinery Co. Ltd (undated) *op.cit.*

¹²⁴ Hubei Handan Mechatronics Co., Ltd. brochure, undated, distributed at Asia Pacific China Police 2012, Beijing, China, 22nd – 25th May 2012 (copy held by author).

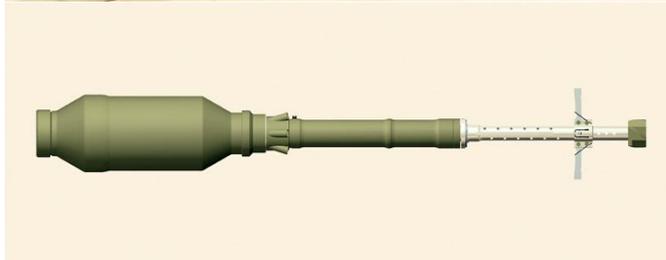
¹²⁵ Hubei Handan Mechatronics Co., Ltd. (undated) *op.cit.*

2.5. Rocket Propelled Grenades (RPG)

105mm munitions for RPG grenade launchers [Russian Federation]

According to the 2009 English language version of the 2006 “*Ordnance and munitions*” volume of “*Russia’s Arms and Technologies*,”¹²⁶ a Russian company developed an RPG-7 grenade launcher round with warhead filled with irritant-action pyrotechnic composition. The round is available in two models: one piece and clustered. It was developed from the standard round fired by the RPG-7 grenade launcher. This 105mm calibre munition weighs 4.3kg and has an effective range of between 400-600 metres. A variant obstacle-penetrating 105mm grenade filled with irritant-action pyrotechnic composition was also developed. It can be used to “*suppress and temporarily incapacitate armed lawbreakers located in light field shelters, bunkers and city buildings... [and] to harass... armed offenders and as an antitank weapon.*”

¹²⁷ [Emphasis added].



Images of RPG-7 grenade launcher and chemical irritant rounds. All images from www.arsenalrus.com.

2.6. Mortars and associated munitions

A range of mortar munitions have been developed either specifically designed to carry RCAs or else capable of carrying a variety of potential “less lethal” payloads. Such munitions can deliver significant quantities of RCA over wide areas and/or extended ranges, potentially affecting large numbers of people. They vary in terms of their calibre, weight, design, material construction, potential payloads, area coverage and range, as well as the purposes for which they have been promoted.

¹²⁶ Arms and Technologies Publishing House (2009) *op.cit.*

¹²⁷ Arms and Technologies Publishing House (2009) *op.cit.*

QLT89 50mm silent mortar



Images of QLT89 50mm silent mortar taken from a 2010 China R&D Academy of Machinery presentation.

China developed a “jet shot” grenade launcher/mortar in the early 1990s which it designated as the QLT89.¹²⁸ The launcher/mortar and related ammunition family are currently promoted by the State owned China North Industries Corp (NORINCO).¹²⁹ The launcher/mortar can be used to fire a range of 50mm munitions including HE/fragmentation, illuminating, smoke/incendiary and tear gas bombs. The tear gas bomb contains 125 grams of agent and covers an area of 300 m². Although the maximum range of the tear gas munition is unknown, the launcher/mortar has an effective range between 200-800 metres depending on the munition used.¹³⁰

Although the range of military, security or police forces that currently possess and employ the tear gas munition are not known, the QLT89 mortar appears to be intended for use by the Chinese military. According to the China R&D Academy of Machinery, the QLT89 is designed to be a type of “close range small arms [that is] portable by [a] single soldier”. It provides indirect fire and is intended for use at the “company or platoon unit” level.¹³¹ It has been designed to fire without any noise, smoke or flash¹³² and thus has potential military utility by concealing the firer’s location from enemy forces.

¹²⁸ Grenade Launchers in China (Upper) Yang, J., Li, X., Yang, B., Ren, Y. and Wang, J. China R&D Academy of Machinery, 19th May 2010, presentation given at the National Defense Industrial Association (NDIA)’s *Joint Armaments Conference, Exhibition & Firing Demonstration, “21st Century Weapon Systems – Providing the Right Response”*, Dallas, 17th – 20th May 2010 <http://www.dtic.mil/ndia/2010armament/WednesdayLandmarkBJuanjuanYang.pdf> (accessed 14th March 2013).

¹²⁹ Janes Ammunition handbook, 2010-2011 (2010) *op.cit.*, p.459.

¹³⁰ Janes Ammunition handbook, 2010-2011 (2010) *op.cit.*, p.459.

¹³¹ Yang, J. et al (2010) *op.cit.*

¹³² Janes Ammunition handbook, 2010-2011 (2010) *op.cit.*, p.459. [For a description of the very similar (if not identical) Jerboa 50mm silent grenade launcher, see: *Janes infantry Weapons 2009-2010*, IHS. Jane’s, Coulsdon, United Kingdom, 2009, p.526.]

51mm tear smoke bomb [India]



Image of 51mm smoke bomb and mortar downloaded from Tear Smoke Unit website in 2005.

Product information, originally downloaded from the website of the Indian Border Security Force Tear Smoke Unit (TSU) in 2005, promoted a 51mm tear smoke bomb. This munition was developed by the TSU: “*With a view to flush out miscreants hiding in jungles, dense undergrowth, elephant grass and broken ground from a distance...*”¹³³ The munition could be “*fired [from] up to 800 meters using the 51 mm mortar and emits tear gas for a period of 3 - 4 minutes in the target area.*”¹³⁴ [Emphasis added]. All information about this munition has subsequently been removed from the TSU website, and no further promotional literature has been made public by the company.

According to a 2005 report by Feakin, as well as supplying “*all of India’s police with tear gas munitions*” the TSU “*also supply all of the paramilitary forces with tear gas munitions and are beginning to supply the army who are showing a particular interest in mortar-fired projectiles.*”¹³⁵ There is no information publicly available regarding which, if any, police, security or military forces previously possessed or currently possess the 51mm smoke bomb. In correspondence dated 2nd April 2013, the Indian Government stated that “*In our view, the items/activities pertaining to India listed in the [BNLWRP/ORF] report are not in contravention of the Chemical Weapons Convention. In any event, the munitions listed have mainly formed part of capability demonstration by Indian security agencies.*”¹³⁶

¹³³ Tear smoke unit, 51mm tear smoke bomb, <http://tearsmoke.org/munition/so8.htm> (accessed 1st September 2005). Although this information was subsequently removed from the TSU website, it is still available on:

<http://web.archive.org/web/20041112194929/http://www.tearsmoke.org/munition/so8.htm> (accessed 14th February 2013).

¹³⁴ *Ibid.*

¹³⁵ Feakin, T. Non-lethal weapons: technology for lowering casualties? 2005, Phd Thesis, University of Bradford, p.282.

¹³⁶ Correspondence from Menon, S. First Secretary (Pol & OPCW), Embassy of India, to BNLWRP and ORF, 2nd April 2013. Copy held by author.

81mm “non-lethal” mortar carrier projectile [United States]



Image of prototype 81mm “non-lethal” mortar carrier projectile, taken from presentation by Hegarty, R. 2003

According to information previously released by the U.S. Government, the Joint Non-Lethal Weapons Directorate (JNLWD) began funding a project in 1999, managed by the U.S. Army’s Armament Research, Development and Engineering Center (ARDEC), to develop a delivery system incorporating an 81mm “non-lethal” mortar munition (NLMM). Work was reportedly carried out by the Army Research Laboratory (ARL), United Defense, and the Army’s Edgewood Chemical Biological Center (ECBC).¹³⁷ The project’s goal was the development of a delivery system utilising a mortar munition that could deliver a solid, liquid, aerosol or powder payload from 200 metres up to 2.5 kilometres from the target with a casing that would not cause injury through kinetic impact on the target person(s)¹³⁸ and that had an effective area of coverage greater than 25 m².¹³⁹ The munition was based upon the M853A1 81mm illumination mortar and was intended to be fired from the existing 81mm M252 mortar system.¹⁴⁰ Potential payloads included: pyrotechnic sub-munitions (e.g. tear gas), malodorants and a liquid dispenser.¹⁴¹ According to information provided by the developers in April 2005, the munition underwent ballistic firings in which it “*successfully deployed payload*” and also achieved a range of greater than 2.5 kilometres.¹⁴² No significant additional information has since been made public about the project.¹⁴³

¹³⁷ For further discussion see: Davison, N. *Off the rocker and on the floor*, Bradford Science and Technology Report, number 8, Bradford Disarmament Research Centre, August 2007, p.32. For relevant U.S. Government documents see for example: US Army, Joint Non-Lethal Weapons Directorate 1QFY01 Director’s Reviews. Joint RDT&E Pre-Milestone 0 & Concept Exploration Program: 81mm Non-Lethal Mortar, 20th November 2000. Picatinny Arsenal, NJ: US Army TACOM/ARDEC-PSAC Center, <http://www.sunshine-project.org/incapacitants/jnlwdpdf/jnlwdmort.pdf> (accessed 14th February 2013); Hegarty, R., Joint Non-Lethal Weapons Program: Non-Lethal Mortar Cartridge (NLMC), US Army Picatinny Arsenal, October 2003, <http://www.sunshine-project.org/incapacitants/jnlwdpdf/usamort03.pdf> (accessed 14th February 2013).

¹³⁸ Evangelisti, M. Delivery of Non-Lethal Mortar Payloads by Mortar Systems, Joint RDT&E Pre-Milestone A Program. Presentation to the 2002 International Infantry & Joint Services Small Arms Systems Section Symposium, National Defense Industrial Association (NDIA), US, 13th -16th May 2002. As cited by Davison, N. (2007) *op.cit.*, p.32.

¹³⁹ Hegarty, R.,(2003) *op.cit.*

¹⁴⁰ Han, S., Ponikowski, A. and Trohanowsky, R. The 81mm non-lethal mortar carrier projectile, US Army RDECOM-ARDEC, 40th Annual Armament Systems, 28th April 2005, www.dtic.mil/ndia/2005garm/thursday/han.pdf (accessed 14th February 2013), p.7 & p.16.

¹⁴¹ Lyon, D., Johnson, R. and Domanico, J. Design and Development of an 81mm Non-Lethal Mortar Cartridge. Presentation to Non-Lethal Defense IV, National Defense Industrial Association (NDIA), US, 20th - 22nd March 2000, www.sunshine-project.org/incapacitants/jnlwdpdf/udlpmort.pdf (accessed 14th February 2013), p.17.

¹⁴² Han, S., Ponikowski, A. and Trohanowsky, R. (2005) *op.cit.*, p.16.

¹⁴³ See Pearson, A. Late and post-Cold War research and development of incapacitating biochemical weapons, in: Pearson, A., Chevrier, M. and Wheelis, M. (eds) (2007) *op.cit.*, p.82; Davison, N. (2007) *op.cit.*, p.32.

PP87 82mm mortar projectile [China]

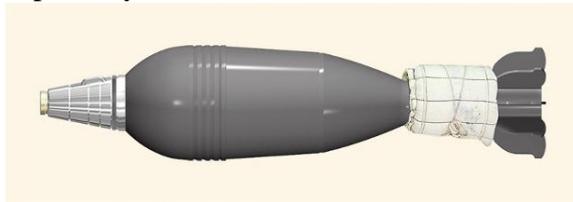


Image of 82mm tear gas mortar munition, taken from brochure distributed by China Ordnance Industry Group, State-owned No. 672 Factory in 2011.

China Ordnance Industry Group, State-owned No. 672 Factory, has manufactured the PP87 82mm tear gas mortar munition, which they state is intended for police use in large scale *ad-hoc* events. According to the company brochure, the 82mm mortar munition, which is composed of plastic, weighs 1.3kg, has a range of between 250-350 metres and has an effective area of coverage of more than 2,000 m².¹⁴⁴ The munition has been promoted at a number of arms and security equipment exhibitions including the 2011 China (Beijing) International Exhibition and Symposium on Police and Anti-Terrorism Technology and Equipment (CIPATE 2011).

82mm mortar projectile [Russian Federation]

According to information contained in the 2009 English language version of the 2006 “*Ordnance and munitions*” volume of “*Russia’s Arms and Technologies, the 21st Century Encyclopedia*”¹⁴⁵ a Russian company developed a 82-mm mortar shell filled with irritant-action pyrotechnic composition for the Model 1937 and 2B14-1 mortars and the 2B9 automatic mortar. The mortar shell weighs 3.5kg and has a maximum firing range of 2,670 metres. The round is available in two models: one piece and clustered. It has been developed from the 82mm standard mortar round using the S-8232S illumination shell.¹⁴⁶ No further information concerning the manufacture, stockpiles and utilisation of the 82mm mortar round is publicly available.



Images of 82mm chemical irritant mortar shell (left), 2B9 automatic mortar (below left) and 2B14 mortar (below right). All images are from: www.arsenalrus.com.



¹⁴⁴ PP87 82mm tear gas mortar munition, China Ordnance Industry Group, State-owned No. 672 Factory, undated brochure, distributed at China (Beijing) International Exhibition and Symposium on Police and Anti Terrorism Technology and Equipment (CIPATE 2011) [Information is from an unofficial translation of the Chinese original held by author].

¹⁴⁵ Arms and Technologies Publishing House (2009) *op.cit.*

¹⁴⁶ Arms and Technologies Publishing House (2009) *op.cit.*

60mm, 81/82mm and 120mm cargo mortar munition [Serbia]

According to Yugoimport-SDPR's promotional materials, the Serbian company developed a range of "Second generation mortar shells...using modern technical and technological solutions" which included a number of mortar munitions containing riot control agents.¹⁴⁷ A marketing brochure produced by the company and distributed during 2005 (entitled *Mortars and Mortar Shells*)¹⁴⁸ included information on 60mm, 81/82mm and 120mm M93 cargo mortar shell families.

According to the Yugoimport-SDPR brochure, each M93 cargo mortar shell family:

"...consists of one standard cargo shell and three types of submunition:

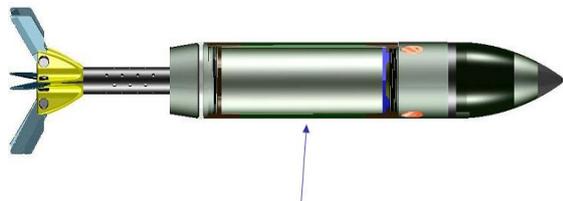
-HC-smoke composition-based submunition,

-CS-composition – disabling effect submunition,

Incendiary effect submunition."¹⁴⁹ [Emphasis added].

No further information is publicly available regarding the amount or concentration of the CS-composition held in each munition. Similarly no details are available regarding the weight, area coverage or maximum range of these munitions; nor concerning their manufacture, stockpiling, transfer or utilisation.

XM984 120mm mortar munition [United States]



Payload Section capable of carrying 50+ Non-Lethal Submunitions

Image of the XM984 cargo munition from presentation given at Picatinny/PEO Mortars Conference, Morristown, New Jersey, 1st-3rd October 2003.

In 2003, work was reportedly initiated in the U.S. on a 120mm mortar cartridge design based on the XM984 munition which was in development for use in the Future Combat System Non Line-of-Sight (NLOS) Mortar.¹⁵⁰ The XM984 was designed to deliver up to 54 M80 DPICM (Dual-Purpose Improved Conventional Munition) grenades and would cover distances of 10-12 kilometres.¹⁵¹ The XM984 reportedly "accommodates a wide variety of payloads, [which] include unitary, smoke, illumination, SFM [sensor fuzed munition], thermobaric, mines and non-lethal."¹⁵² No further information regarding the nature of the "non-lethal" payload or status of the XM984 development programme has subsequently been made public.

¹⁴⁷ Yugoimport-SDPR, *Mortars and Mortar Shells*, undated catalogue, distributed at Latin America Aero and Defence (LAAD) 2005, 26th – 29th April 2005, Rio de Janeiro, Brazil, (copy held by author), p.8.

¹⁴⁸ Yugoimport-SDPR, *Mortars and Mortar Shells* (undated) *op.cit.*

¹⁴⁹ Yugoimport-SDPR, *Mortars and Mortar Shells* (undated) *op.cit.*, pp.9-11.

¹⁵⁰ Hegarty, R. Joint Non-Lethal Weapons Program: Non-Lethal Mortar Cartridge (NLMC) (Power-point presentation to 2003 Picatinny Chapter/PEO Mortars Conference, Morristown, NJ, 1st-3rd October 2003) as cited in Pearson, A. (2007) *op.cit.*, p.82. Powerpoint available on <http://proceedings.ndia.org/C347/Hegarty.pdf> (accessed 14th February 2013).

¹⁵¹ Pascua, D. XM984 120mm Mortar Cartridge Extended Range DPICM, US Army TACOM-ARDEC, 2002 International Infantry & Small Arms Symposium, Exhibition & Firing Demonstration, 14th May 2002, available on <http://www.docstoc.com/docs/53446005/XM984-120mm-Mortar-Cartridge-Extended-Range-DPICM> (accessed 14th February 2013). See pp.2-4.

¹⁵² Pascua, D. (2002) *op.cit.* p.3.

120mm mortar projectile [Russian Federation]



Images of 120mm chemical irritant mortar shell (top left), 120mm self-propelled gun (bottom left) and 120mm mortar (bottom right). All images from www.arsenalrus.com



According to the 2009 English language version of the 2006 “*Ordnance and munitions*” volume of “*Russia’s Arms and Technologies*, a Russian company developed a 120-mm mortar shell filled with irritant-action pyrotechnic composition for Model 1938 and 2B11 mortars, and for 2S9, 2S23 and 2B16 artillery pieces. The mortar shell weighs 16 kilograms and has a maximum range of fire of 5.2 kilometres (from 1938 model mortar), 6.8 kilometres (from 2b11 mortar) and 6.6 kilometres (from 2B16, 2S9 and 2S23 guns).¹⁵³ No further information concerning the manufacture, stockpiles and utilisation of the 120 mm mortar projectile has been made publicly available.

120mm CS MKE MOD 251 mortar round [Turkey]

In November 2003, *Jane’s Defence Weekly* reported that the Turkish (State-Owned) arms manufacturer, Makina ve Kimya Endustrisi Kurumu (MKEK) had developed a 120 mm mortar round - the CS MKE MOD 251 - filled with CS.¹⁵⁴ The CS MKE MOD 251 mortar round weighed 17.34 kg and had a maximum range of 8,132 metres.¹⁵⁵ It was promoted by MKEK on their website¹⁵⁶ and at international security exhibitions including: the 7th International Defense Industry Fair (IDEF) held in Ankara, Turkey in September 2005¹⁵⁷; and at the Africa Aerospace and Defence (AAD) exhibition held in Cape Town, South Africa in September 2010.¹⁵⁸ Two additional Turkish companies – Furkan Defense Industry and

¹⁵³ Arms and Technologies Publishing House (2009) *op.cit.*

¹⁵⁴ Foss, C. Turkey details 120mm Automatic Mortar, *Janes Defence Weekly*, 12th November 2003.

¹⁵⁵ Turkish Defence Industry Catalogue, 2007, <http://www2.ssm.gov.tr/katalog2007/data/24509/9/uruning/uruning34.html> (accessed 30th September 2010).

¹⁵⁶ MKEK was promoting the CS mortar round till at least mid-November 2009 on its website, see <http://mkekexport.com/ammunition.htm> (accessed 16th November 2009).

¹⁵⁷ The 7th International Defense Industry Fair was held by The Turkish Armed Forces Foundation under the auspices of the Turkish Ministry of Defense at the Ankara Hippodrome between 27th - 30th September 2005. Over 400 companies from 49 countries exhibited their goods and services at IDEF, of which 108 were from Turkey.

¹⁵⁸ AAD 2010 was held at Air Force Base Ysterplaat, Cape Town, South Africa from 21st to 25th September 2010. For further information see AAD 2010 website, <http://www.aadexpo.co.za/> (accessed 28th September 2010).

ASCIM Defense Industry – also promoted these munitions on their websites, but subsequently removed such information.¹⁵⁹



Images of MKEK Tactical CS 120 mm mortar round, photographed on display at AAD 2010, in Cape Town, South Africa, 21st-25th September 2010 (Photo: © Robin Ballantyne/Omega Research Foundation).

In February 2011, in correspondence with BNLWRP, ORF and the Institute for Security Studies (ISS), the Turkish OPCW Ambassador stated that 1,000 CS MKE MOD 251 munitions had been produced in 1996, prior to Turkey's ratification of the Convention and that "around 150 of the said ammunitions were used for testing purposes during the initial R&D phase in 1997".¹⁶⁰ In July 2011 correspondence, the Turkish Counsellor to the OPCW stated that "At the time of ratification, there remained 850 pieces of CS MKE MOD 251 type munitions in the inventory of the Turkish Armed Forces. The facility for their production was discontinued after 1997."¹⁶¹

The Turkish OPCW Ambassador explained that: "The remaining 850 [munitions], whose dates of expiry have passed, are stored at the Turkish Armed Forces ammunition destruction facility awaiting disposal."¹⁶² Subsequently in his July 2011 correspondence, the Turkish Counsellor reported that: "The destruction of CS containing canisters of the remaining CS MKE MOD 251 munitions has now been completed at our state-of-the-art munitions disposal facility located near Ankara."¹⁶³

In correspondence, dated 29th March 2013, the Turkish Ambassador confirmed Turkey's wide-ranging actions to halt trade of such munitions:

¹⁵⁹ Furkan Defense Industry http://www.furkandefense.com/product_info.php?products_id=147 (last accessed 24th November 2010); ASCIM Defense Industry

http://www.ascim.com.tr/default.asp?inc=urun_detay&b=b&urun_id=78&Urun_kat=180 (Last accessed 1st March 2011).

¹⁶⁰ Correspondence from Ambassador Dogan, Permanent Representative of Turkey to the OPCW, to BNLWRP, ORF and ISS, 25th February 2011 (copy on file with author).

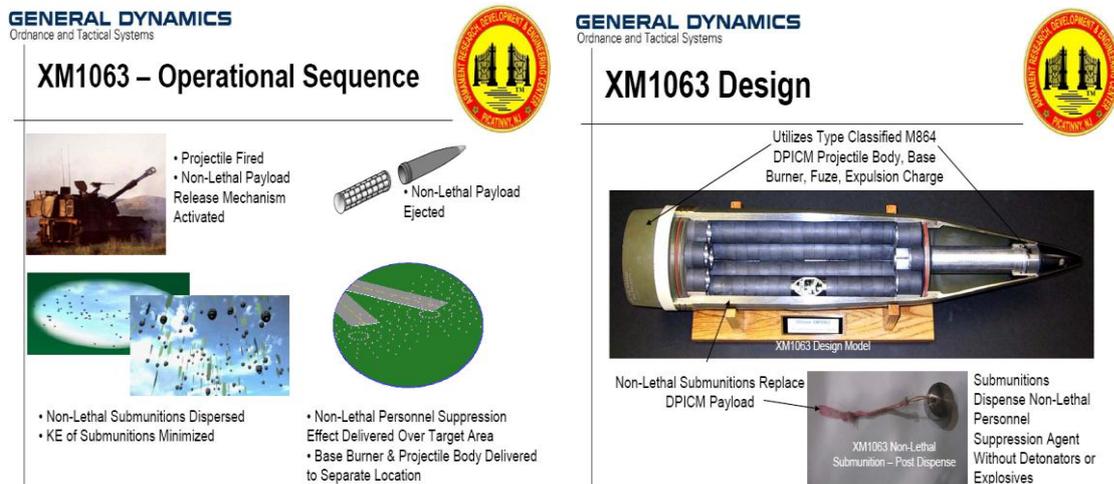
¹⁶¹ Correspondence from Mr Utkan, Counsellor, Permanent Representation of Turkey to the OPCW, to BNLWRP, ORF and ISS, 8th July 2011 (copy on file with author).

¹⁶² Ambassador Dogan (25th February 2011) *op.cit.*

¹⁶³ Counsellor Utkan (8th July 2011) *op.cit.*

“Turkey has implemented a series of measures ranging from completion of destruction of its remaining [large calibre] RCA munitions to destroying all promotional materials and conducting outreach to brokers and intermediaries to inform them that promoting or trading in such items is not permissible under Turkey's CWC obligations.”¹⁶⁴

2.7. Large calibre aerial munitions XM1063 155mm projectile [United States]



Images of the XM 1063 operational sequence and design taken from presentations given by General Dynamics personnel at National Defense Industrial Association Conferences in 2006 (above left) and 2007 (above right).

According to information previously released by the U.S. Government, General Dynamics Ordnance and Tactical Systems worked under the direction of the U.S. Army’s Armament Research, Development and Engineering Center (ARDEC) to develop a 155mm artillery projectile called the XM1063.¹⁶⁵ According to General Dynamics, the XM1063 (also called the Non-Lethal Personnel Suppression Projectile) was designed to carry out three interrelated functions, to: “*separate combatants from non-combatants; suppress, disperse or engage personnel [and] deny personnel access to, use of, or movement through a particular area, point or facility.*”¹⁶⁶ The munition was intended to “*Address...[the] need for Non-Lethal Options that is highlighted by current conflicts in Iraq and Afghanistan...[the munition would] minimize...collateral damage, fatalities and permanent injury.*”¹⁶⁷

¹⁶⁴ Correspondence from Ambassador Dogan, Permanent Representative of Turkey to the OPCW, to BNLWRP and ORF, 29th March 2013. (Copy held by author). See also: Ambassador Dogan (25th February 2011) *op.cit.*; Counsellor Utkan (8th July 2011) *op.cit.*

¹⁶⁵ US Army, Picatinny Centre, Non-Lethal Artillery Structural Firing (FY04) Purchase Order Contract in Support of the FY04 155mm Non-Lethal Artillery Projectile Program, Contract Number W15QKN-04-M-0328, 14th September 2004, www.sunshine-project.org/incapacitants/jnlwdpdf/XM1063.pdf (accessed 14th February 2013).

¹⁶⁶ McCormick, J., Presentation on 155mm XM1063 Non-Lethal Personnel Suppression Projectile, General Dynamics OTS, National Defense Industrial Association, 42nd Annual Armament Systems: Gun and Missile Systems Conference and Exhibition, 23rd-26th April 2007, Charlotte, North Carolina, USA,

http://www.dtic.mil/ndia/2007gun_missile/GMTuePM2/McCormickPresentation.pdf, (accessed 14th February 2013), p.4.

¹⁶⁷ McCormick, J. (2007) *op.cit.* p.4.

The XM1063 was based upon the M864 artillery projectile¹⁶⁸, and was intended to have a range of at least 20 kilometres, and potentially up to 28 kilometres.¹⁶⁹ The multiple sub-munitions would be released above the target area and then fall to the ground and disperse their payloads.¹⁷⁰ Estimates of the area covered vary between a minimum of 5,000 square metres¹⁷¹ to a reported maximum of 10,000 square metres.¹⁷² Only limited details of the proposed payload have been made public but the available documentation described it as a “liquid payload”¹⁷³ and a “non-lethal personnel suppression agent.”¹⁷⁴ Payload agent effectiveness was apparently tested at Army Edgewood Chemical Biological Center,¹⁷⁵ indicating a chemical agent. Furthermore a JNLWRD reference book on “non-lethal” weapons, published in 2011, included a reference to a legal review conducted in 2007 of the “XM1063 Malodorant 155mm Artillery Round”,¹⁷⁶ that indicated that such malodorant agents were considered for this munition.

According to a July 2008 article in the U.K. newspaper, *The Guardian*, testing of the XM1063 was completed successfully in 2007 and it was due for low-rate production from 2009.¹⁷⁷ According to *The Guardian*, ARDEC stated “that the production decision is on hold awaiting further direction from the program manager.”¹⁷⁸ Information currently available from the General Dynamics website stated that “XM-1063 Non-Lethal Artillery has achieved TRL Level 6.1 through gun test firings as payload in 155mm M483 rounds” and was “Prepared for Milestone B decision.”¹⁷⁹ In his June 2012 *New Scientist* article, Hambling noted that although “the project is on hold, [it] has been developed by General Dynamics...to the stage of test firings and could be reactivated.”¹⁸⁰ No further information regarding the current status of the XM1063 research and development programme has been made public by the U.S. Government.

¹⁶⁸ For information on the M864 projectile see: [Globalsecurity.org, M864 Base Burn DPICM, http://www.globalsecurity.org/military/systems/munitions/m864.htm](http://www.globalsecurity.org/military/systems/munitions/m864.htm) (accessed 14th February 2013).

¹⁶⁹ McCormick, J., 155mm XM1063 Non-Lethal Personnel Suppression Projectile. Presentation to the 41st Annual Armament Systems: Guns and Missile Systems, Conference & Exhibition, National Defense Industrial Association (NDIA), Sacramento, US, 27th -30th March 2006, <http://www.dtic.mil/ndia/2006garm/tuesday/mccormick.pdf>, (accessed 14th February 2011) .p.12.

¹⁷⁰ McCormick, J. (2006) *op.cit.*

¹⁷¹ NLOS-C Non-Lethal Personnel Suppression, US Army ARDEC brochure, 2005, as cited in Davison, N. (2007) *op.cit.*, p.34.

¹⁷² Hambling, D., *The Guardian*, US weapons research is raising a stink, 10th July 2008, <http://www.guardian.co.uk/science/2008/jul/10/weaponstechnology.research> (accessed 14th February 2013).

¹⁷³ US Army ARDEC, Solicitation, R -- 155mm XM1063 Non-lethal Artillery Engineering Support Contract, Solicitation number: W15QKN-04-X-0819, 30th September 2004, <http://www.fbo.gov/contracts/2004/Oct-2004/FBO-00687159.htm> (accessed 14th February 2013).

¹⁷⁴ McCormick, J. (2006) *op.cit.*p.7.

¹⁷⁵ US Army ARDEC (2004) Solicitation (Modification) R -155mm XM1063 Non-lethal Artillery Engineering Support Contract (Ref: W15QKN-04-X-0819). *FBO Daily*, 30th September 2004, as cited in Davison, N. (2007) *op.cit.*, p.34.

¹⁷⁶ Joint Non-Lethal Weapons Directorate, Non-Lethal Weapons (NLW) Reference Book, 30th June 2011, copy of report available at <http://publicintelligence.net/dod-non-lethal-weapons-2011/> (accessed 14th February 2013), p.viii.

¹⁷⁷ Hambling, D. (2008) *op.cit.*

¹⁷⁸ Hambling, D. (2008) *op.cit.*

¹⁷⁹ General Dynamics website, http://www.gd-ots.com/agent_dispersing.html (accessed 14th February 2013).

¹⁸⁰ Hambling, D. US military malodorant missiles kick up a stink, *New Scientist*, issue 2867, 4th June 2012, <http://www.newscientist.com/article/mg21428676.800-us-military-malodorant-missiles-kick-up-a-stink.html> (accessed 14th February 2013).

200mm cargo projectile [Italy]

In 2003, a research and development programme was initiated by OTO Melara S.p.A, supported and funded by the Italian Ministry of Defence, to develop a prototype 200mm cargo projectile that was able to carry a generic payload of about 3kg over a distance of approximately 300 metres. The projectile was also required to be capable of “*low cruise speed, high precision [and] high environmental compatibility.*”¹⁸¹ A 2005 paper presented by a member of the munition development team, at the 3rd European symposium on non-lethal weapons, described the intended functions of this cargo projectile: “*...the system performs the function of carrying a non-lethal payload extremely useful for military (but also civil) operations (i.e. sensors, tear-gases, machineries able to switch off piston-engines), ensuring, in the meanwhile, some requirements to be satisfied, necessary in many military applications: accuracy, short deployment and employment times, stealthiness.*”¹⁸² [Emphasis added].

The paper stated that “*an analysis of probable operational scenarios*” allowed the identification of “*typical target missions*” which included “*Tear gases release in a[n] open place with high people density.*”¹⁸³ In 2007, a further paper detailing the continuing project development was presented to the 4th European symposium on non-lethal weapons.¹⁸⁴ No further information regarding the current status of the research and development programme has been made public.

2.8. Other aerial delivery munitions

Heliborne KMGV-type dispenser of RCA munitions [Russian Federation]

According to the 2009 English language version of the 2006 “*Ordnance and munitions*” volume of “*Russia’s Arms and Technologies*,”¹⁸⁵ a Russian company developed a heliborne KMGV-type dispenser of packages of sub-munitions filled with irritant-action pyrotechnic composition. The publication stated that: “*These submunition packages are dispensed singly or all together from helicopters Mi-8MT and Mi-24 (four KMGV dispensers on external hardpoints) at an altitude of 50 to 300m at a flying speed of 150 to 300 km/h. They can also be dropped in the helicopter hovering mode.*”¹⁸⁶ No further information concerning the manufacture, stockpiles and utilisation of the heliborne dispenser is currently publicly available.

¹⁸¹ Panesi, R. High environmental compatibility cargo projectile, *Proceedings of 3rd European symposium on non-lethal weapons, Ettlingen, Germany, 10-12th May 2005*, Fraunhofer Institut Chemische Technologie, Ettlingen, Section V5, pp.1-14. Varone, F. Lunadei, A., Steardo, P. and Gastaldi, A., High environmental compatibility cargo projectile: project development and experimental tests, *Proceedings of 4th European symposium on non-lethal weapons, Ettlingen, Germany, 21st -23rd May 2007*, Fraunhofer Institut Chemische Technologie, Ettlingen, Section V40, pp.1-10.

¹⁸² Panesi, R. (2005) *op.cit.*, p.1.

¹⁸³ Panesi, R. (2005) *op.cit.*, p.1.

¹⁸⁴ Varone, F. Lunadei, A., Steardo, P. and Gastaldi, A., High environmental compatibility cargo projectile: project development and experimental tests, *Proceedings of 4th European symposium on non-lethal weapons, Ettlingen, Germany, 21st -23rd May 2007*, Fraunhofer Institut Chemische Technologie, Ettlingen, Section 40, pp.1-10.

¹⁸⁵ Arms and Technologies Publishing House (2009) *op.cit.*

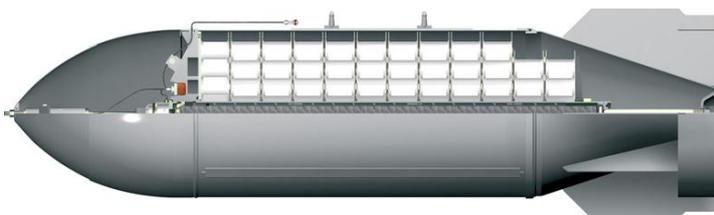
¹⁸⁶ Arms and Technologies Publishing House (2009) *op.cit.*



Images of helicopter loaded with heliborne KMGV-type dispenser of packages containing RCA (above left) and of a single heliborne dispenser (above right). All images from: www.arsenalrus.com.

Cluster munition [Russian Federation]

According to the 2009 English language version of the 2006 “*Ordnance and munitions*” volume of “*Russia’s Arms and Technologies*,”¹⁸⁷ a Russian company developed a 500-kilogram cluster bomb packed with sub-munitions charged with irritant-action pyrotechnic composition. The publication stated that: “*This cluster bomb has been developed from the standard 500kg cluster bomb packed with smoke sub-munitions. It is dropped from a fixed-wing or rotary-wing aircraft in an altitude span of 100 to 12,000m at a speed of up to 1,200 km/h...The bomb permits high concentrations of an irritant agent to be attained within a short time.*”¹⁸⁸ No further information concerning the manufacture, stockpiles and utilisation of the cluster munition is currently publicly available.



Images of 500kg cluster munitions loaded onto fixed wing aircraft (top) and of a single cluster munition (bottom). All images from: www.arsenalrus.com.

¹⁸⁷ Arms and Technologies Publishing House (2009) *op.cit.*

¹⁸⁸ Arms and Technologies Publishing House (2009) *op.cit.*

2.9. Unmanned aerial vehicles

It is apparent that there has been a dramatic increase in the development and use of unmanned aerial vehicles (UAVs) worldwide¹⁸⁹ There are indications that certain manufacturers and security organisations have explored the potential of utilising UAVs for the delivery of RCAs. For example, in May 2011, a European Defence Agency (EDA) paper presented at the 6th European symposium on non-lethal weapons stated that: “...*the development and deployment of Non-Lethal Weapons (NLW) will gain momentum during the period to 2025. Non-lethal options will become the weapons of first choice for dealing with civil unrest and in situations in which there is a high risk of causing injury to non-combatants. The use of non-lethal means will be incorporated into some aspects of tactical doctrine for intervention forces.*”¹⁹⁰ And furthermore that: “*Current systems including tasers, non-lethal directed energy weapons..., warning and inert munitions and the use of small low altitude Unmanned Aerial Vehicles (UAVs) for dispensing measured CS gas payloads will be progressively developed. Such systems will retain their importance in relatively low-intensity conflict.*”¹⁹¹ [Emphasis added].

Camcopter S-100 UAV [Austria]



Camcopter S-100 on display at International Exhibition of Means for Provision of State Security, INTERPOLITEX 2011, Moscow, 25th-28th October 2011. (Photo: © Robin Ballantyne/Omega Research Foundation)

The Camcopter S-100, manufactured by Austrian company, Schiebel, is a UAV incorporating a Vertical Takeoff and Landing (VTOL) system. It is capable of autonomous flight and can fly a programmed mission without operator intervention.¹⁹² It is designed to carry a payload of up to 75 lbs (34 kilograms) for more than 6 hours whilst travelling at 55 knots.¹⁹³

¹⁸⁹ See for example: Blyenburgh, P. (ed.) 2007, *UAS: Unmanned Aircraft Systems – The Global Perspective 2007/2008*, Paris: Blyenburgh & Co; *Jane's Unmanned Vehicles and Aerial Targets*, Coulsdon: Janes Information Group, 2007; *Non-proliferation: Agencies Could Improve Information Sharing and End-Use Monitoring on Unmanned Aerial Vehicle Exports*, US Government Accountability Office, July 2012, GAO-12-536.

¹⁹⁰ Weissenbock, E. Non-lethal capabilities for CSDP operations: update of activities within the European defence, paper 33, 6th European symposium on non-lethal weapons, 16th -18th May, 2011, Ettlingen, Germany, p.2

¹⁹¹ Weissenbock, E. (2011) *op.cit.*, p.3

¹⁹² Schiebel, Camcopter S-100, Introduction, <http://www.schiebel.net/Products/Unmanned-Air-Systems/CAMCOPTER-S-100/Introduction.aspx> (accessed 14th February 2013).

¹⁹³ Schiebel, Camcopter S-100, System performance, <http://www.schiebel.net/Products/Unmanned-Air-Systems/CAMCOPTER-S-100/System.aspx> (accessed 14th February 2013).

According to a press release by Schiebel Technology, Inc., Schiebel's US subsidiary "conducted extensive experimentation" with the Camcopter UAV system in November 1997 at the McKenna MOU (Military Operations in Urban Terrain) facility at Fort Benning in Georgia, USA. The experimentation evaluated the ability of the VTOL UAV to deliver "non-lethal" munitions. All experimentation was completed using soldier operators. The "non-lethal" deliveries "*included smoke grenades which were fired from a modified chaff and flare block and used as a surrogate for Riot Control Agents (RCA). These munitions were delivered during both day and night operations at area and point type targets within the MOU environment.*"¹⁹⁴ [Emphasis added].

These trials were described in a June 2001 *Jane's* article which stated that:

"What was, essentially, a surveillance vehicle underwent an astonishing transition during the experiment. The US Army decided to extend the evaluation envelope around the ability of a... (VTOL) UAV to deliver non-lethal munitions and other loads. Thus the Camcopter became an early UCAV (Unmanned Combat Air Vehicle), if not the first rotary-wing UCAV altogether." [Emphasis added]. Among the reported munition payloads were "tear gas and liquid/powdered surrogates for Riot Control Agents (RCA)." ¹⁹⁵

No reference is made in Schiebel's current publicly available marketing literature to the Camcopter's potential use as a means to deliver riot control agents. However, in an interview on 22nd November 2010, with the online publication, *Defense Professionals*, Chairman of Schiebel Group of Companies, Hans-Georg Schiebel, stated that:

*"Fields of application for the CAMCOPTER S-100 are numerous – both military and civilian: tactical surveillance and reconnaissance at land and on sea, safe mine detection from the air, artillery support, marine surveillance and amphibious support, special military applications. The latter include, for example, an ISTAR capability, detection of improvised explosive devices (IEDs), Psyops missions, precision delivery and recovery of remote controlled munitions, and the deployment of riot control agents, smoke, flares, and non-lethal munitions."*¹⁹⁶[Emphasis added].

Until at least November 2011, a second company, Dharma Magna (of Indonesia), promoted the Camcopter's potential utility for RCA delivery. Dharma Magna which claimed to have "been the trusted partner in providing defense and security services and solutions to Indonesia's military and police"¹⁹⁷ marketed a wide range of products including the Camcopter S-100. The company webpage detailing "*Special Military Applications*" of the Camcopter stated that: "Using two control stations... it is possible to mount a joint operation where both surveillance and specialist tasks can be run concurrently. **Tasks already trialed**

¹⁹⁴ Schiebel, Press Release, US Army Dismounted Battlespace Battle Lab conducts non-lethal weapon experiments with the Camcopter VTOL UAV, (date of release unknown). The press release was available on the Schiebel website until 29th April 2001. It has subsequently been removed. It is still available on: (<http://web.archive.org/web/20010429204330/http://www.schiebel.com/industries/N0045.htm>) (accessed 14th February 2013).

¹⁹⁵ *Jane's International Defense Review*, 16th June 2001, <https://janes.ihs.com/CustomPages/Janes/DisplayPage.aspx?DocType=News&ItemId=+++1099721&Pubabbrev=IDR> (accessed 14th February 2013).

¹⁹⁶ *Defence professionals*, CAMCOPTER – More Than a Foot in the Door in the US Market, 22nd November 2010, <http://www.defpro.com/daily/details/698/> (accessed 16th January 2013).

¹⁹⁷ Dharma Magna, <http://www.dharmamagna.com/profile.php> (Accessed 15th November 2011). This link has subsequently been removed from the internet. A copy of the relevant page is held by the author.

include: [p]recision delivery, and recovery, of remote controlled munitions; [d]eployment of riot control agents, smoke, flares, non-lethal munitions ...¹⁹⁸ [Emphasis added]

In correspondence with BNLWRP, dated 18th November 2011, the CEO of Schiebel stated: “[W]e are not aware that any of our customers has tested the S-100 or uses it in conjunction with RCAs.” He further stated that: “No research activities regarding chemical payload delivery are currently conducted or planned for the future [by Schiebel].”¹⁹⁹

In correspondence with BNLWRP, dated 23rd November 2011, the Head of the Austrian National Authority for the CWC and BTWC stated that “the use of “Riot Control Agents” (RCAs) and “Incapacitating Agents” (ICAs) is prohibited for all military purposes (that includes counter-insurgency operations). In fact the new Austrian trade law 2011 and its by-laws i.a. regulate even the transfer, sales, purchases of RCAs and ICAs now....”²⁰⁰ As a result of the introduction of the 2011 Austrian trade law and its by-laws: “...a sale of the Camcopter with dissemination equipment installed would be considered as a military good and would therefore require the authorisation of the Austrian export control authorities for every foreign country.”²⁰¹ The Austrian Government also stated that: “No export-license application from Schiebel was ever received for RCA use or with dissemination equipment installed...According to information received by Schiebel no other foreign governments tested their Camcopter S-100 specifically for RCA application or - as to Schiebel’s best knowledge - used it for RCA dissemination until now.”²⁰²

Long range airborne dispenser capable of carrying riot control agents [Germany]

In 2007, researchers from the Fraunhofer-Institut für Chemische Technologie (ICT) presented a paper at the 4th European symposium on non-lethal weapons, describing their research and development of an “airborne, optically guided system, capable of accurately delivering 1kg of non-lethal payload even to moving targets.”²⁰³ The system consisted of two coupled mini-unmanned aerial vehicles (UAVs) which separate before delivery of the payload. “The larger re-usable plane carries propulsion and course navigation systems, the smaller is a lightweight, precision guided glider carrying the payload into the target.”²⁰⁴ The system which weighed 5kg, had a reported maximum range of between 1-2 kilometres.²⁰⁵ There was some discussion in the ICT paper of the utility of “non-lethal” weapons in military, law enforcement and peace support operations, and a range of scenarios were identified where the delivery of “heavy non-lethal payloads over large distances is especially useful”²⁰⁶, including “delivering irritant agents through a building window without LOS [line of sight]

¹⁹⁸ Dharma Magna, Camcopter s-100, Special Military Applications, <http://www.dharmamagna.com/21-Camcopter-S-100-4-Special-Military-Applications.php> (Accessed 15th November 2011). This link has subsequently been removed from the internet. A copy of the relevant page is held by the author.

¹⁹⁹ Correspondence from Hans Schiebel, CEO, Schiebel, to BNLWRP, 18th November 2011, (copy held by author).

²⁰⁰ Correspondence from the Head of the Austrian National Authority for the CWC and BTWC, to BNLWRP, 23rd November 2011, (copy on file with author).

²⁰¹ Head of the Austrian National Authority for the CWC and BTWC (23rd November 2011) *op.cit.*

²⁰² Head of the Austrian National Authority for the CWC and BTWC (23rd November 2011) *op.cit.*

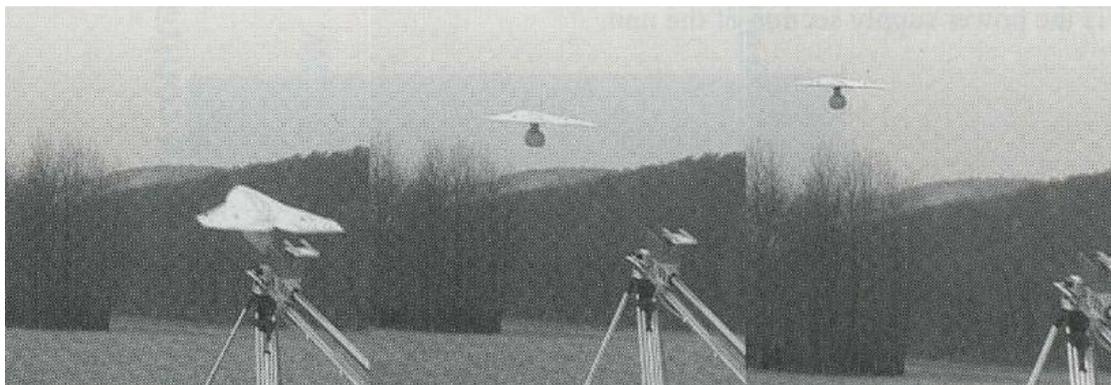
²⁰³ Liehmann, W. Zettl, S. and Thiel, K., Airborne long-range NLW dispenser, Fraunhofer-Institut für Chemische Technologie, paper presented at 4th European symposium on non-lethal weapons, Ettlingen, Germany, 21st -23rd May 2007.

²⁰⁴ *Ibid.*

²⁰⁵ NATO, Assessment of possible disruptive technologies for defence and security, Final report of task group 062, February 2010, RTO-TR-SAS-062 AC/323(SAS-062) TP/258. Annex H, p.54.

²⁰⁶ Liehmann, W. Zettl, S. and Thiel, K. (2007) *op.cit.*, p.1.

conditions.”²⁰⁷ According to the ICT, the UAV research and development programme has been terminated.²⁰⁸ This was subsequently confirmed in correspondence from the German Ambassador to the OPCW.²⁰⁹



Images of long range airborne dispenser taken from proceedings of 4th European symposium on non-lethal weapons, 2007.

Although the ICT paper did not specifically address the potential “non-lethal” weapons payloads that could be carried by the airborne dispenser or the potential missions for which it could be employed, these issues were raised in papers developed as part of an “*Assessment of possible disruptive technologies for defence and security*” conducted by a NATO study group which published its final report in February 2010.²¹⁰ The goal of this horizon-scanning study was to “*assess and enhance the knowledge in expected and so-called possibly disruptive developments and the consequences for military systems and operations when applied by own or opposing forces.*”²¹¹

One aspect of the NATO study incorporated table-top Disruptive Technology Assessment Games (DTAG) utilising a wide variety of developing technologies including the “airborne long-range NLW dispenser”. In its summary of the “airborne long-range NLW dispenser” a NATO study group paper described possible payloads: “*NLW-payloads could be **irritant agents, malodorants, kinetic impact, flash-bang, nets**...Payloads will be modular so that the payload required for the mission can be chosen during setup for launch. Lethal payloads are a possibility as well.*”[Emphasis added].²¹²

In the analysis of the employment of the “airborne long-range NLW dispenser” in the table-top games, the report stated that: “*This system was used in a variety of situations, **including crowd and riot control, and to carry out attacks where collateral damage is unacceptable**...Range was the biggest limitation to its use...The system could have an impact on TTP [Tactics, Techniques and Procedures] if it had a larger range as it would give a new*

²⁰⁷ *Ibid.*

²⁰⁸ Correspondence with ICT researcher engaged in this project. Email received 4th November 2011. Copy on file with the author.

²⁰⁹ Correspondence from Ambassador Gregor Koebel, Permanent Representative of the Federal Republic of Germany, 21st November 2011, (copy on file with author).

²¹⁰ NATO, Assessment of possible disruptive technologies for defence and security, Final report of task group 062, February 2010, RTO-TR-SAS-062 AC/323(SAS-062) TP/258. NATO Unclassified, copy held by author.

²¹¹ NATO (2010) *op.cit.*, Chapter 1, p.xiv.

²¹² NATO (2010) *op.cit.*, Annex H, pp.53-54.

long range NLW capability."²¹³ [Emphasis added]. It should be noted that this NATO study, and the DTAGs in particular, were intended to stimulate creative thinking amongst participants regarding possible future impacts of advances in relevant technologies, and were not intended as detailed analysis of specific technologies.²¹⁴

2.10. Unmanned ground vehicles

A range of unmanned ground vehicles (UGVs) have been developed, some of which incorporate RCA delivery systems. Such UGVs are remotely operated and are intended to perform a variety of functions potentially including security or military operations.

RiotBot [Spain]



Images of RiotBot (above left) and the PepperBall Tactical Automatic Carbine [TAC 700 launcher] (above right) both taken from Technorobot website

The Spanish company Technological & Robotics Systems (Technorobot) has developed the RiotBot - an “*advanced security robot*” especially designed for remote operation in areas considered to be too dangerous to deploy personnel.²¹⁵ RiotBot employs a mounted PepperBall Tactical Automatic Carbine (TAC 700 launcher), which has been customised and adapted for use on the robot. According to marketing materials published by Pepperball Technologies Inc, which manufacture the TAC 700 and related munitions, the launcher “*averages 700 rounds per minute in full automatic mode with up to 60 ft. target accuracy and up to 150 ft. accuracy for saturating an area with pepper.*”²¹⁶ The TAC 700 utilises the 3 gram PAVA pepper projectile and, according to TechnoRobot, the RiotBot has a total capacity of 450 these PAVA projectiles.²¹⁷

²¹³ NATO (2010) *op.cit.*, Annex L, p.3.

²¹⁴ Correspondence with member of SAS-062 NATO study group. Email received 2nd November 2011.

²¹⁵ See Technorobot, Riotbot applications, <http://www.technorobot.eu/en/riotbot.htm> (accessed 14th February 2013); See also: Technorobot, Riotbot brochure, undated, http://www.technorobot.eu/en/pdf/dip_ing.pdf (accessed 14th February 2013).

²¹⁶ See PepperBall Technologies Inc, PepperBall products, military, <http://www.pepperball.com/mil/products.html#proj> (accessed 18th January 2013); See also: PepperBall Technologies Inc, The TAC 700 Launcher: PepperBall Tactical Automatic Carbine, Brochure, available from either PepperBall Technologies Inc website or Technorobot website <http://www.technorobot.eu/en/pdf/tac700.pdf> (accessed 14th February 2013).

²¹⁷ Technorobot, Riotbot, specifications, http://www.technorobot.eu/en/riotbot_specifications.htm (accessed 14th February 2013).

Capable of speeds exceeding 20km per hour, RiotBot can be deployed by a single operator either through direct viewing or through incorporated video equipment at distances of more than 1.5 kilometres. The operator can remotely control the robot's movement, as well as the vertical and horizontal position of the gun turret before firing the carbine. RiotBot can be operated continuously for more than two hours.²¹⁸

According to Technorobot, RiotBot was developed for a “*wide range of police, military and general security operations, mainly those in which the personal safety of the members of the intervention units is not fully guaranteed or could be in danger.*”²¹⁹ The company literature stated that: “*some of the scenarios that have been studied for [RiotBot's] development include: “Riot control...civil order...area denial...boundary defense and intervention ...control point security...surrounding unit rescues...urban warfare.*”²²⁰ [Emphasis added]. Correspondence received from Technorobot on 26th March 2013 confirmed the veracity of all material cited regarding RiotBot.²²¹

Modular Advanced Armed Robotic System (MAARS)[United States]



Image of Modular Advanced Armed Robotic System (MAARS) taken from QinetiQ North America website

The US company QinetiQ North America, Inc. (QNA) has developed the Modular Advanced Armed Robotic System (MAARS®), an unmanned ground vehicle developed through “*partnership with various agencies in the Department of Defense.*”²²² It was “*freshly created...to meet U.S. SOCOM [Special Operations Command] requirements.*”²²³ MAARS has been “*designed expressly for reconnaissance, surveillance, and target acquisition (RSTA)*

²¹⁸ See: Technorobot, Riotbot, specifications, http://www.technorobot.eu/en/riotbot_specifications.htm (accessed 14th February 2013); and Technorobot, Riotbot brochure, undated, http://www.technorobot.eu/en/pdf/dip_ing.pdf (accessed 14th January 2013).

²¹⁹ See Technorobot, Riotbot applications, <http://www.technorobot.eu/en/riotbot.htm> (accessed 14th February 2013).

²²⁰ *Ibid.*

²²¹ Correspondence from Guerrero, E., Business Development Director, Technorobot, to BNLWRP and ORF, 26th March 2013. Copy held by author.

²²² QinetiQ North America, MAARS Advanced armed robotic system, <http://www.qinetiq-na.com/products/unmanned-systems/maars/> (accessed 14th February 2013).

²²³ QinetiQ North America, Modular Advanced Armed Robotic System (MAARS), Product Overview, http://www.qinetiq-na.com/wp-content/uploads/2013/01/pdf_maars.pdf (accessed 14th February 2013), p.1.

missions to increase the security of personnel manning forward locations”.²²⁴ It is remotely controlled by an operator who can be from over 1 kilometre²²⁵ and reportedly up to 3 kilometres away.²²⁶ According to QNA, MAARS can be “positioned in remote areas where personnel are currently unable to monitor their security, and can also carry either a direct or indirect fire weapon system.”²²⁷

According to QNA, MAARS is the “first fully modular ground robot system capable of providing a measured response including non-lethal, less-lethal and even lethal stand-off capabilities”.²²⁸ As well as a M240B medium machine gun firing 7.62mm ammunition, MAARS incorporates a 4 barrelled 40mm grenade launcher that has the capability to utilise either 40mm high-explosive grenades or a range of “less-lethal” ammunition, including 40mm tear gas grenades.²²⁹ No details are available concerning the grenade launcher’s rate of fire or range; nor of the area coverage, weight, or fill of the 40mm tear gas grenades.

In June 2008 QNA announced that it had “shipped the first MAARS ground robot to the US military under a contract from the Explosive Ordnance Disposal/Low-Intensity Conflict (EOD/LIC) Program within the Combating Terrorism Technical Support Office (CTTSO).”²³⁰ According to a November 2010 *New York Times* article, US Army Special Forces had bought six MAARS “for classified missions”, and the National Guard had requested “dozens more to serve as sentries on bases in Iraq and Afghanistan.”²³¹ This section of the report was reviewed by representatives of QNA and all recommended changes incorporated.²³²

2.11. Vehicle protection systems

The fitting of vehicle protection systems (capable of launching a range of lethal or “less lethal” munitions, potentially including RCA projectiles) onto military vehicles such as tanks and armoured personnel carriers (APCs) is widespread. The number and nature of the mounted launchers (rate of fire, range) and RCA munitions (calibre, weight, area coverage, nature and amount of RCA content), the vehicles on which they are mounted, and intended missions in which they are to be employed vary.

²²⁴ QinetiQ North America, MAARS Advanced armed robotic system, <http://www.qinetiq-na.com/products/unmanned-systems/maars/> (accessed 14th February 2013).

²²⁵ QinetiQ North America, MAARS Product Overview, *op.cit.*, p.1.

²²⁶ Dubiel, J. Robots can stand in for Soldiers during risky missions, 11th August 2008, <http://www.army.mil/article/11592/robots-can-stand-in-for-soldiers-during-risky-missions/> (accessed 14th February 2013).

²²⁷ QinetiQ North America, MAARS Advanced armed robotic system, <http://www.qinetiq-na.com/products/unmanned-systems/maars/> (accessed 14th February 2013).

²²⁸ QinetiQ North America, QinetiQ North America ships first MAARS robot, (undated but related press articles commence on 4th June 2008) <http://www.qinetiq.com/news/pressreleases/Pages/qna-ships-first-maars-robot.aspx> (accessed 14th February 2013).

²²⁹ QinetiQ North America, MAARS Modular Advanced Armed Robotic System, Warfighter controls the escalation of force, http://www.qinetiq-na.com/wp-content/uploads/2011/12/pdf_maars.pdf (accessed 22nd January 2013); QinetiQ North America, MAARS Product Overview *op.cit.* p.2.

²³⁰ QinetiQ North America, QinetiQ North America ships first MAARS robot, undated but related press articles commence on 4th June 2008) <http://www.qinetiq.com/news/pressreleases/Pages/qna-ships-first-maars-robot.aspx> (accessed 14th February 2013).

²³¹ Markoff, J. War Machines: Recruiting Robots for Combat, *The New York Times*, 27th November 2010, http://www.nytimes.com/2010/11/28/science/28robot.html?pagewanted=all&_r=0 (accessed 14th February 2013).

²³² Correspondence from Darya, S., Communications Manager, QinetiQ North America, Technology Solutions Group, to BNLWRP, 1st April 2013. Copy held by author.

Light Vehicle Obscurant Smoke System (LVOSS) and L96A1 CS munition [United States and United Kingdom]

The 66mm Light Vehicle Obscurant Smoke System (LVOSS) is a vehicle mounted remotely fired launcher - in service with the UK military, and the US Army and US Marine Corps - that can potentially discharge a single salvo of 4 66mm grenades at 50, 75 or 100 metres. The family of Vehicle Launched Non-Lethal Grenades (LNLG) are capable of delivering blunt trauma, smoke, flash bang effects and RCAs.²³³ The last of which is delivered by the L96A1 munition which contains 23 individual canisters filled with CS riot control agent, providing a number of dispersants, rather than a single plume. It has an effective range of 65 to 95 meters.²³⁴



L96A1 CS munition (left) and the Light Vehicle Obscurant Smoke System (centre and right)

The L96A1 was developed in the late 1990's by the Defence Science and Technology Laboratory (DSTL)²³⁵, with the U.K. company PW Defence²³⁶ acting as a build to print manufacturer. In correspondence with BNLWRP, dated 21st March 2013, a representative of Chemring Defence (formerly PW Defence) stated that: *“The product was developed at the express request of the UK MOD [Ministry of Defence] and US DoD [Department of Defense]. The only customers were the UK MoD for shoulder launched devices, and US DoD for vehicle launched devices. I believe that the last of these products were supplied to these customers in the mid to late 2000's.”*²³⁷

²³³ See: 66mm Light Vehicle Obscurant Smoke System and Vehicle Launched NL Grenades, US Department of Defence, Non-Lethal Weapons Program, <http://jnlwp.defense.gov/current/lvoss.html> (accessed 14th February 2013); Joint Non-Lethal Weapons Directorate, *Non-Lethal Weapons (NLW) Reference Book*, 2012. <https://acc.dau.mil/adl/en-US/266913/file/65607/NLW%20ReferenceBook%202012.pdf> (accessed 14th February 2013); Light Vehicle Obscurant Smoke System, Chemical, Biological, Radiological & Nuclear Information Resource Centre, 11th February 2013 (copy on file with author).

²³⁴ Project Manager Close Combat System (PMCCS) [the US Army Training and Equipment Sector], http://www.pica.army.mil/pmccs/combattmunitions/nonlethalsys/nonlethalcapset/counterper/4nlc_65.htm (accessed 14th February 2013).

²³⁵ Defence Science and Technology Laboratory (DSTL) is a UK Government organisation with the purpose of maximising the impact of science and technology for the defence and security of the UK. For further information see: <https://www.dstl.gov.uk/aboutus> (accessed 28th March 2013).

²³⁶ PW Defence no longer exists as a sales company nor as a brand since its amalgamation into the Chemring Group. For further information see: <http://www.chemringdefence.com/AboutUs/CompanyHistory/> (accessed 28th March 2013).

²³⁷ Correspondence from Pittman, R., Group Director of Communications and Investor Relations, Chemring Group PLC, 21st March 2013, (copy on file with the author).

According to the U.S. Joint Non-Lethal Weapons Directorate (JNLWRP), the LVOSS and accompanying LNLGs are “designed to deny access into/out of an area to individuals, move individuals through an area, and suppress individuals.”²³⁸ The technology “has the potential to support multiple missions including: force protection...crowd control...offensive and defensive operations.”²³⁹

In correspondence with BNLWRP, dated 28th March 2013, the U.K. Deputy Permanent Representative to the OPCW, stated:

*“The U.K. currently has the LVOSS system in service on military vehicles. It is primarily used to deliver smoke/obscurant rounds, although it is capable of firing RCA munitions it is not currently being used for this purpose. Such use for law enforcement purposes would be entirely consistent with the CWC.”*²⁴⁰

Galix 80mm vehicle mounted projection system [France]

The Galix vehicle mounted protection system, manufactured by Etienne Lacroix Defense and Giat Industries (now part of the Nexter Group)²⁴¹, comprises groups of four launch tubes which cover a 45^o area zone, with addition of further tube-groups extending area coverage up to 360^o. The system can utilise a range of 80mm Galix munitions including infrared decoy, illumination, smoke and tear gas. The Galix 15 irritant munition weighs 1.5kg and “the irritant composition used meets all the characteristics of non-toxicity and effectiveness required for law enforcement applications.”²⁴² Firing of the system is by electrical initiation which is followed by airburst of the munitions with each Galix 15 munition distributing “7 irritant payloads at a range of 45 or 150 metres from the vehicle.” According to the manufacturers, one salvo of 4 Galix 15 rounds will provide area coverage of 1,600 m².²⁴³



Images of the Galix vehicle mounted protection system taken from Giat Industries and Etienne Lacroix Defense brochure

²³⁸ 66mm Light Vehicle Obscurant Smoke System and Vehicle Launched NL Grenades, US Department of Defence, Non-Lethal Weapons Program, <http://jnlwp.defense.gov/current/lvoss.html> (accessed 14th February 2013).

²³⁹ 66mm Light Vehicle Obscurant Smoke System and Vehicle Launched NL Grenades, US Department of Defence, Non-Lethal Weapons Program, <http://jnlwp.defense.gov/current/lvoss.html> (accessed 14th February 2013).

²⁴⁰ Correspondence from Broughton, S. UK Deputy Permanent Representative to the OPCW, 28th March 2013, (copy on file with the author).

²⁴¹ For details of Nexter Group see: <http://www.nexter-group.fr/> (accessed 14th February 2013).

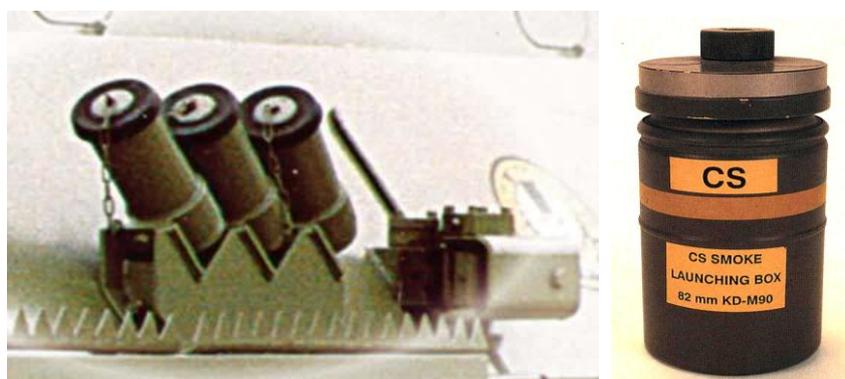
²⁴² Galix 15 Munition Lacrymogène/irritant munition brochure, Giat industries/Etienne Lacroix Defense, undated, distributed at DSEI 1999. [Copy held by author].

²⁴³ Galix 15 Munition Lacrymogène/irritant munition brochure, Giat industries/Etienne Lacroix Defense, undated, distributed at DSEI 1999. [Copy held by author].

According to Giat Industries and Etienne Lacroix Defense marketing materials, distributed in 1999, GALIX munitions were “*In service with numerous land forces including the French Army*” and attendant images showed the GALIX system mounted on the following military vehicles: Leclerc main battle tank, Leopard 1, AMX 10 RC, Sadral, CV 90, M 48, AMX 30 B2, VAB, Piranha, VLRA and the VAB.²⁴⁴ A 2001 briefing article in *Janes Defence Weekly* stated that the Galix combat vehicle protection system “*is fitted on all production Giat Industries Leclerc-series [Main Battle Tanks] MBTs and has also been purchased by a number of other countries including Sweden, Saudi Arabia and the United Arab Emirates.*”²⁴⁵ A 2011 article in *Janes International Defence Review* stated that the Galix protection system was also mounted on Nexter’s Véhicule Blindé de Combat d’Infanterie (VBCI) [Armoured vehicle for infantry combat], 630 of which had been ordered by the French Army.²⁴⁶

Vehicle mounted multiple grenade launcher/KD M90 82mm grenade [Serbia]

The Serbian company Yugoimport-SDPR has promoted a service “*upgrading... combat and non-combat vehicles by retrofitting 82mm grenade launching systems*”.²⁴⁷ Whilst the accompanying literature describing this system stated that Yugoimport-SDPR had “*Worldwide experience from peace keeping operations and many types of low-intensity conflicts*”, the company literature did not clarify whether the system is intended for use by police, security or military forces, nor in what circumstances it would be employed (e.g. law enforcement, peace-keeping, counter-insurgency).²⁴⁸



Images of the vehicle mounted protection system (left) and the associated KD M90 82mm RCA munition (right) taken from Yugoimport-SDPR marketing material

²⁴⁴ Galix, Defensive aids and law enforcement systems for fighting vehicles brochure, Giat industries/Etienne Lacroix Defense, undated, distributed at DSEI 1999. [Copy held by author].

²⁴⁵ Foss, C. Making the tough tougher, *Jane's Defence Weekly*, 31st May 2001.

²⁴⁶ Foss, C. Nexter Systems boosts VBCI production to offer specialised export versions, *Jane's International Defence Review*, 16th February 2011.

²⁴⁷ Yugoimport-SDPR, “Weapons and Equipment for Rapid Deployment Forces”, undated catalogue distributed at Defense and Security, Bangkok, Thailand, 4th-7th November 2009 (copy held by author). See also: Yugoimport-SDPR, Infantry, special forces, peace making/keeping and rapid deployment forces weapons, equipment and upgrading sets, undated catalogue distributed at Latin America Aero and Defence (LAAD) 2005, 26th – 29th April 2005, Rio de Janeiro, Brazil, (copy held by author).

²⁴⁸ Yugoimport-SDPR, “Weapons and Equipment for Rapid Deployment Forces” (undated) *op.cit.*; Yugoimport-SDPR, Infantry, special forces, peace making/keeping and rapid deployment forces weapons, equipment and upgrading sets, (undated) *op.cit.*

The company literature stated that: “The 82mm multiple grenade launches can be installed on forward or side plates of a turret or on hull sides. The system is characterized by low-weight, high reliability, multiple launching capability, possibility of enhancing of effectiveness by mounting of additional launches, high versatility due to employment of a wide range of launching grenades...”²⁴⁹ Yugoimport-SDPR have also developed and promoted the KD M90 82mm smoke grenade for use with this system. This munition weighs 1.2kg, contains 535 grams of CS and has a maximum range of 200 metres.²⁵⁰

2.12. Area Denial Munitions

Certain manufacturers have developed and promoted a range of “less lethal” munitions, including tear gas devices, intended to ensure denial of specific areas. Some of these devices appear to be target-activated whilst others are controlled by a remote operator.

“Anti-Riot Warning Mines” [China]



Less than lethal mines displayed on the 9604 Factory Xiangfan City Hubei Province stall at China Police, 2008, including the smoking tear gas mine (rear left) and an explosive tear gas less lethal mine (front right). (Photo: © Robin Ballantyne/Omega Research Foundation.)

The Chinese State-owned No. 9604 Factory has developed and promoted a range of “Anti-Riot Warning Mines” which have the: “features of both mine and anti-riot grenade.” These mines “can immediately work and barricade rioters and raise an alarm when the distributed mine is lifted and knocked down.” They can also be used “for guard[ing] along with roadblocks under main roads and important departments.”²⁵¹ According to State-owned No. 9604 Factory publications, the following categories of Anti-Riot Warning Mine are produced: explosive tear gas mine, smoke tear gas mine, rubber ball mine, dye mine and flash mine, with the tear gas mine having a dispersion area greater than 200 m².²⁵² Information on this product has also appeared in the 2006 edition of *Jane’s Police and Security Equipment* which described its status as: “in production and in service”.²⁵³ A very similar (if not identical) product has also been promoted by a second Chinese company, Hubei Handan Mechatronics Co. Ltd, in its Military Products Manual.²⁵⁴

²⁴⁹ Yugoimport-SDPR, “Weapons and Equipment for Rapid Deployment Forces” (undated) *op.cit.*; Yugoimport-SDPR, Infantry, special forces, peace making/keeping and rapid deployment forces weapons, equipment and upgrading sets, (undated) *op.cit.*

²⁵⁰ Yugoimport-SDPR, “Weapons and Equipment for Rapid Deployment Forces” (undated) *op.cit.*; Yugoimport-SDPR, Infantry, special forces, peace making/keeping and rapid deployment forces weapons, equipment and upgrading sets, (undated) *op.cit.*

²⁵¹ No.9604 Factory Xiangfan City Hubei Province, Anti-riot grenades for police, [In English and Chinese], undated publication, distributed by company in 2006 [copy held by author].

²⁵² No.964 Factory Xiangfan City Hubei Province (2006) *op.cit.*

²⁵³ *Janes Police and Security Equipment*, 3rd November 2006, Janes Information Group, p.519.

²⁵⁴ Hubei Handan Mechatronics Co. Ltd, Military Products Manual, the anti-riot warning mine series, pp. 17-20, undated publication, distributed by company in 2008, [copy held by author].

"MAGAR" "Floating Tear Smoke Device [India]

The Indian manufacturer, the Tear Smoke Unit has developed and promoted the "MAGAR" "Floating Tear Smoke Device. According to the company promotional materials: *"The device is designed to float on water and can be used by the coast guards and the security forces to temporarily incapacitate water borne miscreants and smugglers or for protection of offshore installations. Once initiated, it discharges large volumes of irritant gas for 50-60 seconds."*²⁵⁵ The *Jane's Police and Security Equipment Handbook 2005-2006* stated that the MAGAR was "In production and in service".²⁵⁶

MAGAR floating tear smoke device displayed with other TSU products, from TSU brochure (below). MAGAR activated, from TSU website (right).



No entries for the MAGAR were found in subsequent *Jane's* publications and the munition is not currently promoted on the company website. No further information is available concerning the nature or quantity of riot control agent dispersed by this device nor whether the munition is remotely activated and/or target activated.

In correspondence dated 2nd April 2013, the Indian Government stated that *"In our view, the items/activities pertaining to India detailed in the [BNLWRP/ORF] report are not in contravention of the Chemical Weapons Convention. In any event, the munitions listed have mainly formed part of capability demonstration by Indian security agencies."*²⁵⁷

²⁵⁵ Tear smoke unit Non Lethal Munitions, Product Information, undated brochure, Tear Smoke Unit, BSF Tekanpur Gwalior India, (copy held by author), p.5.

²⁵⁶ *Jane's Police and Security Equipment Handbook 2005-2006*, Jane's Information Group, 2005, p.797.

²⁵⁷ Correspondence from Menon, S. First Secretary (Pol & OPCW), Embassy of India, 2nd April 2013.

Sphinx and Syproz area denial/protection systems [France]



Images of the Sphinx system taken from Etienne Lacroix Defence & Security marketing material

According to marketing literature distributed by French manufacturer, Etienne Lacroix Defence & Security (which is part of the Etienne Lacroix Group), the Sphinx is a portable delivery mechanism which is “designed to ensure area denial during riot control operations.”²⁵⁸ The *Jane’s Police and Homeland Security Equipment 2009-2010 Handbook* stated that the Sphinx system “strengthens the protection of fixed positions, temporarily parked units or command posts. It prohibits access to the area to be protected by firing lethal or less-lethal ammunition at short range, depending on the threat considered.”²⁵⁹

According to Lacroix Defense & Security, the system covers a 140° arc within a distance of 50 metres and “immediately controls an area of around 3000m² in front of the launcher”²⁶⁰ The Sphinx system can be controlled remotely; firing cannot be initiated without the operator’s decision. It fires ammunition from the Galix range, produced by Lacroix and Giat Industries (now part of the Nexter Group). This includes the Galix 15 80mm tear gas munition which weighs 1.5kg and is deployed at a range of 35 metres by the Sphinx launcher.²⁶¹ The Sphinx system has the capacity to fire three such Galix RCA munitions simultaneously.

According to Etienne Lacroix Defence the Sphinx system “can be incorporated into the Syproz complete zone protection system.”²⁶² This system appears to be similar if not identical to Sphinx NT, which Lacroix Defense states: “ensures protection of strategic points,

²⁵⁸ Lacroix Defence & Security, Law enforcement, control area/launchers, Sphinx, available from http://www.nachtsicht-germany.de/Nachtsichtneu/index_htm_files/CONTROLE%20DE%20ZONE_GB.PDF (accessed 14th February 2013).

²⁵⁹ *Jane’s Police and Homeland Security Equipment 2009-2010 Handbook*, Jane’s Information Group, (ed) McBride, M., 12th August 2009, p.376.

²⁶⁰ Lacroix Defence & Security, Law enforcement, control area/launchers, Sphinx, available from http://www.nachtsicht-germany.de/Nachtsichtneu/index_htm_files/CONTROLE%20DE%20ZONE_GB.PDF (accessed 14th February 2013).

²⁶¹ Etienne Lacroix Defense, Sphinx Perimeter Defence System, Brochure, distributed at IDEX 2001, 18th – 22nd March 2001.

²⁶² Lacroix Defence & Security, Law enforcement, control area/launchers, Sphinx, available from http://www.nachtsicht-germany.de/Nachtsichtneu/index_htm_files/CONTROLE%20DE%20ZONE_GB.PDF (accessed 14th February 2013).

checkpoints and troop encampments.”²⁶³ The system has a wireless remote command/control function, is modular, and has LOS (line of sight) and NLOS (non-line of sight) multi-effect applications. It has the following “AP/AV (anti-personnel/anti-vehicle) graduated effects: Galix ammunition; remote controlled hand grenades; 56mm ammunition range; anti-vehicle device.”²⁶⁴ All of these components, as featured in the schematic diagram (below), are described in the company's documentation relating to Syproz.²⁶⁵



Image of the schematic for the Sphinx NT system taken from the Lacroix Defense website. The diagram indicates that the system can incorporate the Cougar 12 launcher, Sphinx system, Puma launcher and the WIT remote controlled “non-lethal” ammunition firing system.

²⁶³ Lacroix Defense website, our products, self-protection/area protection, <http://www.lacroix-defense.com/produit.php?nom=sphinxnt&categorie=land&souscat=SELF%20PROTECTION> (accessed 14th February 2013).

²⁶⁴ Lacroix Defense website, our products, self-protection/area protection, <http://www.lacroix-defense.com/produit.php?nom=sphinxnt&categorie=land&souscat=SELF%20PROTECTION> (accessed 14th February 2013).

²⁶⁵ Lacroix Defence & Security, Law enforcement, control area/launchers, available from http://www.nachtsicht-germany.de/Nachtsichtneu/index_hm_files/CONTROLE%20DE%20ZONE_GB.PDF (accessed 14th February 2013).

3. Regulation of riot control agents and related means of delivery under the Chemical Weapons Convention

3.1. Review of the Convention:

Under Article I of the Chemical Weapons Convention:

“Each State Party to this Convention undertakes never under any circumstances:

(a) To develop, produce, otherwise acquire, stockpile or retain chemical weapons, or transfer, directly or indirectly, chemical weapons to anyone;

(b) To use chemical weapons;

(c) To engage in any military preparations to use chemical weapons;

(d) To assist, encourage or induce, in any way, anyone to engage in any activity prohibited to a State Party under this Convention.”²⁶⁶

Article II.1 of the Chemical Weapons Convention, defines a chemical weapon as:

*“(a) **toxic chemicals or their precursors**, except where intended for purposes not prohibited by the Convention, as long as the types and quantities are consistent with such purposes;*

*(b) **munitions and devices specifically designed to cause death or other harm through the toxic properties of those toxic chemicals specified in subparagraph (a)**, which would be released as a result of the employment of such munitions and devices;*

*(c) **any equipment specifically designed for use directly in connection with the employment of the munitions and devices referred to in (b)**.”²⁶⁷ [Emphasis added].*

Amongst the “*purposes not prohibited*” defined under Article II.9 of the Convention are:

*“(c) **Military purposes not connected with the use of chemical weapons and not dependent on the use of the toxic properties of chemicals as a method of warfare;***

*(d) **Law enforcement including domestic riot control purposes.**”²⁶⁸*

In addition, the Convention specifically defines riot control agents (RCAs) as: *“Any chemical not listed in a Schedule, which can produce rapidly in humans sensory irritation or disabling physical effects which disappear within a short time following termination of exposure.”²⁶⁹* Whilst the Convention expressly prohibits the use of *“riot control agents as a method of warfare”²⁷⁰*, States Parties are permitted to possess and employ RCAs for *“purposes not prohibited”* including *“law enforcement including domestic riot control purposes.”* However, such use would be acceptable only *“as long as the types and quantities [of toxic chemicals] are consistent with such purposes.”²⁷¹*

Although neither *“law enforcement”* nor *“method of warfare”* are defined under the Convention, leading scholars, Krutzsch and Trapp in their *Commentary to the Chemical Weapons Convention* have stated that *“It can be argued that **any hostile use of a weapon disseminating a riot control agent as defined in paragraph 7 of Article II other than for law***

²⁶⁶ OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article I.1.

²⁶⁷ OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article II.1.

²⁶⁸ OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article II.9.

²⁶⁹ OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article II.7.

²⁷⁰ OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article I.5.

²⁷¹ OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article II.1.a.

enforcement (including domestic riot control) purposes is to be considered a method of warfare, and hence prohibited, and that any agent so used is to be considered a chemical weapon."²⁷² [Emphasis added].

Consequently, whilst CWC States Parties may manufacture, promote, acquire, stockpile and employ delivery systems to disseminate appropriate types and quantities of RCAs for law enforcement purposes, they would be prohibited from developing or employing RCA means of delivery for any other "*hostile act*" including certain military operations in urban terrain (MOUT) not of a law enforcement nature; as well as counter-insurgency operations (COIN) or urban warfare.

3.2. Application of the CWC to "limited area" RCA means of delivery

Although the CWC did not list the types of acceptable or non-acceptable delivery systems for use with toxic chemicals in law enforcement scenarios, it did place an important constraint upon such means of delivery through the Article II.1(a) "types and quantities" restriction. There are certain means of delivery which have a narrow dispersal area, short range and emit a limited quantity of riot control agent - such as certain hand-thrown RCA canisters and grenades, or hand-held spray disseminators - which do not appear to inherently conflict with the "types and quantities" restriction of the Convention.

These "limited area" RCA means of delivery are widely employed in public order situations by law enforcement officials – potentially including police, security or military personnel²⁷³. If such devices have been properly tested and trailed, their use should not raise concern, provided it is consistent with the "law enforcement" purpose under the Convention, and is in accordance with the relevant criminal justice standards e.g. UN Basic Principles on the Use of Force and Firearms, UN Code of Conduct for Law Enforcement Officials, UN Standard Minimum Rules for the Treatment of Prisoners²⁷⁴, etc., and national deployment guidelines.

3.3. Application of the CWC to "Wide area" RCA means of delivery

3.2.1. "Wide area" RCA means of delivery of potential concern

In contrast to the foregoing, a range of delivery mechanisms have been developed that deliver far larger amounts of RCAs over wider areas and/or over greater distances than could previously be delivered by hand-held sprays and the like. As detailed in this report, such means of delivery include: large back-pack sprayers, fogging devices, vehicle mounted dispensers, grenade launchers, multiple munition launchers, and associated RCA munitions.

²⁷² Krutzsch, W. and Trapp, R. *A Commentary on the Chemical Weapons Convention*, 1994 Kluwer Academic Publishers, p.43.

²⁷³ The UN Code of Conduct for Law Enforcement Officials defines such officials as including "*all officers of the law, whether appointed or elected, who exercise police powers, especially the powers of arrest or detention...In countries where police powers are exercised by military authorities, whether uniformed or not, or by State security forces, the definition of law enforcement officials shall be regarded as including officers of such services.*" United Nations, UN Code of Conduct for Law Enforcement Officials adopted by General Assembly resolution 34/169 of 17th December 1979, http://www.unhchr.ch/html/menu3/b/h_comp42.htm. (accessed 14th February 2013), Article 1.

²⁷⁴ See: United Nations, UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials, 7th September 1990, http://www.unhchr.ch/html/menu3/b/h_comp43.htm. (accessed 14th February 2013). Standard Minimum Rules for the Treatment of Prisoners, adopted by the First United Nations Congress on the Prevention of Crime and the Treatment of Offenders, held at Geneva in 1955, and approved by the Economic and Social Council by its resolutions 663 C (XXXIV) of 31st July 1957 and 2076 (LXII) of 13th May 1977.

Certain types of such means of delivery may raise questions about the feasibility of their discriminate use with the consequent danger of affecting bystanders. In addition, given the potential quantities of agent dispersed by some of these mechanisms, questions of proportionality arise as well as concerns regarding the potential danger of serious injury and death due to asphyxiation or agent toxicity. Certain forms of such “wide area” dispersal mechanisms may also be more open to intentional misuse by law enforcement officials on a large scale than are “limited area” dispersal mechanisms. However, depending on their specifications, some “wide area” RCA means of delivery may have utility in extreme law enforcement situations, for example against large violent crowds and large scale riots, providing they meet the CWC “types and quantities” provision and are employed in conformity with human rights standards.

Whilst certain “wide area” RCA means of delivery may potentially be used for law enforcement²⁷⁵, they could also be readily employed in a variety of armed conflict scenarios. A range of “wide area” RCA means of delivery have been promoted for use by security or military forces for peacekeeping, military operations in urban terrain, counter-insurgency operations and urban warfare. The employment of such means of delivery for at least some of these proposed purposes would appear to be inconsistent with the CWC “law enforcement purpose” and/or breach the CWC prohibition on the use of RCAs as a “method of warfare”.

3.2.2. *Inherently inappropriate “wide area” RCA means of delivery*

According to a number of international lawyers and arms control experts, a range of munitions containing RCAs which have military utility, such as cluster munitions, aerial bombs, mortar rounds and artillery shells would be inherently unacceptable for use in law enforcement activities.²⁷⁶ Such munitions would potentially breach the CWC “types and quantities” provision and/or the prohibition on use of RCAs as a “method of warfare”.²⁷⁷

Neill has argued that:

*“it is not appropriate to disseminate a non-lethal agent using a mechanism whose ancillary effects could easily be lethal (e.g., a large, high-velocity carrier shell or a bursting device producing shrapnel); or whose gross capacity and interoperability with conventional military equipment (e.g. in mortars, howitzers, rocket projectiles or by high-speed aircraft) would render it rapidly adaptable for use as a “method of warfare.”*²⁷⁸

Similarly, NATO’s Research and Technology Organization has stated that:

“The employment of chemicals as NLT [Non-Lethal Technologies] has to be compatible with use, thus demonstrating intent. For example, whereas CS in hand or baton round sized canisters would be considered legitimate law enforcement equipment, 155mm shells filled

²⁷⁵ Such means of delivery must meet the “types and quantities” restriction and be utilised in accordance with the “law enforcement purpose” of the CWC as well as relevant international human rights law and standards.

²⁷⁶ For example see, Chayes, A. and Meselson, M. Proposed Guidelines on the Status of Riot Control Agents and Other Toxic Chemicals Under the Chemical Weapons Convention, *Chemical Weapons Convention Bulletin*, volume 35, March 1997.

²⁷⁷ OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article II.9 and Article I.5.

²⁷⁸ Neill, D. (2007) *op.cit.*, p.12.

with CS would clearly be considered as preparation to use riot control agent in waging war, prohibited under the CWC."²⁷⁹

Using 105mm howitzer shells as an example, Chayes and Meselson have argued that “*there appears to be no legitimate application of [such] shells for ‘law enforcement including domestic riot control purposes’.*”²⁸⁰ They have also argued, that although the CWC “*might conceivably permit a small number of howitzer shells intended for use in training troops to operate in an environment containing toxic chemicals, the Convention would not permit a stockpile of such shells...*” and furthermore “*there is no obvious other military application for a stockpile of howitzer shells that would not amount to use as a method of warfare.*”²⁸¹ Consequently, Chayes and Meselson have concluded: “*Thus a State possessing a stockpile of shells of this type would be required to treat the shells as chemical weapons, and they would be subject to the Convention’s prohibitions on production, acquisition, retention, use, and transfer, and to the Convention’s provisions on declaration and destruction.*”²⁸²

3.4. Current discourse on RCA munitions and means of delivery within the OPCW

Although the CWC specifically included munitions and means of delivery within its definition of a chemical weapon under Article II.1, there is continuing ambiguity as to the type and specifications of those RCA means of delivery that are prohibited. This ambiguity has potentially dangerous consequences, allowing divergent interpretations, policy and practice amongst States Parties to emerge.

A U.K. official questioned in November 2008 described the situation for RCA munitions: “*Whether the development of large mortar shells, cluster munitions or RPGs filled with RCA is a breach of the CWC would be a matter for SPs [States Parties] to judge in the light of the circumstances. However, to date SPs [States Parties] have not reached any common understandings on such matters. The U.K. believes it would be helpful if SPs [States Parties] were to do so, but at present there is no consensus among SPs [States Parties].*”²⁸³

Despite subsequent civil society and media reports detailing commercially available large calibre RCA munitions and other “wide area” RCA means of delivery potentially in conflict with the Convention²⁸⁴, as of 3rd April 2013, no OPCW policy making organ had formally

²⁷⁹ NATO, Research and Technology Organisation, AC/323(HFM-073)TP/65, The Human Effects of Non-Lethal Technologies, August 2006, <http://www.rta.nato.int/Pubs/RDP.asp?RDP=RTO-TR-HFM-073>, (accessed 20th July 2009) chapter 6, p.9.

²⁸⁰ Chayes, A. and Meselson, M. (1997) *op.cit.*, p.14.

²⁸¹ Chayes, A. and Meselson, M. (1997) *op.cit.*, p.14.

²⁸² Chayes, A. and Meselson, M. (1997) *op.cit.*, p.14.

²⁸³ UK government official, correspondence with author, 10th November 2008, as cited in: Crowley, M. Dangerous Ambiguities: Regulation of riot control agents and incapacitants under the Chemical Weapons Convention, Bradford University, October 2009, p.113.

²⁸⁴ See for example: BNLWRP, ISS and ORF, Destruction by Turkey of all remaining 120mm mortar munitions containing CS: A briefing note for CWC States Parties, 12th September 2011, <http://www.omegaresearchfoundation.org/assets/downloads/publications/Briefing%20Paper%20Turkey001.pdf> (accessed 14th February 2013); BNLWRP, ISS and ORF, The production and promotion by a Russian Federation company of a range of munitions containing chemical irritants: A briefing note for CWC States Parties, 12th September 2011, http://www.brad.ac.uk/acad/nlw/publications/russia_crowley.pdf (accessed 14th February 2013). These briefing papers were distributed by BNLWRP, ISS and ORF to the Director General, Executive Council and all CWC States Parties. See also: Crowley, M. (October 2009) *op.cit.*, pp.107-109; Schneidmiller, C. Danger of "Nonlethal" Agents Grows Amid States' Inaction, Report Says, *Global Security Newswire*, 6th November 2009; Crowley, M. Toxic traps - weaknesses of the

addressed the regulation of such RCA means of delivery under the CWC. However, in its report to States Parties in preparation for the Third Review Conference, the Scientific Advisory Board (SAB) did raise the issue of RCA means of delivery, and stated that “*The SAB notes with concern isolated reports of the commercial availability of munitions apparently designed to deliver large amounts of riot control agents over long distances.*”²⁸⁵

To date, few States Parties have clarified their position regarding the regulation of RCA munitions under the CWC. One notable exception, however, has been Turkey. In correspondence to BNWLRP, ISS and ORF, the Turkish Ambassador has stated Turkey’s view that the 120mm CS MKE MOD 251 munition (previously manufactured and promoted by Turkish company, Makina ve Kimya Endustrisi Kurumu [MKEK]) was prohibited under the CWC and that such prohibition would extend to other “*mortar ammunition containing tear gas or any other prohibited substance...*”²⁸⁶ This position was further elaborated in correspondence to BNLWRP, ISS and ORF from the Turkish Counselor to the OPCW, that highlighted the activities of the Turkish Ministry of Defence to inform all licensed arms brokering companies in Turkey that “*trading 120mm CS mortar ammunition is not permissible under Turkey’s CWC obligations*”.²⁸⁷ Turkey's position was recently reaffirmed by the Turkish Ambassador in correspondence to BNLWRP and ORF, dated 29th March 2013.²⁸⁸ Turkey’s corresponding actions in destroying all remaining 120mm CS MKE MOD 251 munitions, together with epoxy models and promotional materials, and its attempts to halt the trade, promotion and brokering of such munitions have clearly underlined this position.²⁸⁹ The information provided by the Turkish Government and its robust actions in this area have, therefore, been of great importance as they have provided a powerful precedent for developing common understandings and approaches to this issue.

chemical control regime, *Jane’s Intelligence Review*, December-January 2009; Hatch Rosenberg, B. Riot Control Agents and the Chemical Weapons Convention, Open Forum on Challenges to the Chemical Weapons Ban, Federation of American Scientists Working Group on Biological and Chemical Weapons, The Hague, Netherlands, 1st May 2003, <http://www.fas.org/bwc/papers/rca.pdf>. (accessed 14th February 2013).

²⁸⁵ OPCW, Conference of the States Parties, Report of the Scientific Advisory Board on Developments in Science and Technology for the Third Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention, RC-3/DG.1, Third Review Conference, 8 – 19 April 2013 29 October 2012 Paragraph 56, http://www.opcw.org/index.php?eID=dam_frontend_push&docID=15865 (accessed 11th January 2013).

²⁸⁶ Correspondence from Ambassador Dogan, Permanent Representative of Turkey to the OPCW, to BNLWRP, ORF and ISS, 25th February 2011. Available on: http://www.brad.ac.uk/acad/nlw/publications/turkey_1_Crowley.pdf (accessed 14th February 2013).

²⁸⁷ Correspondence from Mr Utkan, Counsellor, Permanent Representation of Turkey to the OPCW, to BNLWRP, ORF and ISS, 8th July 2011. Available on: http://www.brad.ac.uk/acad/nlw/publications/turkey_2_Crowley.pdf (accessed 14th February 2013).

²⁸⁸ Correspondence from Ambassador Dogan, Permanent Representative of Turkey to the OPCW, to BNLWRP and ORF, 29th March 2013. (Copy held by author).

²⁸⁹ Correspondence from Ambassador Dogan (25th February 2011) *op.cit.*; correspondence from Mr Utkan (8th July 2011) *op.cit.*

4. Conclusions and recommendations for CWC States Parties

4.1. Conclusions

Although the CWC specifically included munitions and means of delivery within its definition of a chemical weapon under Article II.1, there is continuing ambiguity as to the type and specifications of those RCA means of delivery that are prohibited. This ambiguity has potentially dangerous consequences, allowing divergent interpretations, policy and practice amongst States Parties to emerge.

This report has highlighted the development, testing, production and commercial promotion of a range of munitions and delivery systems that could be utilised for delivering significant amounts of RCA over wide areas or over extended distances. Certain forms of such “wide area” RCA means of delivery may have utility in large scale law enforcement situations provided they meet the CWC “types and quantities” provision and are employed in conformity with human rights standards; however some could also be readily misused in armed conflict, thereby breaching the CWC. Such means of delivery should be stringently regulated to prevent misuse.

Other forms of “wide area” RCA means of delivery appear to be completely inappropriate for any form of law enforcement, having possible utility only in armed conflict. Such means of delivery inherently breach the CWC “types and quantities” provision and/or the prohibition on use of RCAs as a “method of warfare”. They should be considered to be chemical weapons and treated accordingly.

Despite the development and promotion of a range of “wide area” RCA means of delivery potentially in conflict with the Convention, none of the OPCW policy making organs have effectively addressed this situation to date. Given the evident dangers arising from the unregulated production, proliferation and misuse of such means of delivery, BNLWRP and ORF believe that the OPCW should address this issue as a matter of urgency.

4.2. Recommendations for CWC States Parties

BNLWRP and ORF recommend that the relevant policy making organs of the OPCW – namely the Executive Council and the Conference of States Parties – in consultation with the Technical Secretariat should:

- Develop a process for determining prohibited means of RCA delivery;
- Develop a clarificatory document detailing prohibited RCA means of delivery;
- Strengthen existing RCA declaration and reporting measures, and explore the feasibility and utility of introducing appropriate monitoring and verification measures.

In addition, States Parties should utilise existing CWC consultation, investigation and fact - finding mechanisms where activities of potential concern come to their attention, such as the reported development, marketing, transfer, stockpiling or use of prohibited means of RCA delivery.

4.2.1. Develop a process for determining prohibited means of RCA delivery

Recommendation: The OPCW should develop criteria and a suitable process for determining which means of RCA delivery are inappropriate for law enforcement purposes and would breach Article II.1 and/or Article I.5 of the CWC. If agreed by the Organisation, proposals for appropriate criteria and a determination mechanism could be developed by the Technical Secretariat. These proposals could then be submitted for the consideration of an appropriate forum of the OPCW, such as the Executive Council or Conference of States Parties.

The OPCW may wish to consider the following factors when developing criteria for determining permissibility of RCA means of delivery under the CWC:

i.) Total quantity of toxic chemical delivered to target:

Factors affecting the quantity of active agent delivered to the target will vary according to the specific means of delivery and the frequency with which it is employed, but will include:

- Quantity of agent mixture/solution in a delivery system e.g. amount of filler in an individual large calibre munition; total quantity contained in cluster bomb sub-munitions; total amount of agent mixture held in a multiple munition launcher fully loaded with RCA munitions; agent solution contained in a large capacity spray or fogger tank;
- Concentration of active agent in the agent mixture;
- Rapidity of complete cycle of fire/rapidity of re-load for multiple RCA munition launchers, automatic RCA grenade launchers; rapidity of agent discharge from large capacity foggers or sprayers.

ii.) Nature of toxic chemicals delivered:

Consideration should be given to all potentially toxic chemicals contained in the munition, means of delivery or dispersal mechanism, such as the carrier and propellant, as well as the RCA itself. Analysis should be undertaken of each toxic chemical individually and also of whether and how they may interact. Although certain toxic chemicals may be classed as RCAs and considered suitable for dispersal in limited amounts over narrow areas (e.g. in hand held sprayers) in law enforcement activities, their chemical properties (including

potency and toxicity) may make them unsuitable for dispersal in large amounts over wide areas.

iii.)Discrimination:

- *Effective coverage area:* Certain means of RCA delivery such as airburst munitions and cluster munitions are solely intended to disperse RCAs directly (or indirectly via sub-munitions) over an extremely wide coverage area. Other systems - such as multiple RCA munition launchers, automatic RCA grenade launchers, large capacity foggers - may have the capability of delivering more limited quantities of RCAs or individual RCA munitions, but are also intended for the rapid blanketing of large areas with RCAs. Such wide area application raises potential concerns over the discrimination of such delivery systems which are likely to affect nearby individuals not participating in the crowd being targeted. Furthermore, there are potential concerns that certain vulnerable individuals, such as children, the elderly, those suffering from respiratory illness as well as those otherwise incapacitated or immobilised (e.g. wounded individuals) may be unable to escape such wide area RCA coverage before suffering serious injury or potential fatality through asphyxiation or as a result of the toxic effects of the RCA.
- *Effective range:* Munitions with extended effective ranges such as certain mortar rounds or artillery projectiles may not be suitable for riot control or other law enforcement purposes as it is unlikely that they will be sufficiently targetable or discriminate in their effects at such extended ranges.
- *Target activated munitions:* certain munitions, for example “less lethal” RCA landmines, certain RCA cluster munitions and RCA munitions with trip-wires, are inherently indiscriminate weapons that could be triggered through the actions of unintended targets such as children.

iv.)Physical characteristics of the munition or means of delivery not related to RCA toxicity: Consideration should be given to the risk of serious injury or fatality that may arise as a result of the impact of the munition, sub-munition, components or shrapnel. Factors to consider include the weight, calibre, length of the munition, its constituent materials and design, the velocity at which the munition is launched or the height at which it is dropped; all of which will affect the kinetic energy that the munition or its components will possess at the moment of impact with the target. Consequently, information on the launch mechanism (e.g. whether the munition is fired from a mortar, howitzer, etc.) will be of relevance. Certain airborne munitions may contain bursting devices which, as well as disseminating the RCA, may also result in the production of (metallic or non-metallic) shrapnel.²⁹⁰ Also of relevance are concerns about potential injury or fatality to individuals in close proximity to munitions with explosive charges such as “less lethal” landmines and cluster munitions.

v.)Purpose and manner of employment:

The following factors should be taken into consideration when seeking to determine the

²⁹⁰ Although the dangers of metallic shrapnel are well known, health professionals have also highlighted the potentially fatal effects of non-metallic (e.g. plastic) fragments imbedded in the human body. See for example: Non-metallic and metallic craniocerebral missile injuries: Varied outcome; Bhat, A., Wani, M., Kirmani, A., Altaf, U., Raina, T., Alam, S., Arif, S. *Indian Journal of Neurotrauma (IJNT)* 2010, volume 7, number 2, pp. 113-122.

purposes for which the means of delivery are intended:

- The level of inter-operability of the RCA munition with existing conventional military armaments: an assessment should be undertaken of whether the munition's design would allow it to be utilised with existing military equipment such as mortars, howitzers, rocket launchers, helicopters, high-speed aircraft, unmanned aerial vehicles and unmanned ground vehicles, that would render it rapidly adaptable for use as a “method of warfare”;
- The nature of the entities that have undertaken, managed and/or funded relevant research, development and production of the means of delivery;
- Whether the RCA munitions and means of delivery have been promoted solely for use by law enforcement entities in riot control and other law enforcement purposes, or whether they have been promoted as having multiple utilities, and have been marketed for use by military or security forces in certain armed conflict scenarios;
- The nature of the entities – police, gendarmerie, army – that currently hold stockpiles of the RCA means of delivery and/or have been authorised to deploy and utilise such means of delivery, and under what rules of engagement;
- The circumstances in which the specific (or similar) types of RCA munitions and means of delivery were deployed and utilised in practice. For example, have they only been utilised in crowd control situations or have there been confirmed reports of their use by military or security forces in certain armed conflict situations.

4.2.2. Develop a clarificatory document detailing prohibited RCA means of delivery

Recommendation: *The OPCW should develop a clarificatory document for States Parties detailing those means of RCA delivery that are considered inherently inappropriate for law enforcement purposes and breach Article II.1 and/or Article I.5 of the CWC. All States Parties would be prohibited, under Article I.1, from developing, producing, stockpiling, marketing, transferring or using such means of delivery. Subsequently, all States Parties currently possessing such prohibited means of RCA delivery should declare such items to the Technical Secretariat as required under Article III.1 and verifiably destroy such means of delivery as required under Article I.2 of the Convention.*

If agreed by the Organisation, a clarificatory document containing a proposed list of prohibited means of RCA delivery should be developed by the Technical Secretariat. This document could then be submitted for the consideration, review and approval of an appropriate forum of the OPCW, such as the Executive Council (EC) or Conference of States Parties (CSP). The clarificatory document should be reviewed regularly in an appropriate forum such as the EC or CSP to determine whether additional items should be added in the light of developments in science and technology.

An analysis of the means of RCA delivery currently developed or under development was carried out against the criteria detailed in Section 4.1. Listed below are those means of RCA delivery that the OPCW should consider prohibiting because they are inherently inappropriate for law enforcement purposes:

- High capacity foggers or spray devices that contain inappropriate amounts of active

- RCA in their tanks²⁹¹;
- Automatic grenade launchers and associated RCA grenades that deliver inappropriate amounts of active RCA in one firing cycle;
 - Multiple launch mechanisms and associated RCA munitions that deliver inappropriate amounts of active RCA in one firing cycle;
 - Rocket propelled RCA grenades and associated launchers;
 - Large calibre aerial RCA munitions;²⁹²
 - Large calibre RCA mortar munitions;
 - RCA cluster munitions;
 - RCA dispersal mechanisms on aerial platforms (e.g. aircraft, helicopters and UAVs), that disperse an inappropriate amount of active RCA;
 - Any other means of RCA delivery that carry or disperse an inappropriate amount of active RCA.
 - Any other means of RCA delivery that do not allow appropriate levels of targetability and discrimination.²⁹³
 - Any other means of RCA delivery that, as a result of design or physical characteristics not related to RCA toxicity, present an unacceptable risk of serious injury or fatality.

There are a range of multi-purpose means of delivery and dispersal that as well as disseminating RCAs can also be utilised for the dissemination of a wide variety of lethal or “less lethal” payloads (such as flash-bangs and sting-balls) that do not come under the scope of the CWC. The proposed list of prohibited items above would include only those means of delivery solely intended for disseminating RCAs²⁹⁴ – whether or not they have been filled with such chemicals.

4.2.3. Strengthen existing RCA declaration and information-sharing measures, and explore feasibility and utility of monitoring and verification measures

The CWC requires that States Parties submit an initial declaration of all chemicals that are kept for riot control purposes. Consequently, all States Parties are required to supply the chemical name, structural formula and Chemical Abstracts Service (CAS) registry number, for each chemical kept for such purposes. States Parties are also required to provide an update of the initial declaration 30 days after any change has become effective.²⁹⁵ However, States Parties are not required to provide any information about the quantities of RCAs that they possess. Furthermore, there is no requirement upon States Parties to provide any information regarding the types, quantities or the location of any “wide area” RCA means of delivery stockpiles held, nor provide any details of whether they are under military or civilian law enforcement agency control.

²⁹¹ Definition and thresholds for “inappropriate amounts of active RCA” will need to be determined by an appropriate OPCW body in consultation with the Technical Secretariat.

²⁹² Definition and thresholds for “large calibre” will need to be determined by an appropriate OPCW body in consultation with the Technical Secretariat.

²⁹³ Determination of what constitutes “appropriate levels of targetability and discrimination” will need to be undertaken by an appropriate OPCW body in consultation with the Technical Secretariat.

²⁹⁴ Such constraints should also be applicable to means of delivery intended for dispersal of other toxic chemicals including malodorants and incapacitants.

²⁹⁵ OPCW, Chemical Weapons Convention, (1993) *op.cit.*, Article III.1(e).

In addition, once a State Party has submitted their initial RCA declaration there are no monitoring or verification provisions to ensure that such declarations are full and accurate, i.e. the Technical Secretariat has no authority to undertake routine inspections to verify the information on RCA possession provided by States Parties.²⁹⁶

Effective declaration, information-sharing, monitoring and verification measures could play an important role in combatting the possession of prohibited RCA means of delivery and in alerting States Parties to the emergence of militarily significant stockpiles of other “wide area” RCA means of delivery²⁹⁷, allowing them to address concerns before they escalate.

Recommendation: *The OPCW should expand the range of information provided by States Parties in their RCA declarations in fulfilment of Article III.1(e). To facilitate this process, the Technical Secretariat should be tasked with developing recommendations for relevant information categories for consideration by States Parties at the appropriate OPCW forums i.e. Executive Council or Conference of State Parties. Such information should include details of:*

- *Name, structural formula and CAS number of each type of RCA and quantities held;*
- *Nature and quantities of the associated “wide area” RCA munitions, means of delivery and dispersal;*
- *Locations of, and authorities responsible for holding, stockpiles of RCAs and associated “wide area” RCA munitions, means of delivery or dispersal;*
- *Entities permitted to use RCAs and associated “wide area” RCA munitions, means of delivery or dispersal;*
- *Nature of intended use.*

In line with existing obligations, States Parties should be required to provide an update of the initial declaration 30 days after any change has become effective. These expanded reporting obligations could be introduced as voluntary confidence building measures (CBMs) – similar to the CBMs utilised by States Parties to the Biological and Toxin Weapons Convention. Alternatively the CWC could be amended so as to make such measures mandatory for all States Parties.²⁹⁸ As a means of promoting confidence and best practice in this area, all States Parties should now consider unilaterally providing the Technical Secretariat with the additional information regarding holdings of RCAs and related “wide area” means of delivery outlined above.

In addition, the OPCW should study the potential feasibility and utility of introducing appropriate monitoring and verification measures undertaken by the Technical Secretariat to ensure that declarations submitted by States Parties concerning possession of RCAs and associated “wide area” means of delivery are full and accurate.

²⁹⁶ OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article III.

²⁹⁷ Providing they meet the “types and quantities” restriction, a range of “wide area” RCA means of delivery (such as certain RCA grenades/launchers, multiple RCA munition launchers, large RCA back-pack sprayers) may potentially be utilised for law enforcement in certain circumstances (such as dispersal of a large and violent crowd), but could also readily be employed in armed conflict. Whilst a State Party may require a limited number of such “wide area” RCA means of delivery for law enforcement purposes, if that State acquired large numbers of such means of delivery and they were held by certain military forces this may indicate an intention to use them in armed conflict.

²⁹⁸ OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article XV (1)-(3).

4.2.4. Utilise existing consultation, investigation and fact-finding mechanisms

Where a State Party is concerned about the possible non-compliance of another State Party it can initiate a range of consultation, clarification and fact-finding mechanisms under the Convention.²⁹⁹ These range from informal bilateral consultations to full-fledged challenge inspections and investigations of alleged use of chemical weapons. They include on-site challenge inspections of any facility or location in the territory or in any other place under the jurisdiction or control of another State Party.³⁰⁰ If such procedures fail to adequately clarify the situation or do uncover evidence of non-compliance, the matter can be passed to the Executive Council or to a Special Session of the CSP for resolution.³⁰¹

***Recommendation:** States Parties should utilise existing CWC consultation, investigation and fact -finding mechanisms where activities of potential concern come to their attention such as the reported development, production, marketing, transfer, stockpiling or use of prohibited RCA means of delivery or the emergence of militarily significant stockpiles of other “wide area” RCA means of delivery. If bilateral consultations with the relevant States Parties are not fruitful, concerned States Parties could consider a formal request under Article IX of the CWC.*

²⁹⁹ OPWC, Chemical Weapons Convention (1993) *op.cit.*, Article IX.

³⁰⁰ OPCW, Chemical Weapons Convention (1993) *op.cit.*, Articles IX.8 to IX.25.

³⁰¹ OPCW, Chemical Weapons Convention (1993) *op.cit.*, Articles IX.3 to IX.7, IX.23.