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STUDY REPORT

ON

Development and Testing of Effective Non-lethal Weapons/ Technologies and Tactics for Countering Public Agitation with Minimum Force

Bureau of Police Research & Development

Disclaimer

The Bureau of Police Research & Development has conducted a Research Project Study on Topic ***"Development and Testing of Effective Non-Lethal Technologies/Equipment and Tactics for Countering Public Agitation with minimum Force"*** *through M/s Orkash Services Pvt. Ltd., New Delhi. The aim of the study is to understand different technologies (Non/Less Lethal) available worldwide and their utilization under different law and order situations.*

The aim of the circulation of this study to all the stakeholders is for knowledge sharing regarding the availability of Non/Less Lethal technologies worldwide. All recommendations are general in nature and the products of some specifications mentioned in the report are also readily available with other vendors/manufacturers. This Bureau does not endorse any product of any company mentioned in the report. Mentioning the name of the firm/company in the study does not carry any bearing.

The contents of this report are merely guideline for law enforcement agencies as a ready reference and not for usage for any other purpose or for any legal issues involved.

List of Abbreviations Used

ADS – Active Denial System

AEP - Attenuated Energy Projectile

AFSPA – Armed Forces Special Powers Act

ANLM - Airburst Non-Lethal Munition

ASRAP - Advanced Segmented Ring Airfoil Projectile

BA - Bromoacetone

BTWC - Biological and Toxin Weapons Convention

BWC - Biological and Toxin Weapons Convention

CCW - United Nations Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons

CED - Conducted Energy Devices

CENWOSTO - Central Workshop and Stores

CN – Chloroacetophenone

CS - Ortho - Chlorobenzylidene Malononitrile

CR - dibenz(b,f)-1:4-oxazepine)

CWC – Chemical Weapons Convention

DM – Diphenylaminearsine

EMD - Electro Muscular Disruption

FIFO – First in First Out

HIDA - High Intensity Directed Acoustic

IDF - Israel Defense Forces

INSAS – Indian Small Arms System

IWC - Inhumane Weapons Convention

JNLWD - Joint Less Lethal Weapons Directorate

KMSS - Krishak Mukti Sangram Samiti

LLNL - Lawrence Livermore National Laboratory

LLWs – Less Lethal Weapons

L&O – Law and Order

LRAD - Long Range Acoustic Devices

LSD - D-lysergic Acid Diethylamide

LV – Low Velocity

MBL – Multi Barrel Launcher

MSDD - Multi-Sensory Distraction Device

MSGL – Multi Shell Grenade Launcher

MUSHTI – Multi Baton Round

MV – Medium Velocity

NCNC - No Cost and No Commitment

NDRC - National Defense Research Committee

NIOSH - National Institute of Occupational Safety and Health

NITRA - Northern India Textile Research Association

OC - Oleoresin Capsicum

OLDS - Overhead Liquid Dispersion System

OPCW - Organisation for the Prohibition of Chemical Weapons

PAG – Pump Action Gun

PAGST - Personnel Armored Support Ground Troops

PBR – Plastic Baton round

PEL - Premier Explosive Limited

PC – Polycarbonate

PTC - Police Training School

PVAB - Portable Vehicle Arresting Barrier

QRTs - Quick Reaction Teams

RAG - Ring Airfoil Grenade

RCAs – Riot Control Agents

RGES - Running Gear Entanglement System

SLR – Self Loading Rifle

SWAT – Special Weapons and Tactics

TSM – Tear Smoke Munition

TSU - Tear Smoke Unit

UAV – Unmanned Aerial Vehicle

UBGL – Under Barrel Grenade Launcher

UGEs – Under Ground Elements

VLAD - Vehicle Lightweight Arresting Device

Preface

The Project titled "Development and Testing of Effective Non-Lethal Technologies and Tactics to Counter Public Agitation with Minimum Force" is one of the projects accepted by the Standing Committee chaired by then Union Home Secretary on 29.02.2012 at MHA.

The aim of this Project is to examine the following: -

i) Non-lethal equipment/ammunition being used by the Police Forces
ii) Shortfall of non-lethal weapons, the reasons and solutions
iii) Efficacy of the various equipments in actual situation.
iv) Need of other equipment to be inducted in the Forces.
v) Evaluation of problems faced by State Police Forces in controlling agitation and solutions thereof.
vi) Study of existing non-lethal weapons and their use in the actual field conditions.
vii) Study of the new non-lethal equipment available in the market and their efficacy.
viii) Simulation of various operational scenarios for implementation of non-lethal technologies.

To ensure the wide range of field inputs/surveys about the crowd behavior, terrain geography and weather conditions in various States, Bureau had requested the research team to visit at least 10 States (J & K, Manipur, Assam, West Bengal, Maharashtra, Andhra Pradesh, Rajasthan, Uttar Pradesh, Haryana and Punjab). Besides, team was also requested to interact with personnel of RAF at Hyderabad and CAPFs deployed in Srinagar, Kolkata, Imphal and Guwahati.

In order to ensure the quality of the study, the Bureau had decided to organize a national level workshop and demonstration of some of the selected new less lethal weapons and equipment on interim findings of the report. These workshops and demonstrations were organized at BSF Bhondsi, Firing Range and CRPF Academy Khadarpur on 12.09.2012 & 19.11.2012 respectively. During these workshops, one to one interactions and Focused Group Discussions (FGDs) were carried out with the personnel of State Police, CRPF, RAF and BSF at all the three levels – junior, middle and senior.

The topic being a least studied area of research at least in the Indian context, larger emphasis had been placed on primary research and field data gathering.

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Part 4: Field Inputs and Analysis

Annexures

Executive Summary and Recommendations

Executive summary of the report and the recommendations of the study are discussed in two parts in below paragraphs. Summary of the findings are discussed in Part 1 and the recommendations are presented in Part 2.

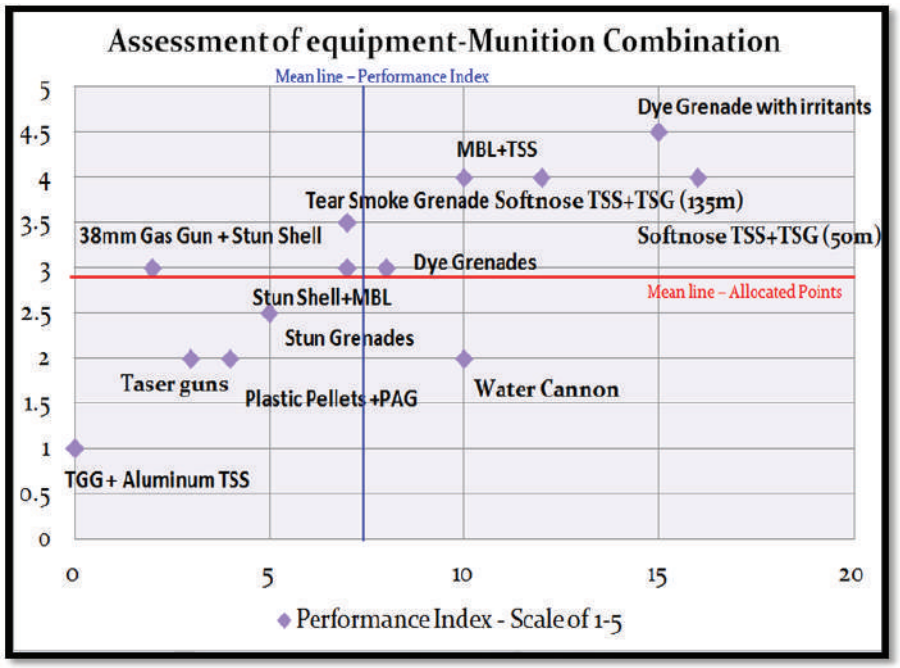
Part 1 – Summary of Findings

Complexity in Riot Management: Riot management in India is an extremely complex domain and is dictated by multitude of factors and variations owing to aspects like geography, terrain, socio-political aspects, demographics, inter-community issues, extremism, nature of the agenda of the mob, crowd psychology, intensity/hostility levels, cause of violence (communal, anti-state, extremist fuelled and separatist), strength of police personnel, force escalation options and communication methodologies, varying crowd tactics and crowd behaviour from a region to region.

Crowd Behavior and Tactics: Widespread differences were noticed in composition and behavior of the crowd across the country. Kashmir is characterized by hostile crowds who indulge in skilful stone pelting, hurl abuses and throw burning kangries during agitations. Manipur is characterized by women led movements. Agitations in the Telangana region of Andhra Pradesh usually have political backing. Riots in Assam were at times insurgents driven, and also found to have an element of intercommunity rivalry on a few occasions. This issue of complexity requires scientific approach that involves systematic riot control planning.

Importance of Less Lethal Weapons: Police personnel lack adequate modern-day less lethal weaponry. Growing resistance among general populace to tolerate high handedness and deaths caused by the law enforcement agencies deployed in crowd control operations, greater significance of human rights considerations, intense media scrutiny and the widespread condemnation of use of lethal force against protesting citizens have resulted in causing a gap with respect to availability of relevant and acceptable less lethal weapons to be used in crowd control operations. The need to induct new less lethal technologies along with changes in the associated operating procedures, training and concept of operations are being realized. Hence, this study was undertaken to identify the right equipments for countering public agitation with minimum force. Significantly, the study examined the currently used less lethal weapons, their efficacy, and shortfall, the problems faced by the state police forces while using those weapons, new less lethal options, and their suitability to Indian conditions. Further, the study also examined various operational scenarios in detail and the application of relevant less lethal weapons.

Need for Indoctrination: Orkash team's field visits revealed that the less lethal weapons provided to the personnel handling riots are skewed towards munitions manufactured at Tear Smoke Unit - Tekanpur. It was found that they have choices to use these munitions at all the three ranges, short, medium and long (up to 145 metres. Less lethal anti personnel chemical technologies (ammunitions) have been incorporated with respect to crowd control. Nevertheless, the indoctrination among the field personnel of the importance of timely application of these weapons with respect to crowd control has not been adequately done across states. Significance and importance of less lethal weapons were recognized and appreciated at the middle and senior level. However, the same recognition and appreciation were found lacking at the lower level. During our interactions with a senior police officer in various places, we were told that the field personnel perceive that tear smoke munitions and stun munitions fail to create adequate deterrence among the rioters, and hence prefer to use lathis which they perceive generates enough fear. Our findings indicate that an important reason for this is the inadequacy in the weapons as well as operational procedures that are currently employed. Another important area is that of training where there was found to be a general lack of infrastructure and formal refresher courses in crowd and riot control for police personnel.



Assessment of Equipment – Munition Combination: The graph below gives us the perception of the field personnel on the aspect of equipment-munition combination. Y-axis measures the importance of the weapons and X-axis the performance.

Dye Grenade with irritants is the most preferred. This combination has been rated high on both performance and importance. This is followed by Multi barrel launched Tear Smoke Shell and Tear Smoke Grenade Softnose (both 135 and 50 meters). The combination of 38mm Gas Gun and Stun Shells have been rated low on performance because of the malfunctioning of shear pin and formation of soot deposits, and the inability of the gas gun to put down a rapid-rate of fire (maximum rate of fire is two rounds per minute, which is highly inadequate to saturate even a small an area with tear smoke). Water canon has been rated high on the performance but due to its limited application (size and weight constraints) it has been rated low on the importance. Aluminum tear smoke shell fired through Tear Gas Gun is the least preferred and has been rated 0 on the performance. This was mainly because aluminum shells can be thrown back by rioters.

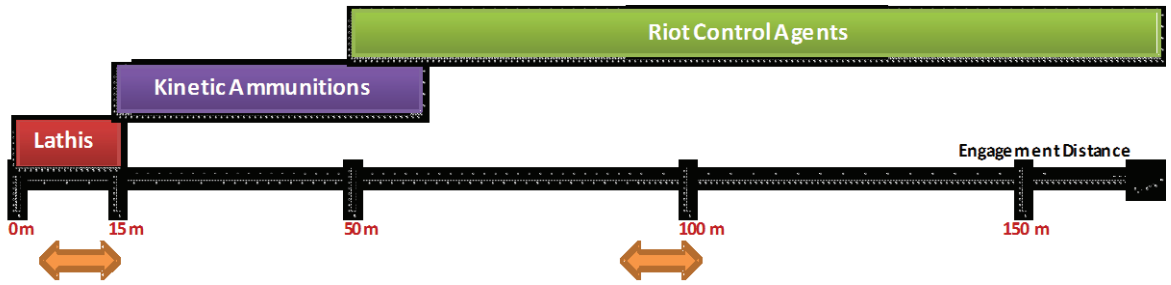
Lack of Effective Kinetic Munitions: There is a gap in the basket of less lethal munitions available to the personnel tackling crowd. Kinetic Munitions (or impact munitions) are essential for tackling crowd at short ranges (where tear gas or other irritants can not be used as these would impact the police force as well due to the close proximity of use). Consensus had been found across states in expressing that they lack effective (non TSU) munitions like kinetic based (plastic bullet, rubber pellet, rubber baton, rubber ball etc) technologies to tackle agitating crowd. The existing munitions relied upon so far under this category like plastic bullets and rubber pellets were found to be causing lethal effects (and therefore need urgent replacement with better and modern kinetic energy munitions). Lack of training and quantity of gun powder used in plastic bullets were referred as the primary reasons for general aversion with respect to these kinetic munitions. Owing to this, the personnel we interacted expressed their dissatisfaction over the performance of these weapons, and also not interested in using these weapons. Further, the launchers used to fire rubber batons and rubber pellets respectively 38 mm gas gun and 12 bore Pump Action Gun were found to have limitations. Our interactions also found that the rate of firing through modified .303 rifles is very low. The in modified .303 rifle for firing rubber batons is of Second World War vintage, and the ammunition is found to have near-lethal wound ballistics. The aspects like these pose operational issues and reportedly influence the decision making with respect to the use of less lethal weapons.

Alternative to Chemical Technologies: Less lethal weapons falling under the categories of kinetic (except water cannon), acoustic, electrical and directed energy are not widely used in India. It raises an important question that whether the absence of weapons under these categories are in proportion to the requirement or is their absence is due to non availability of adequate required technologies under these categories?. Our interactions with the field personnel did not yield an answer to a query if not for Tear Smoke Munitions then what. It highlights the limited options available with respect to less lethal weapons. Moreover, it was found that even the available limited choices are not used in effective manner due to issues like poor training, less awareness about importance of less lethal weapons, and the typically large size of crowds. It was found that owing to the larger size of the crowd, the field personnel find resorting to lathi charge as the most effective method of crowd control, and if that fail then their next option is resorting to use of live ammunition. Significantly, the option of resorting to lathi charge exposes the personnel to the crowd at a closer range jeopardizing their personal safety and security. It also permits the crowd to come to a close range, where its violence causing capabilities against police personnel and public property become highly effective (as at close range the crowd can effectively engage the police personnel with stone pelting and fire bombs etc). Desktop research, market mapping, interviews with Indian and foreign specialists and field interactions revealed that new technologies like acoustic (example: LRAD) and electrical (example: TASER) were being tried at a few places like Srinagar. However, the latter is viewed as a weapon of individual control, and the impact of former is yet to be fully seen (even in foreign countries).

Range and Distance: Mixed responses were found with the respect to the range and the distance where the field personnel would be comfortable in engaging protesters. In the states like Andhra Pradesh and Maharashtra, we were told that 100 metres distance is relatively enough, and in the states like Jammu and Kashmir and Manipur the need to tackle rioters or stop their advance beyond 100 metres were expressed. However, the general consensus as well as our overall finding is that the distance from where the rioters should be tackled is a decision influenced by a multiple of factors like

nature of agitation, crowd's emotional state, local terrain, and leadership, past history of the crowd violence /rioting and driving forces behind it.

Further, based on wide ranging considerations it was found that at various ranges different types of less lethal weapons and munitions should be resorted to. The picture below presents the details pertaining to it.



Options at Short Range: The options to tackle crowd at short ranges were found to be limited. Less lethal hand grenades were rated as effective. Our primary research revealed availability of a variety of options in the market with respect to hand grenades whose effective range is between 20 and 40 metres. There is no paucity of options for field personnel with respect to hand grenades. Our primary research revealed plastic tear smoke shell with soft nose launched through 38 mm gas gun as another chemical technology based option for our field personnel. The effective range of this ammunition is between 45 and 55 metres. The options like throwing grenades at crowd within 15 and 20 metres distance between the place where the personnel are positioned and the crowd might cause reverse effect, and hurt the police personnel too.

Except the options to use lathis, TASER and shock baton, shields and barricades, the police personnel lack other options to tackle crowd at short ranges. The options like electrical technologies, shock shield and shock batons were not widely used. It being electrically driven the field personnel expressed their concerns with respect to human right aspects. As a result, virtually the field personnel were left with lathis to tackle crowd at the short range. Our market research revealed certain options like tear gas direct flush and pepper gas direct flush manufactured by foreign countries, which can be launched at a distance of 3 metres. However, since the ammunitions like these are not used in India so far, there is a need for proper trial before these options can be explored in detail. Additionally, our interactions also revealed that placing of barricades like concertina coils would be significant tools to stop the advancing crowd.

Market research revealed another option to tackle agitating crowd at the short range of 20 to 50 metres. The study came across Pepper Ball Non Lethal Weapon System, manufactured by PepperBall Technologies Inc, USA. However, the launch of pepper balls requires separate launchers. These weapon systems were demonstrated at CRPF Academy – Gurgaon. It being a new system, there is a need for proper trials before it is inducted into the basket of less lethal weapons used in India.

Options at Medium Range: Our research revealed that with respect to medium range weapons and ammunitions at the moment there is a requirement to fill the existing gap, and one suggestion that emerged from the field interactions is that the quantity of gun powder used in plastic bullets needs to be reduced which will proportionately reduce its lethality.

Options at Long Range: With respect to range above 60 metres, our interactions with the personnel who are part of the crowd control exercise revealed that they chose between the munitions manufactured by Tear Smoke Unit. The field research revealed that the choice for the officers to tackle crowd at a distance from 60 to 150 metres is between tear smoke shells and stun shells. However, our interactions also revealed that the effective range of stun shell is around 100 metres, and beyond that the personnel rely on tear smoke shells to cause an impact.

Body Protectors: Vulnerabilities of police personnel being high at the short range, our findings echo the urgent need for better and quality body protectors in adequate quantities. Currently there are large gaps in these both in terms of quality and availability. The quality of body protectors used by field personnel requires overhauling. Further, the absence of good quality gear also impact the confidence and morale of police personnel. The body protection gear currently used by the police forces, as in the case of less lethal weapons is not uniform across the country. The forces have customized the features depending on the need and availability. However, there is a general trend of dissatisfaction across all the levels in the state and central police forces in terms of performance of body protection equipment. Our field surveys found very high rates of injuries and casualties to police personnel when facing violent crowds. This is largely because of lack of adequate quantities of well designed protective equipment.

It was also found that wherever refresher training and regular motivational talks were undertaken, there was a significant increase in the morale of the forces.

Helmet: Our interaction with the police forces across the country revealed that the helmets which are being used currently neither provide ear protection nor cover the neck area. It was suggested that the helmets should be of level II bullet proof, having a snug fit with eye visor and light weight. Our interactions also revealed that the design of helmets currently used is of Personnel Armored Support Ground Troops (PASGT). We were told that it is a very old American design made for their army, and the design of helmets is such that it provides protection only at the top and it is not specifically meant for use in riot control operations. Complete ear protection, complete protection to full head, face and neck, visor with mesh on top, to protect against non ballistic threats such as rocks, bottles, sticks etc. are stated as important requirements for helmet used in riot control operations. Our interaction with some private companies revealed that they have sold samples of helmets meeting these requirements to Gujarat police and National Police Academy, Hyderabad.

Gas Filter/ Mask: Police forces across the world use NIOSH, (National Institute of Occupational Safety and Health), USA, approved gas masks which provide protection against CN and CS tear gas. They have a shelf life of five to 10 years, and do not deform after prolonged usage even in extreme climates. But the masks which are currently being used in India were found to be lacking capacity to withstand chilli and tear smoke. There is a need for gas masks which are effective against tear smoke and RCAs.

Shields: The riot shields currently used (Mark IIB Shields) are of Polycarbonate (PC) ones and are indigenously manufactured. These are 4mm thick shields. Our field visits, especially the one at Baramullah revealed that the poly carbonate shields used by them develop cracks at places where there are rivets and bolts either due to heat or due to hit of some hard objects like stone. It makes the shield weak. Further, the shields also found to be passing the energy directly into the hands of an

officer handling the shield. It lacked mechanism to stop direct transferring of energy onto the hands. Another issue with these PC shields is that when they are used to push the protestors backwards, the handle gets locked causing pain to the policemen. Further, the Jaipur state police noted that the shield glass being used was of poor quality leading to poor visibility.

Twin Purpose Launchers: The need for weapons/launchers which can be used to launch both lethal and less lethal munitions has been found. The advantage of which as told by the field personnel is that it negates the requirement to carry two weapons, one to fire lethal and another one to fire less lethal munitions. The recommendations from the field personnel as well as from trials conducted on modern weapons available in the market are that Under Barrel Grenade Launchers (UBGLs) can be attached to INSAS or SLRs. Our primary research also revealed the urgent need for Multi Shell Grenade Launcher (MSGL), unlike single shot Guns and UBGLs, as MSGLs are the only hand-held weapons that can put down a rapid rate of fire to saturate an area with riot control agents. MSGL was test fired and evaluated on two separate demonstrations during the course of this study by police/para-military/BPR&D personnel in live demonstrations, and found suitable for platoon level deployment.

Tactical Mobility: Our field surveys revealed a gap in the availability of vehicles which can penetrate through the mob and reach to the other end. Vajra vehicles and modified gypsy vehicles were found to be meeting the requirement in a limited manner owing to its shortcomings like ad hoc design, limited protection and mobility. Armoured gypsy vehicles that are in use in India are unstable and lose balance when loaded with people and also at times when the vehicles required taking sharp curve (which is the case while maneuvering in lanes and by-lanes in most parts of the riot-prone areas). They often topple down and are set ablaze by the rioters.

It was found that during the operational response to a mob disorder, light armoured vehicles are essential for swift mobilization and judicious allocation of police troops. Light armour protection vehicles equipped with multi barrel tear gas launchers, communication facilities, floodlight, and other needed paraphernalia will act as force multipliers by venturing into the crowd. These vehicles are likely to prove useful for rapid redeployment of police teams. Further, they can also be equipped with a public address system, distinctive audible sirens and blue flashing lights, and video cameras. Such vehicles are widely used internationally in conjunction with riot-control police. Various state police forces were found to have experimented with such locally modified vehicles, albeit in a limited manner.

On-site mobile command and control systems: Field surveys expressed the need for on-site mobile command and control systems. The light armored vehicles (or existing vehicles can be modified with armour protection) along with added necessary equipment be converted into command and control rooms that would receive field inputs from various communication systems, augmented with aspects like map based systems and CCTV feeds that can be quickly analysed, and subsequently commands be passed on to the men on the ground. This would be more effective than to communicate with a police control room which are generally kilometers away from the riot site.

***Mechanical efficiencies and maintenance troubles of tear gas guns*:** The field findings revealed that tear gas guns, which are currently the main-stay of the available anti-riot weaponry means at longer ranges, suffer from mechanical inefficiencies and maintenance issues such as malfunctioning of shear pin and formation of soot deposits. The weapon also gets heated up fast, thus limiting the amount of

munitions that can be fired. Its rate of fire and load-reload time is slow. It can effectively fire a maximum of two tear gas shells per minute. Since a tear gas shell gives smoke for 20 seconds, this effectively means that by the time the second shell is fired, the first shell has stopped giving smoke. As a result, an effective concentration of smoke at the crowd is found impossible to be achieved unless a number of gas guns are fired simultaneously. The gas gun also lacks sighting mechanism (it is patterned on the US gas gun of 1950s), which prevents accurate placement of shells at the target end. These aspects have a direct impact on the effectiveness of the munitions fired using the tear gas gun as the forces are not able to saturate the area with substantial amount of smoke. There is a need for better design of the weapon, material for gun body which would rectify these lacunae and improve efficiency. MSGLs are found to have the required characteristics to address the deficiencies of the gas gun.

***Vajra and Varun*:** Vajra and Varun vehicles faced with limitation of mobility. These vehicles lacked power steering. Due to their heavy size, these vehicles report maneuverability problems which reportedly affect the attempts of field personnel in bringing the agitating mob under control in a swift manner.

There is a need for power steering and sophisticated design that takes into account the turning radius, weight and stability of the vehicle while designing the armor on these vehicles. In addition, field inputs have indicated the need for miniature versions of Vajra and Varun so that they can be successfully maneuvered in the lanes and by-lanes of the riot prone areas.

***Multi Shot/Shell Grenade launchers*:** Forces have explained that quick saturation of an area with enough quantities of tear and chilli irritants at long range as well as usage of stun shells to create a is the need of the hour. Current equipment (38 mm gas gun) can launch only one TSM at a time (up to two shells at best in a minute) and is not able to achieve saturation of the area. Hence, the need for hand held multi shot grenade/shell launchers that can launch shells/ grenades/ combination in less time and saturate the area have been expressed.

***Demand-Supply gap*:** With respect to the availability to tear smoke munitions, there is a demand-supply gap in what is being demanded by the States vis-à-vis the demand made to TSU from BPR&D. While TSU has repeatedly stressed that they were able to meet the demand put forth to them by BPR&D, the states demand for ammunition was not being met. Curtailment of demand sent by the states at the BPR&D (central agency) taking into account the production capacity of TSU has been attributed as the reason behind this.

It points to a gap in supply, and highlights the need for increasing the production capacity of TSU. Our interaction with the officials from TSU has revealed that their capacity as on date is about 400000 munitions in a year and are forecasting an increase in the demand because of which they are looking at increasing the current capacity by 10 times through automation. Enhanced capacity of TSU would help in meeting the gap in future.

Field surveys revealed demand for Oleoresin Capsicum based grenades (manufactured by PEL, Hyderabad).

Further, supply gap also been found with respect to tear gas guns. Currently, on an average a platoon has only 2 tear gas guns.

***Standards*:** It was found that in the current context, due to lack of industry standards, poor quality equipments were being procured. Procurement procedures and quality requirements need to be laid down at the national level. In Kashmir, during 2010 riots, it was reported that due to lack of proper protection to eyes, ear and medulla oblongata area (neck), the forces have suffered severe casualties. There are absence of standards and laboratories in India that can test the equipment.

Inventory Management: Many tear smoke munitions go waste due to sublimation and expiry. Some states where tear gas is not widely used because of lesser frequency of riots face the problem of expiry of tear smoke munitions.

Legal action: A need has been expressed with respect to immediate legal action that needs to be taken on the arrested rioters. More often, due to the pending cases, these cases do not get resolved. The same rioter who has been acquitted in one riot participates in the other since he has no fear of law. This does impact adversely on the morale of Police. The same was the case with Kashmir couple of years ago. Today, special courts which prosecute these cases in Kashmir have come up and legal action takes place within days.

***Need for Variety of less-lethal munitions and an ecosystem of industry*:** Currently, the less lethal armory of our forces is limited with handful of weapons and ammunitions. Providing a variety of less lethal weapons allows them adequate flexibility to pick and choose force application that is relevant to the scenario. Market mapping also has indicated a gap in terms of lack of industrial players in this area (industrial inaction). In the case of SMEs that cater to defence needs, subsidies and incentives are being provided. However, in the internal security domain, no such incentive scheme exists.

***Training*:** Our interaction with various personnel revealed that there is an absence of regular training programmes. In Manipur, inadequate training of the forces has been cited as a major reason for the ineffectiveness of the less lethal weaponry on the ground. It is crucial for the man on ground to be well versed with the weapon system when he faces a hostile crowd, especially in the light of increased frequency of agitation and protests. Further, proper training and development is required not only regarding the technical know-how of the system, but should also cover aspects of crowd behavior and psychology, operational tactics (both vehicle and field formations), essential laws and conventions, negotiation skills, policing aspects etc. Although, state police forces have the primary responsibility of handling a riot situation as the first line of response, often times, Central Armed Police Forces (CAPF) are also utilized for this purpose. This highlights the need for joint training and exercises at the troop level, where state police personnel and paramilitary personnel get the opportunity to work together and train, and improve common operating procedures and inter-agency coordination. Kashmir is an example of this where multi-agency coordination happens seamlessly.

There is a need to adopt a framework based approach to riot control (as in the case of the developed countries which are often challenged with professional and tech savvy rioters). This would also involve conducting routine mock drills, developing crowd control training modules, refresher courses, as well as training the trainers. Currently, Tear Smoke Unit, Tekanpur undertakes training courses for the trainers who in turn are required to train the riot control units on the products of TSU. However, these training programs, which limit to a batch size of 60, are oversubscribed and the demand is not being met. There is a need for augmenting the capacity of training infrastructure.

Part 2 – Recommendations

Orkash team following the intense study presents its recommendations that are influenced by **five guiding principles** that emerged from this study, namely,

I. Use of minimum force

II. Tactical imperatives and constraints emerging from distance between rioters and police in any given (riot) situation

III. Ability to saturate the environment with riot control measures/agents for optimum impact on the crowd

IV. Use of combination of technologies for equipping police for optimum results in anti-riot role. This principal includes the ability for the police to rapidly transition from the use of less lethal weapons to use of lethal-force if the situations so demands (which is often the case in militancy/extremis affected areas).

V. Adequate quality protective equipment for the police personnel.

(These guiding principles are discussed in detail in Part 8 of this report)

Use of minimum force: The concept of 'use of minimum force' is a well-accepted overarching principal for handling civilian riots or public disorder situations. This translates in both the selection of weapons and technologies to be used for riot control, as also the concept of operations, operating procedures, tactical deployment of forces and the rules of engagement to be employed for riot control. This principal also entails that police personnel are adequately trained for use in less lethal equipment/weapons and sensitized to the 'softer aspects' of crowd management and that less lethal equipment/weapons be widely available for use by the police forces.

Tactical imperatives and constraints emerging from distance between rioters and police: A large and aggressive crowd should be contained at a distance greater than 50 metres, as within 50 metres the rioters are capable of throwing objects like stones and fire bombs on the police or their intended targets. The 50 meters distance is therefore a very important tactical consideration, as it provides the police personnel a safer zone from which to control the crowd and degrade its violence causing potential/capabilities. Maintenance of this minimum distance also prevents escalation of the 'mob' behavior of the crowd, which tends to get extravagated due to psychological factors when in a 'face to face' situation with the police. One important such psychological trigger in close-distance situations is the targeted hurling of abuses and provocative behavior that individuals in the crowd tend to indulge in to provoke the police personnel.

Ability to saturate the environment: A quintessential factor that goes into determining the effectiveness of riot control measures through the use of Riot Control Agents (RSAs), such as tear smoke munitions (TSMs), is the ability of the forces to saturate the environment within reasonable time duration so that large sections of the rioters are impacted as well as deterred from carrying out further or potential violent action.

Combination of technologies for equipping anti-riot police: Kinetic energy based munitions in combination with Riot Control Agents (RCAs) are found to be the most effective and efficient less lethal means of crowd control. A right balance of these two technologies equips the police to manage the crowds irrespective of distances, terrains, climate, mob dynamics etc. Usage of RCAs is the only and most effective way of controlling violent crowds at larger distances. Kinetic energy based equipments gain prominence as the rioters come closer to the police since the RCAs have usage constraints in such situations (since at close range the use of RCAs effects the police personnel as well). Another aspect is that the equipment and weapons configuration of a police force should permit a rapid transition from the use of less lethal weapons to use of lethal-force if the situations so demands (particularly when riot situations occur in militancy/extremis affected areas, or areas where armed organized crime elements operate or take shelter in crowd/riot situations).

The equipment and technologies needed for police force for crowd/riot management is not confined to weapons and ammunitions, but includes equipment across a wide range such as that needed for communications and command & control, surveillance, and tactical mobility to personal equipment such as equipment for ammunition carriage, subsistence means (i.e. composite rations) to enable police personnel to operate for long periods, etc.

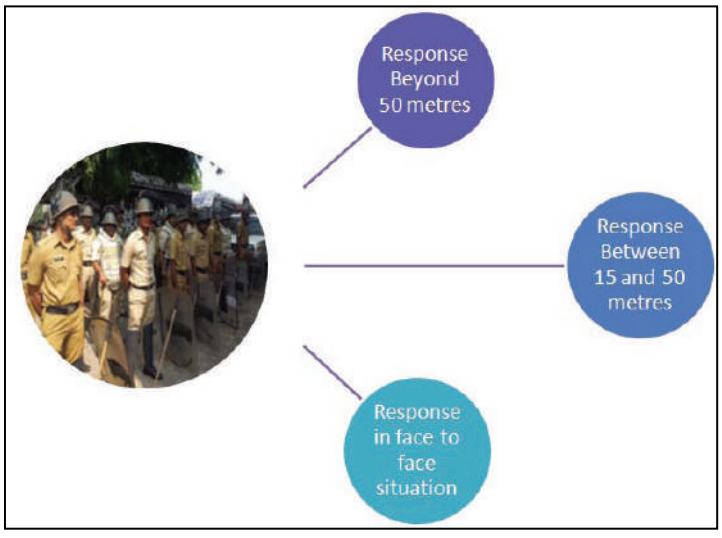
Quality Protective Equipment: The ability of police personnel to face a violent crowd and take effective action is directly proportional to their continued well-being in the face of the threat and their motivation levels. High quality protective equipment in the form of helmets, riot shields, protective body suits, eye protection goggles, boots, (and gas masks and bullet-proof jackets in certain situations) etc. are therefore essential requirements.

Tactical Concept of Operations Based Recommendations for Riot Control Equipment & Weapon Systems

The operational and tactical response requirements of the police to riot situations has been studied by categorizing it under three broad heads with range (distance) as the focal point, namely, response beyond 50 metres, response between 15 and 50 metres, and the response at less than 15 metres. These ranges are based on the capabilities and limitations of various technologies that exist, and the crowd management objectives relating to the degradation of violence potential of the crowd.

Response beyond 50 metres

The induction of Multi Shell Grenade Launchers and Under Barrel Grenade Launchers is recommended at this range.



Riot Control Agents (RCAs) such as tear gas shells are found to be widely used; however, concerns remain over inability of the personnel to saturate the area to the required level. The launchers used currently are many decades old in their design and found to be lacking on two accounts; one, the ability to saturate an area,

and second, the ability for accurate placement of shells at the target end. For instance, a well trained police personnel can fire around two tear gas shells per minute using the existing gas gun (time taken in loading, firing, and reloading). Each tear gas shell produces smoke for about 20 seconds, and by the time the second shell lands in the crowd the first one has already stopped producing smoke. Because of this disadvantage, adequate impact could not be derived. Further, the gas gun lacks sighting mechanism and is also prone to malfunctioning. Multi Barrel Launchers like Vajra and Agnivarsha though found to be effective with respect to area saturation, the associated limitations like mobility, accuracy of fire, and maneuverability pose severe limitations in their effectiveness in most riot situations.

Need to Induct MSGLs and UBGLs: These limitations have necessitated the need for inducting equipments like Multi Shot Grenade Launcher (MSGL) and Under Barrel Grenade Launchers (UBGL) that launch RCAs in a quicker manner (the MSGL tested during the course of this study can fire six shells in three seconds), and hence saturate the environment with tear smoke/irritants based RCAs. MSGLs and UBGLs can also fire other specialized munitions such as marker shells, paint shells, and night illumination rounds, and also the kinetic energy based rubber ball munitions *(details are provided later in this section)*. Further, the use of weapons like MSGL and UBGLs addresses the problem of policemen carrying two equipments one to launch non lethal munitions and another for lethal. The option of UBGLs ensures that the policemen retain the option of firing lethal munitions if situation demands, as the UBGLs can be attached to a rifle (INSAS or 7.62 mm SLR). Another advantage is that it also saves the cost involved in training and maintenance as the equipment used to launch the non lethal as well as the lethal ammunition remains the same, and the personnel are already trained in handling these equipments. (It is to be noted that MSGLs and UBGLs are already being acquired by paramilitary forces/CAPF such as CRPF and BSF for their traditional roles.

Any MSGL and UBGL that are procured must meet the following requirements:

1. Must be able to fire shells upto 120 mm in length
2. 40 mm bore is recommended as adoption as it has become a global standard, and facilitates easier ammunition procurement as well as transfer-of-technology arrangements with global manufacturers of weapons and ammunitions
3. Must have a sighting and aiming mechanism for medium velocity rounds (typically less lethal shells have ‘medium muzzle velocity’ versus lethal ammunition shells which have a ‘high muzzle velocity’).

Milkour’s MSGL was test fired and evaluated on two separate demonstrations during the course of this study by police/para-military/BPR&D personnel in live demonstrations, and found suitable for platoon level deployment in anti-riot role. Both MSGLs and UBGLs would require high precision (low velocity) 40 mm non-lethal ammunition of various types (Tear gas, Chili irritants, Kinetic Energy Rubber Baton/Rubber Ball rounds, etc), which are currently not being manufactured in India.

Response between 15 and 50 metres

In addition to the MSGLs and UBGLs fired kinetic energy based less lethal 40mm munitions which will be used to at this range, *the other technologies recommended are – modified plastic bullets and AEP Baton Rounds. Additionally pneumatic (paint ball type) launchers and associated irritant-based ammunitions are recommended for specialized anti-riot forces such as the RAF. , Use of concertina wire based portable barricades is also highly recommended.*

15 to 15 meters is a very critical range. Rioters are capable of throwing objects like stones and fire bombs on the police personnel or at their intended targets when within this range. The aim is to stop the crowd at a distance of 50 metres and above so that their violent causing capabilities are prevented from translating into action. The less lethal Kinetic munitions that are used currently are found to be causing lethal impact, and the use of tear smoke hand grenades is not rated as effective response owing to the fact that these impact the police personnel as well at this short range, and their effectiveness is largely influenced by extrinsic variables like wind direction, terrain and moisture in the air. The personnel tackling crowd require better options at this range, especially the kinetic ones.

40mm Kinetic energy based munitions for 40mm MSGLs and UBGLs

With adoption of rubber ball based 'medium muzzle velocity' 40mm munitions for MSGLs and UBGLs, these weapons can form the mainstay of crowd control effort by a police platoon. MSGLs and UBGLs can thus fire less lethal ammunitions at over 50 m range (tear gas and irritant based RCA shells) and at 15 to 50 m range (rubber ball based 40mm shells). A 40mm shell contains 15 to 18 rubber balls, which when fired between 15 to 50 meters range can cause significant level of discomfort and pain to people without being lethal (similar effect as that of lathi charge). Use of such ammunition, however, at ranges below 15 meters can result in serious injuries to vital organs, and hence lathi-charge/baton-charge would need to be resorted to by the police between the ranges of 0 to 15 meters.

Modified Plastic Bullets

The plastic bullets currently in use are found to have lethal effect. During trails by Mumbai police these were found to penetrate a .75 inch thick plywood board at upto 100 meters (which implies these would easily penetrate human skin and clothing to cause grievous wounds). There are suggestions to reduce the amount of gun powder charge in the currently used plastic bullets (lower charged) so that its muzzle velocity and hence lethality is reduced. Once this is done, the plastic bullets can emerge as one of the effective kinetic energy based less lethal ammunition. However, proper trials have to be conducted before its induction. Firing of modified plastic bullets is likely to cause lathi-charge kind of effect on the crowd as a reasonably good number of police personnel within a platoon carry the traditional SLR rifle.

AEP Baton Rounds

Attenuating Energy Projectile (AEP) Baton Rounds are single baton aim and fire ammunitions. The round features a 'void' in the nose of the rubber round that is designed to collapse upon impact with a vulnerable area of the body thus reducing the probability of serious or life threatening injury[1]. These are also high precision ammunition and can be used to accurately target individuals especially the leadership of rioters. UBGLs and MSGLs can be used for firing the AEP baton rounds, or alternatively UBGLs such as the M320 can be fitted with a butt to fire these rounds.

Paint Ball Type Pneumatic Less Lethal Systems

This option is not used in India currently. It uses High Pressure Air/Carbon dioxide based pneumatic launchers to fire small rubber balls, of about half inch diameter, containing PAVA irritants (or paint colour) at a high rate of fire, and can be highly effective in crowd control at short ranges. It combines chemical irritant agent exposure with kinetic impact and pain. Owing to their high precision and a very high rate of fire, these weapons systems demonstrate potentials to create a lathi-charge effect in the 15 to 50m range. These also overcome to some extent the problem associated with the use of irritant RCAs at short ranges. However, despite the small amount of irritant, these too tend to adversely affect the police personnel, particularly if the wind direction is unfavorable.

However, Pneumatic technology based systems also have several shortcomings as a technology for use by police in the field. Pressurized air based pneumatic systems are more prone to malfunctioning in the hot-humid Indian climate which causes relatively rapid deterioration of rubber parts (such as tubing, gaskets and washers) that are used in pneumatic systems. The use of such weapons is therefore recommended only in limited quantities by specialized and better-trained riot-police such as the Rapid Action Force. Such weapon systems also require a more intensive maintenance schedule)

Barricades

Need has been felt for better barricades than the ones currently used. Concertina barbed wires are used as barricades in the places like Srinagar and found effective which can be replicated in other parts of the country as well. The significance of better barricades is very high in the current situation following paucity of better kinetic munitions and the limitations of the TSMs in this range. In the countries like Iraq, angle iron barricades are being used which is proving effective, and these types of barricades can be included in the Indian context as well.

Response at less than 15 metres range

Common specifications for the procurement of lathis were found lacking across the country. There is a need for standard specifications as well as testing requirements so that quality lathis, especially

[1] M Symons and etal, Less Lethal Technologies: Review of Commercially Available and Near Market Products for the Association of Chief Police Officers, available at http://www.icpra.org/sites/default/files/homepage/UK_Defence_Scientific_Advisory_Council%20Review_of_Less_lethal_Technologies.pdf, as accessed on 17 November 2012 at 2130 hours

those made of high resistant polypropylene can be procured and used. Lathis made of bamboos also been used and found to be light weight and effective.

Truncheons/lathis are rated as the best less lethal tool available especially at ranges less than 15 metres. However, concerns over the quality of truncheons remain. The poly carbonate lathis that are currently used are found to be brittle, and hence breaks at ease. Further, these lathis are found to be unwieldy and do not lend itself to "Hands Free Principle".

Thus, there is a need for either change in the design of lathis or changes in the materials used to make them, and the need also been expressed for lesser weight and less lengthy batons. There are smaller batons which field personnel can carry in their belt which also ensures that both their hands are free. Tonfa's used abroad can be tried in Indian context.

Along with lathis, TASERs, electric shock batons and shields are recommended which are perceived to be better options to push the agitating mob back. Water canon is found effective. However aspects like limited span, mobility and maneuverability are its limitations.

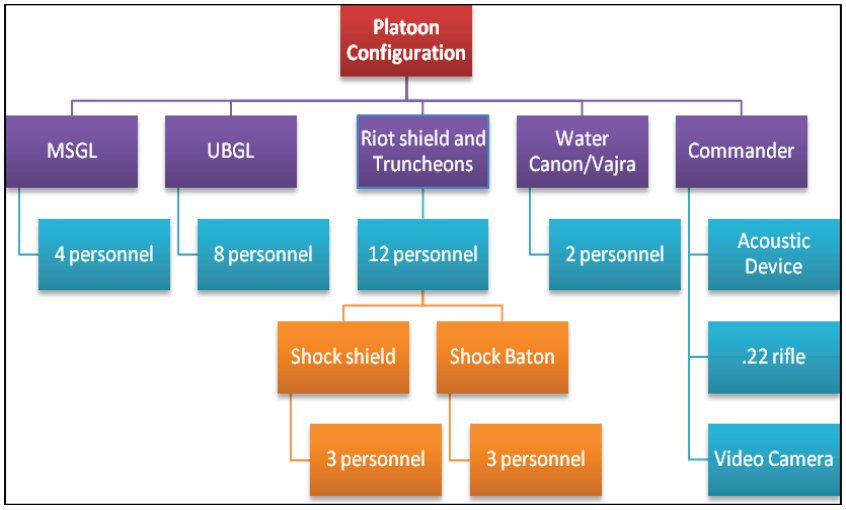
Neutralizing the Leader; Use of .22 Rifles

Use of .22 rifles is recommended with the purpose of neutralizing the leadership.

.22 rifles are high precision ones and causes less injury/damage on individuals/leadership as compared to rifles like 303, SLR and INSAS. This weaponry although not readily available with all forces likely to serve the purpose of targeted attack/incapacitation of the mob leader. The action of neutralizing the leadership result in rapid breakdown of command, control and communication links within the rioters. This requirement warrants a very specialized or targeted attack on the mob leader by inflicting minimal injury.

Platoon Configuration

Based on the field surveys and our recommendations, we have calculated the requirements of a platoon to effectively tackle agitating mob. The sketch of our calculation is given in the chart aside.



The requirements of equipments are directly proportional to the intensity of the agitation. For instance, in the places like Srinagar more number of MSGL would be required, and in the places like Delhi the requirements would be for shock shields and shock batons.

MSGL

There is a need for four MSGL in a platoon. It being versatile equipment well trained personnel can launch chemical irritants and kinetic munitions through it. It can be used to target protesters at ranges beyond 50 metres as well as between 15 and 50 metres. The disadvantage with this equipment is that it is not been used by law enforcement agencies so far, and needs fresh procurement.

UBGL

Eight UBGLs are recommended in a platoon. It does not necessitate the replacement of existing weapons like SLR/INSAS rather it facilitates the effective use of them. RCAs as well as kinetic munitions can be fired. It does not necessitate additional expenditure on training and maintenance.

Riot Shield/Truncheons

12 personnel should be carrying riot shields and truncheons. And, of this 12, at least 50 percent of them should be carrying TASERs/Shock Shields/shock batons. TASER type of weapons believed to be force multipliers as well as generates increased deterrence.

Water Canon/Vajra

Two to three personnel can be deployed to operate these equipments.

Commander

It is recommended that commander of the platoon carry .22 rifles especially with the purpose of taking on the mob leadership. Further, it is also recommended for him/her to carry an acoustic device to send message to the crowd and a video camera to record the protests.

Tactical Mobility - Light Armoured Vehicles

A need has been recognized for light armored high protection vehicles. Such vehicles equipped with multi barrel tear gas launcher, communications, floodlight, etc are likely to act as force multiplier by venturing into the crowd. It also provides an option for riot controlling police to ascertain the intensity of the situation and respond accordingly.

The survey also revealed the need for high protection vehicles, similar to Ashok Leyland's Stallion Kavach 4x4 Armored Troop Carrier, to carry the personnel swiftly from one place to another.

On-site mobile command and control systems

The existing vehicles can be modified with armour protection and necessary equipment into command and control rooms that would receive field inputs from various communication systems, augmented with map based systems, CCTV feeds etc which can be quickly analysed and commands can be passed on to the man on the ground. This would be more effective than to communicate with a police control room that is kilometers away from the riot site.

Testing laboratories and standard specifications

Orkash recommends creation of testing laboratories and prescribing specifications to ensure that poor quality body gears are not used by our police forces.

Currently we neither have proper standards laid down, nor laboratories that can test and certify the quality of the equipments especially with respect to body protectors.

National Institute of Occupational Safety and Health (NIOSH) standards are accepted worldwide for gas masks. While the rest of the world has moved onto specifically designed helmets for riot control where there is protection for ears, neck and eyes, in most places in India the Personnel Armored Support Ground Troops (PASGT) helmets that are designed for Military purposes are used. With respect to body protectors and shields, our interactions made the case for testing certifications from prominent labs like Northern India Textile Research Association (NITRA), Ghaziabad, which is linked to the Ministry of Textiles.

Production Capacity of TSU – Tekanpur

Orkash recognize the urgency shown by TSU officials in automating their facilities to increase the production capacity. However, the pace of the process needs to be increased. Further, private players like Condor Non Lethal Technologies – Brazil (through SRG Group, India), ALS USA (through Milkor USA), Rheinmetall Denel Munition - Germany have expressed interest for Transfer of Technology with TSU. The working with private players is likely to increase the pace of automation as well as the production capacity.

Training

Proper training and development is required not only regarding the technical know-how of the system, but should also cover aspects of crowd behavior and psychology, operational tactics (both vehicle and field formations), essential laws and conventions, negotiation skills, policing aspects etc.

There is a need for joint training and exercises at the troop level, where state police personnel and paramilitary personnel get the opportunity to work together and train, and improve common operating procedures and inter-agency coordination.

There is a need to adopt a framework based approach to riot control. This would also involve conducting routine mock drills, developing crowd control training modules, refresher courses, as well as training the trainers.

Currently, Tear Smoke Unit, Tekanpur undertakes training courses for the trainers who in turn are required to train the riot control units on the products of TSU. However, these training programs, which limit to a batch size of 60, are oversubscribed and the demand is not being met. There is a need for augmenting the capacity of training infrastructure.

Part 1: Background

1. Orkash Services Private Limited, a company with expertise in homeland/internal security, intelligence management, operational risk management, decision support systems and IT R&D, was tasked to carry out a study on "Development and Testing of Effective Less Lethal Technologies/Equipment and Tactics for Countering Public Agitation with Minimum Force" by the Bureau of Police Research and Development, BPR&D, Ministry of Home Affairs. This report presents the findings of this study.

Purpose of the Study

2. The purpose of the study is to examine the following aspects,

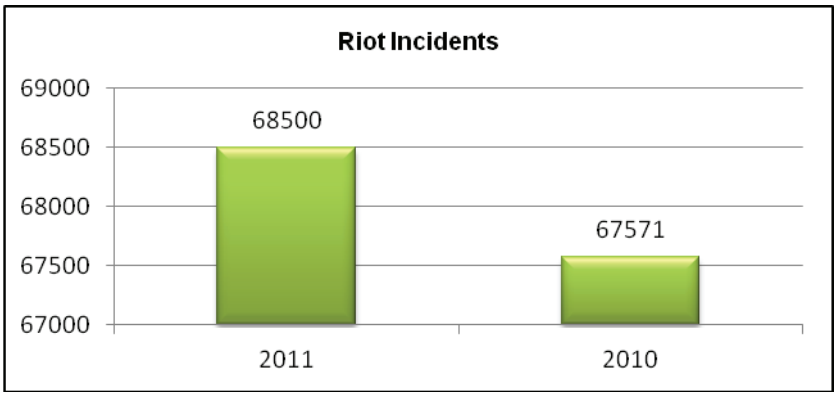
   2.1. Less Lethal equipment and ammunition being used by the police forces,
   2.2. Shortfall of Less Lethal weapons, the reasons and solutions,
   2.3. Efficacy of various equipments in actual situation,
   2.4. Need for other equipment to be inducted in the forces,
   2.5. Evaluation of the problems faced by state police forces in controlling agitation and solutions thereof,
   2.6. Study of existing Less Lethal weapons and their use in the actual field conditions,
   2.7. Study of the new Less Lethal equipment available in the market and their efficacy,
   2.8. Simulation of various operational scenarios for implementation of Less Lethal technologies

Significance of the Study

3. Gone are the days where riots and violent crowd behavior were brought under control by resorting to use of live ammunitions firing by law enforcement agencies. Police personnel increasingly avoid tackling protesters during public agitations through force. There is a realization across the world that there are better options available to take on agitating mobs than firing live ammunition. The right to live and other human rights aspects like freedom to protest, freedom of speech and expression, are widely recognized and appreciated; and disturbances in exercising these rights, even if these emanate from legitimate agencies or actions, are widely condemned.

4. Crowd behavior though exhibited at a particular location, is shown live across the country and globe, owing to the active media. The media exposes the action of mobs and crowd as well as the police, and the reaction of the latter to crowd behavior is often widely debated. In addition to the actions of the police, the tactics and weapons used by them to bring the agitating mob under control are questioned, evaluated and appreciated on a case by case basis. Increasing number of riot and public agitation incidents have been reported every year. The chart below presents the details related to riot incidents and public agitation reported in India in 20112 and 20123.

[2] Crime in India 2011, National Crime Records Bureau



5. When it comes to the police agencies, they are expected to provide a rapid response for the management and control of agitations, protests and riot situations. They are expected to manage and resolve these incidents through the use of minimum force and using means that are less lethal, ethical and human rights friendly. The world had developed and experimented with many solutions that attempt to adhere to these requirements, in the form of less lethal weapons and technologies.

6. India is not far behind. In addition to truncheons and lathis, tear smoke munitions are widely used to control crowds. These two are increasingly being supplemented with more advanced and better designed equipment and Less Lethal weapons. The reduced casualties due to civil disturbances in Kashmir between 2010 and 2011 are viewed as testimony to the significance of the less lethal weapons.

Year --->	2010	2011
Deaths	112	0
Injuries	5049	58

7. The significance of the less lethal weapons been realized across the country; the availability of right technologies and equipment and in adequate quantities is an important need, along with changes in associated operating procedures, training and concept of operations.

8. The need to induct new less lethal technologies into the basket of weapons being used is recognized. However, rethinking and evaluation is also required on the less lethal weapons which are already in use. For instance, less lethal kinetic munitions that are in use like plastic bullets and rubber pellets are not preferred weapons by the users (the police personal) owing to their lethal effect. Tear smoke munitions being used are found useful; however, it seems that there is a need for options in this segment too.

9. The efficiency and effectiveness of the equipments that are being used like 38 mm gas gun, 12 bore Pump Action Gun, modified 303 rifle, multi barrel launcher (MBL) and water cannon

[3] Crime in India 2012, National Crime Records Bureau

(Varun) requires evaluation. Questions remain, such as; are personnel tackling crowds required to carry two equipments - one that fires less lethal munitions and another one to fire lethal ones; or can they be given equipment/launcher that can fire both lethal and less lethal munitions, and thereby the weight carried by them stands substantially reduced.

10. Having realized the necessity to equip the police personnel with less lethal weapons, and also the need for review of the efficiency of the current ones, there is also a need to study the existing new technologies in the market like new multi shell launchers, kinetic munitions, electric (stun) guns and acoustic devices along with the new variety of body protectors. The suitability of new equipments to Indian conditions requires detailed analysis and study, and hence the need for this study has been derived.

Methodology

11. The techniques of primary and secondary research have been used in this study with predominant emphasis on the former.

12. The idea is to understand the less lethal weapons that are currently used, including body protectors and their efficiency in actual operations, and also to understand the perceptions of the field personnel on the performance of the currently used less lethal weapons; as well as the requirements for new types of weapons and equipment. One to one interactions as well as Focused Group Discussions (FGDs) were accorded higher priority.

13. With this purpose in mind, the Orkash team visited 10 states namely: Jammu and Kashmir, Assam, Manipur, West Bengal, Rajasthan, Punjab, Haryana, Maharashtra, Andhra Pradesh and Uttar Pradesh. In addition to visiting these states, Orkash team also visited the Tear Smoke Unit – Tekanpur. In addition to interacting with the personnel of state police forces, Orkash team also interacted with the personnel of Border Security Force in Srinagar, Guwahati, Imphal and Kolkata.

14. The team also interacted with the personnel of Central Reserve Police Force (CRPF) in Srinagar, Kolkata, Imphal and Guwahati, and interacted with the personnel of Rapid Action Force (RAF) in Hyderabad.

15. Our team met and interviewed numerous field personnel in the police, middle level officers and the senior officers across various states and locations, and across various state police and paramilitary forces. We carried out one to one interviews, focus group interactions, questionnaire based surveys and brain-storming sessions with these individuals who have had extensive experience of handling riot situations at different levels. Our sample size for this research stands between 1600 and 1700.

16. In addition to visiting the states, our team also interacted with various private players in the market with the purpose of understanding their product range, and its suitability to our police forces with respect to crowd control tasks. We interacted with a few companies (both Indian and international), and evaluated their products.

17. To supplement the field research and literature review, the study team also undertook case analysis of riots in various international situations, to include Europe, Middle East and South East Asia. As part of this process extensive examination of video recorded live riot situations was undertaken (from youtube and other similar sources). This enabled us to analyse various riot situations across the world as also the police response, and the weapons and technologies used by them for riot control and their effectiveness.

18. Further, our team subjected itself to the first-hand experience on the impact of tear smoke munitions when it made a visit to Tear Smoke Unit – Tekanpur.

19. Moreover, the demonstration of less lethal munitions and equipments shortlisted by the Orkash team were held at BSF's Bhondsi Firing Range on 12 September 2012, and at CRPF Academy, Kadarpur, on 19 November 2012.

20. The aim of the demonstration was to study the suitability of these equipments to Indian conditions, as well as to seek the feedback of the officers who attended. The representatives from the agencies namely, RAF, NSG, SSB, CISF, BSF, Gurgaon police, TSU, J&K Police, Andhra Pradesh Police, West Bengal Police, Uttar Pradesh Police, Delhi Police, Haryana Police and Meghalaya Police attended the demonstration, and evaluated the weapons. The companies participating in the demonstration include Milkor USA Inc, Condor Less Lethal Technologies – Brazil, BSST India Private Limited, and Applied Systems - India.

21. In addition to holding demonstration of less lethal weapons, Orkash in coordination with Bureau of Police Research and Development (BPR&D) organized an all India day-long workshop on this study on 20 July 2012. The purpose of the workshop was to seek the feedback of the officers on the less lethal weapons being used and our research findings; the problems faced by the police personnel, as well as the need for induction of modern less lethal technologies into the basket of weapons.

22. On 20 November 2012, Orkash in collaboration with BPR&D held a review meeting on the draft report on the study. The aim of the meeting was to gather the suggestions/feedback of the implementing agencies like state police forces and the Central Armed Police Forces on our findings and analysis before submitting the final draft and the recommendations. The review meeting chaired by DG – BPR&D was held in our office wherein senior police officers from selected states (Andhra Pradesh, West Bengal, Jammu and Kashmir, Haryana, Uttar Pradesh and Delhi), and all the CAPFs attended and shared their comments and suggestions.

23. The Orkash team attended the Security Expo organized by Uttar Pradesh police on 25 August 2012 in Lucknow. The purpose of the visit was to identify players into the less lethal weapons and evaluate their products.

24. Further, the team also interacted with a few international experts based in the United Kingdom, the United States and Australia, and collected opinions on less lethal weapons. As part of this process, the Orkash research team interacted and interviewed a number of experts in the field of riot control and public agitation management, including those from international research institutions, and former international law enforcement officials.

25. In addition to the primary research, Orkash team also carried out extensive secondary research, especially desktop search on the subject.

Team Composition

26. Orkash has fielded a highly qualified multi-disciplinary team headed by a social scientist (awarded Doctorate by the country's premier Jawaharlal Nehru University) and supervised by the Chief Executive Officer (CEO) of ORKASH, who is an MBA from the Indian School of Business, Hyderabad and was awarded the Times Fellowship for his field research into the 'Human Element in Terrorism and Insurgency in India'. Prior to joining the corporate sector he served in the Indian army special forces at various capacities for over 13 years and is a recipient of Vir Chakra award.

27. The team was also advised by a former Additional DG – BSF who carries extensive experience in counter insurgency operations and border management. Further, the team comprised of six technocrats and management graduates. The backgrounds of these other team members who undertook this study include graduates and PHD holders from prestigious institutions like Jawaharlal Nehru University – New Delhi, Indian School of Business – Hyderabad, Indian Institute of Technology – Delhi and Kanpur, London School of Economics – London, and Tel Aviv University - Israel.

Part 2: Concept of Less Lethal Weapons

Less Lethal Weapons: Definition

1. There are multiple definitions available on less lethal weapons. The commonly accepted definition "*weapons that are explicitly designed and primarily employed so as to incapacitate personnel or material while minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment*".

Conceptual Understanding

2. Attempts have been made in this chapter to deliberate upon the concepts pertaining to Less Lethal Weapons, namely Kinetic Energy, Chemical Technologies, Acoustic Technologies, Electrical Technologies, Directed Energy, Barriers and Entanglements, and Combined Technologies.

   2.1. **Kinetic Energy**: These weapons are intended to influence the behavior of the subject by causing physical discomfort (in the form of temporary shock and pain followed by incapacitation) through their blunt impact.

   2.2. **Chemical Technologies**: Chemicals are of two types – anti-personnel and anti-material. Anti Personnel chemicals aim at temporarily inhibiting or incapacitating individuals or crowds from taking certain actions. Anti-material chemicals, on the other hand, aim at disabling vehicles and thus, hindering infrastructure functions.

   2.3. **Acoustic Technologies**: Application of this technology on crowd in the form of acoustic devices aims to not only create discomfort/pain in ears but also disables coordinated attacks by blocking human communication (i.e. the ability to hear). Flash bang grenades also use this principal; these produce burst of light and high decibel sound that temporarily stun people in the vicinity. Long Range Acoustic Devices (LRAD) are designed to deliver audible warning messages or discomfort due to their high volume over long ranges (1km), and are found increasingly used in anti piracy (maritime anti pirate operations) and crowd control operations.

   2.4. **Electrical Technologies**: Electrical technology based NLWs have the effect of stunning the target individuals with an incapacitating high voltage very low current short-duration electric shock, but without any injury.

   2.5. **Directed Energy**: The objectives of using directed energy is to target energy beams on rioters with the purpose of causing temporary irritation and incapacitation.

   2.6. **Barriers and Entanglements**: It consist of spikes/stripes of spikes, concertina wire entanglements, caltrops, and metal or plastic barriers to stop vehicles and people; launched nets to snare people or tangle boat propellers; rigid foams to block windows or doorways.

Entanglement weapons may be disbursed by a net gun that can entangle a human or vehicular target.

2.7. **Combined Technologies**: This basically combines two or more non-lethal technologies described above to cause an impact on protesters.

Historical Evolution of Less lethal Weapons

3. Less lethal weapons are accorded importance due to factors like need for use of minimum force for controlling public agitation and riots, increased public awareness, respect for human rights, media, and the emerging belief and best practices among the police forces of the world that agitating mobs can be effectively handled without resorting to use of lethal ammunition/fire-power.

4. These weapons though have acquired significance especially in the post Cold War period across the world have been used for long. During Victorian times (1837 to 1901) policemen in the UK reportedly used a heavy wooden truncheon against people. Other weapons that were available during Victorian times include broom handles, and wooden bullets made out of teak. These types of weapons were known to be used by the British in their eastern colonies before using them domestically. In the US, police officers on patrol have been armed with riot batons or truncheons and/or firearms for over a century now. Use of smoke by military for constraining visibility is one of the oldest forms of chemical warfare. Entangling devices such as caltrop were employed against cavalry and infantry long before they were used against motorized vehicles.

5. Nevertheless the term Less Lethal Weapon was coined in the 1960s, and the modern interpretation of it began since then. This chapter discusses the genesis of these weapons by looking at the developments during four broad periods, namely, pre-1980, 1980s, 1990s and the current period.

6. **Pre-1980 Period:** Developments pertaining to chemical irritants, kinetic energy, electric shock weapons, and biological weapons are discussed below,

6.1. *Chemical Irritants*

6.1.1. Chemical irritants were known to be first used in 1912 by the French Police in Paris. These irritants were part of military's arsenal during the First World War. After the World War I, the US army relied on Chloroacetophenone (CN) as a new irritant, which became common weapon used by the police forces in the mid 1920s. Subsequently, other countries also used CN as the main irritant agent in the 1940s. However, CN proved less successful in addressing the problem of policemen in bringing the agitating mob under control in quick manner. For example, the British forces reportedly failed to bring civil disorder in Cyprus under control using CN in the mid-1950s. Incidents like this known to have pushed the law enforcement agencies in the countries like the United Kingdom and the United States to replace CN by Ortho - Chlorobenzylidene Malononitrile (CS).

6.1.2. Compared to CN, CS is found to be less toxic, more severe in effect and rapid in action. The British used CS for the first time in Cyprus in 1958-59, and then extensively on the colonies between 1960 and 1965. The Vietnam War reported massive use of CS by the US Army. This reliance on CS reversed the trend of CN being the standard agent.

6.1.3. In general, the Post World War II period witnessed use of irritant chemical agents by the law enforcement agencies across the world. These were used by the police in the US during the 1960s and 1970s. It proved alternative to batons and firearms to address unrest (riots in Newark and Detroit). In this period, with several race riots, the law enforcement agencies believed that CS could be used safely even in densely populated area. Consequently, after 1967 riots in Newark and Detroit, second Presidential Commission (Report of the National Advisory Commission on Civil Disorders) recommended federal research for developing guidelines to govern the use of riot control equipment, and to provide alternatives for lethal weapons.

6.1.4. The period also witnessed many campus demonstrations. During the student protests at Berkeley in California in May 1969 the National Guard sprayed CS from helicopters onto demonstrators. British used CS for the first time on the UK territory in 1969 during riots in Londonderry, Northern Ireland. Following this incident there was a public outcry and an enquiry chaired by Harold Himsworth had been commissioned to investigate the health effects of CS. The report recommended that 'irritant agents should be subject to the level of testing required for pharmaceutical drugs'.

6.1.5. Also during this period, another riot control agent, CR (dibenz(b,f)-1:4-oxazepine), synthesized by British scientists in 1962 found to be more potent but less toxic than CS. It was manufactured by the UK Ministry of Defence between 1968 and 1977. The Ministry of Defence authorized its use in Northern Ireland from 1973. The US Army approved CR as a riot control agent in 1974.

6.1.6. Another chemical irritant Oleoresin Capsicum (OC) also was in use during this period. By 1971, the SIPRI authors noted that OC was already being used as an irritant agent in several commercially available self defence spray devices in the US.

6.2. Kinetic Energy

6.2.1. During this time, research works had been reported with respect to refinement of kinetic energy impact projectiles. These projectiles added to the existing less lethal weapon tool set consisting of chemical irritants, batons and water cannon in the countries like the US and the UK. Similar projectiles were also being used in other parts of the world. Asia experienced skipping rounds (projectile that was fired at the ground and meant to bounce or skip towards the intended target. The desired effect was to hit the protestor's legs, as a direct impact could be fatal or cause severe injury), and cylindrical inch long bullets. The latter were fired at protestors in Hong Kong in 1958.

6.2.2. Rubber bullets were used by the British in Northern Ireland as a means of riot control in 1970. Over 55,000 bullets were fired which caused numerous injuries and deaths.

Consequently in 1972, a shorter, lighter, more accurate projectile with a PVC outer layer plastic bullet was developed, and first used in the subsequent year.

6.2.3. In the late 1960s and the early 1970s, the US witnessed the emergence of 37-mm wooden block projectiles used against protestors in California, and also witnessed the development of 'bean bag' projectiles, Golf-ball like projectiles, and rubber projectiles filled with liquid. Two ring shaped rubber projectiles were also developed. These were called Ring Airfoil Grenade (RAG) - soft RAG and sting RAG. However, sting RAGs were declared obsolete in 1995, and the ring RAGs never entered production.

6.3. Electric Shock Weapons

6.3.1. The period also witnessed the emergence of electric shock weapons. In Argentina, the barbed cattle prod had been replaced with an electrical version, picana electrica, in the 1930s. This was adopted by the Argentinean police as a torture tool for interrogation. The early designs in the US were a derivative of basic cattle prods before their advanced designs were developed as potential less lethal weapons.

6.3.2. Invention of TASER happened in 1970. The characteristics of incapacitation, predictable psychological effect and applicants control over dose were cited as its advantage over chemical and kinetic weapons. Over 2000 TASERS were sold in 1975 to public, security guards and policemen. Its sales however dropped with concerns that it might be used for torture. As a result of this, Michigan and New York passed laws prohibiting the possession of TASERS and Canada declared its buying, selling and processing illegal.

6.4. Biological Weapons

6.4.1. Biological agents, including certain bacteria, viruses and toxins were developed as incapacitating agents as a part of the military biological weapons programmes in the post World War II period. It was felt that these chemical and biological weapons were politically advantageous since they were less lethal. However, following the renouncement of biological warfare in 1969, these weapons were banned under the international law titled 1972 Biological and Toxin Weapons Convention (BWC).

6.5. Other Developments

6.5.1. There were proposals to use polymers mixed with water as lubricants to restrict movement of people (or vehicles) for area denial. Aqueous foams were also proposed for use as a temporary barrier or to disorient groups of people in a crowd control situation.

6.5.2. The 1970s also saw Malodorants emerging as a potential weapon for crowd control.

6.5.3. Optical devices specifically designed to temporarily blind by producing flashes of bright light were developed and used in limited manner. The law enforcement agencies in the US experimented with high intensity light systems mounted on vehicles and flashed on and off to impair night vision. Stroboscopic lights were also investigated as a means of

crowd control both in the UK and the US. LASERS also emerged as alternatives around this time with considerable investment by the US military and programmes by the countries like the UK, the USSR and Germany.

7. Period of 1980s

7.1. In the early 1980s the focus was on developing ground based systems and portable LASER weapons. Research had also been reported in the area of acoustic weapons and their effect on humans.

7.2. In 1980s the focus in the UK was on extending the existing less lethal technologies to the police forces rather than developing new technology. Less lethal weapons used at this time consisted of the products developed by the military since the law enforcement agencies reportedly lacked the necessary resources required for research and development. There wasn't much of a change in the less lethal armory of 1980s compared to that of 1960s and 1970s probably because the attention of military had been on Cold War hostilities. Further, the research and development carried out in this area during this period was classified.

7.3. The broad trends of 1980s are given below,

7.3.1. CS and CN remained the preferred agents with wide usage,

7.3.2. Kinetic impact projectiles saw little use, and no significant further development were reported in the United States

7.3.3. Rubber and plastic bullets were widely deployed by the British in Northern Ireland, and

7.3.4. Increased use of low power LASERS, both in the US and UK.

7.4. LASERS though found to be useful weapons, it's potential to cause permanent damage and blindness at shorter ranges threatened its application at wider scale.

7.5. In case of electrical weapons, by the mid 1980s a few police departments in the US started using TASER. These weapons weren't available to the civilian population and could only be used by the military, police and security agencies. Its limitations in terms of its reliability and effectiveness against people wearing heavy clothing or under drug influence were highlighted and improvements were suggested.

7.6. Stun guns were widely available to the public and the police. During this period, the health aspects of TASER guns and stun guns (due to their increased usage) were examined and highlighted since the use of these weapons on rioters led to deaths. The use of electrical shock weapons for torture was highlighted by Amnesty International. During this period these weapons were proliferated into countries like China, Taiwan and South Korea, and subsequently these countries also started manufacturing them. Further, 1980s and 1990s saw production of stun weapons in many other countries such as Brazil, France, Germany, Israel, Mexico and South Africa.

8. 1990s

8.1.The major trends observed during this time are discussed below,

8.1.1.Chemical Irritants

8.1.1.1.Substantial work on chemical based less lethal weapons were reported including further development of lubricants, foams, Malodorants, and incapacitating agents. OC became popular as the irritant chemical weapon of choice for the US police forces.

8.1.2.Electrical Weapons

8.1.3.A significant development of this time was the modification of TASER. The market targeted for this was the civilian population, who could use the modified design for "self defence" purpose.

8.1.4.Other Technologies

8.1.4.1.This period saw no major developments with respect to Kinetic energy impact projectiles. In the US, potential of Ring Airfoil Projectiles (RAP) were assessed, while in the UK, replacements for the L5A6/7 plastic bullets were contemplated. Further, the establishment of Joint Non Lethal Weapons Directorate (JNLWD) in the United States led to research on slippery substances. Research programmes on acoustic weapons were conducted and research on Malodorant chemical was taken up to formulate an odour index. Development of anti-personnel directed energy weapons presented as less lethal expanded during this period, which also saw development of new or adapted delivery mechanisms like grenades, mortars and other munitions. Unmanned aerial vehicles (first used in Kosovo) were also developed.

8.2.Developments in less lethal arena were explicitly visible in countries like the USA and the UK. Majority of literature on this subject discusses developments in this area pertaining to these two countries. It gives an impression that these two countries have taken a lead in research and development in this field. Accordingly, attempts were made to capture the developments in these two countries.

8.2.1.Developments in USA in 1990s

8.2.1.1.Research on less lethal weapons received significant attention in the US. This was due to the changed nature of global security. The peace keeping operations across the world highlighted the importance of less lethal weapons. The US army was also involved in humanitarian peacekeeping operations - UN peacekeeping operations in Somalia, Haiti and former Yugoslavia.

8.2.1.2.In 1993, the US marines in Somalia reportedly had only batons and OC spray at their disposal. These were of little help in controlling the crowd. Eventually, they had to deploy lethal weapons which resulted in civilian killings. In 1994, the US

Marines were tasked with assisting in the withdrawal of UN peacekeepers from Somalia. A variety of less lethal weapons such as flash bang grenades, sticky foam, various OC spray devices, aqueous foam, and grenade launched kinetic energy projectiles were used by them. The deployment of these weapons played an important role in combating violence and successful completion of the mission. Similarly, less lethal weapons, mainly consisting of pepper spray, plastic baton rounds and beanbag rounds for shotguns, were used in Haiti in 1994 and 1995.

8.2.1.3. The year 1996 witnessed the demonstration of a vehicle-mounted "dazzling" laser system and the demonstration of a prototype "Sticky Shocker" projectile. Research was reported with respect to flash bang grenades, smoke grenades and acoustic energy.

8.2.2. *Developments in the UK*

8.2.2.1. Developments were only about modifications in Plastic Baton Round (PBR) or plastic bullet. Research focused on developing new projectiles following the widespread rioting in Northern Ireland in 1996.

8.2.3. China in 1995 developed a portable laser disturber designed to damage equipment and blind (at least temporarily) human targets. The former Soviet Union developed laser weapons for air defence. This period did not witness emergence of new weaponry but saw variations of existing technologies marketed to both the police and the civilians.

9. Current Period Developments

9.1. Less-lethal weaponry has spread to different parts of the world, and finds wide usage in areas like counterinsurgency, counter terrorism, stability operations, and counter-piracy. The NLW technologies used by the police forces currently across the globe are of the following types,

9.2. Kinetic Energy

9.2.1. Water cannons are one of the most commonly used less lethal crowd control weapons. Then there are impact projectiles, like baton (foam, plastic, and rubber), pellets (single, multiple and large), airfoil and beanbag. Various types of plastic bullets are being used such as L21A1 plastic baton round in the UK. Foam-tipped plastic bullets have also been designed to reduce injuries. These were field tested by the US Marine Corps in Iraq but were found to be ineffective.

9.3. Acoustic Technologies

9.3.1. Flash bang grenades are one of the most popular less lethal weapons today. Another popular device in this category is stun grenades that cause loud blast and temporarily neutralize the rioters. The Long Range Acoustic Devices (LRAD) was acquired for use against Iraq by the United States Marines, and reportedly acoustic devices have been used in Afghanistan as well.

9.4.Electric Technologies

9.4.1.It include stun guns, electrical baton, shield, net, Stun belt etc. A list of countries manufacturing electro shock weapons had been identified by Amnesty International. This lists seven countries with the largest group of manufacturers being located in Taiwan, China, South Korea and USA. Wireless electrical projectiles are also being designed to get around the range limitations of TASER (around six meters), and offer increased "stand-off capability".

9.5.Directed Energy

9.5.1.An example of a 'directed energy' based Less Lethal Weapons is Active Denial System (ADS) or the Heat Ray. It is a strong millimeter wave transmitter mainly deployed for crowd control. Active Denial Systems such as HPEM ADS are also utilized to disable vehicles. It is also referred to as pain ray. Reportedly, Active Denial System was considered for the use in Iraq in 2005.

9.5.2.Another one is a stripped down model of ADS called Silent Guardian. This system is operated and aimed with a joystick and aiming screen, and is primarily marketed for use by law enforcement agencies, the military and other security providers.

9.6.Chemical Technologies

9.6.1.Chemical based NLWs include anti-material compounds such as Foams - rigid, sticky and aqueous. Anti-personnel agents such as Riot Control Agents (RCAs), Malodorants, and calmatives are also widely used. CS, commonly referred to as tear gas, is considered to be the ultimate solution against combative crowds by the US and European law enforcement agencies. Israeli security forces resort to it for crowd control. Oleoresin capsicum (OC) is widely used by police agencies. An example of Malodorants is Skunk, which has been designed and manufactured by the Israel Police. It's a machine which sprays high pressured, Less Lethal liquid into air, covering long distances. The intolerable smell disperses rioters, without harming.

10. Technologies in India

10.1.Conventionally, lathi and tear smoke have been the main tools for dispersing agitating crowds and riot control in India. Prior to 1974, tear smoke munitions were imported from the USA and the UK. It was in 1974 that tear smoke was produced indigenously for the first time. Tear Smoke Unit (TSU) was established at Tekanpur in 1976 as project of the Ministry of Home Affairs. The Plant was set up in collaboration with Director General Ordnance Factories (DGOF) based on the technology developed by DRDO. Till then, the police force in India had been dependent on imported Tear Smoke Munitions (TSM) for riot control.

10.2.TSU, which started with the production of only four different types of TSMs, has till date developed thirty six different varieties, supplying them to SPOs, CPOs and Army. Further, the unit switched over to CS based TSMs from CN based products in 2008-09. Today, TSU is the

only manufacturing unit in country which is involved in the production of varieties of less lethal Tear Smoke Munitions.

10.3. At present, less lethal weapons are being used in India by law enforcement agencies for general Law and Order (L&O) situations like riot control, special operations by National Security Guard (NSG) for evacuation and anti-hijacking purposes, VIP protection, and L&O operations during UN peacekeeping missions etc. The usage is limited to few varieties that include, water cannons, stun shells and grenades, tear shells and grenades, plastic pellets, dye grenades, shock batons, TASER guns (in Jammu and Kashmir), wood piercing shells (with CRPF and the Army for CI ops) etc. Multi barrel launchers, gas gun, anti-riot guns and pump action guns are used for launching various munitions. Anti-riot equipment currently used in certain parts of the country include BP vehicles (Vajra), BP bunkers, full body protector (body suits), polycarbonate baton, polycarbonate shield, chest guard, helmets with visor, leg guard, cane shield etc.

Concerns & Controversies Associated with Less-Lethal Weapons

11. *Incident 1*: Use of CS Gas in UK

11.1. In 1969 in the UK, the law enforcement agencies used CS against rioters in Londonderry, Northern Ireland, which led to an enquiry following public outcry. A total of 1091 canisters containing CS gas were released into residential areas. Himsworth inquiry that was set up to investigate the incident called for further need of testing of CS gas before using it as Riot Control Agent (RCA).

12. *Incident 2:* Use of tear gas, Waco, Texas, USA

12.1. Another controversial incident of tear gas was the siege in Waco, Texas in 1993. On 28 February, Agents from the Bureau of Alcohol, Tobacco, and Firearms attempted to storm a residence of a religious group known as Branch Davidians. This led to firefight between both the groups, resulting in deaths and injuries. Subsequently, the Federal Bureau of Investigation (FBI) surrounded the place and tried to negotiate to resolve the standoff. Finally on 19 April, the then US Attorney General, Janet Reno, gave FBI the permission to use tear gas to flush the Davidians out of their residence. CS gas was pumped into the building. Hand held grenade launchers were used to fire ferret rounds into the windows of the buildings, and an armed armored vehicle was moved into to demolish the walls. A fire then broke out and 76 Davidians died.

12.2. There was a huge outcry over the number of deaths and the manner in which the police broke the siege. FBI was criticized for use of what was seen as heavy handed tactics and questions were raised about the abuse of power on part of the law enforcement authorities.

13. Controversies and Lethality of Plastic and Rubber Bullets

13.1. In 1984 one Royal Ulster Constabulary (RUC) officer discharged a plastic baton round killing a local man during an internment commemoration rally in Belfast, Northern Ireland. The incident generated huge controversy over alleged misuse of plastic bullets by the security forces.

13.2. Controversies over the use of plastic bullets were reported from countries like Spain as well. Since 1990, at least 25 people have reportedly lost an eye in Spain as a result of the impact of rubber bullets, six of them in Catalonia since 2009. For example, during the general strike in Barcelona in March 2012, the police fired plastic bullets, because of which two people lost an eye and several others were wounded including a four-year-old child in a pram. In another incident which was reported in April, 2012 in Bilbao, a youth was hit by a plastic bullet fired by the Basque police force, causing brain damage and death. The police denied the allegations pertaining to the misuse of the bullets. However, the week after the incident the Councilor of the country announced that the Ertzaintza's Seguridad Ciudadana [citizen security] patrols often deployed to break up demonstrations will stop using plastic bullets from 1 January 2013.4

13.3. Plastic and rubber bullets have never been used as a riot control option on the British mainland, although they were first developed and deployed by the British. It is believed that the police should not use firearms against crowds of demonstrator strikers, or even rioters. The sentiment in the UK is that even using less lethal weapons is likely to undermine the doctrine of policing by consent – which is something that many feel distinguish the British police force from other forces around the world. Similar sentiments have been echoed by the President of the Association of Chief Police Officers, Hugh Orde, who said that plastic bullets should not be used against people, even if they were rioting and looting. He said that these types of less lethal weapons were only suitable in situations where there was a real risk of loss of life, such as insurgency. However, there have been talks of including these bullets in the less lethal weaponry. For instance, following the August riots in 2011 many had called for the police to deploy Less Lethal weapons during the riots.

14. Fatal Incidents from Rubber/Plastic Bullets

14.1. The use of rubber bullets by police forces across the world has been criticized because of the significant number of injuries and deaths caused by them. Israel military's use of "non-lethal rubber coated bullets" resulted in death of 21 Palestinians from 2000-2008, and human rights groups referred it as the "reckless" use of these munitions5. These bullets have also been used by Sudanese police forces against peaceful demonstrators, resulting in injuries and deaths. In 2011, the security forces and Bahrain Defence Force used rubber bullets (among other weapons) to suppress pro-democracy protests, inflicting injuries to protestors and

[4] Statewatch, (2012), "Less-lethal" weapons and pUBGLic order: Athletic Bilbao fan killed by a plastic bullet", *Statewatch,* Spain, 15 April, 2012.

[5] http://www.youtube.com/watch?v=Xi47ujPbUms

bystanders.6 Some doctors have asked for a ban because of this reason. For instance, Professor Michael Krausz and colleagues at the Rambam Medical Center in Haifa, who analyzed the medical records of 595 casualties admitted to hospital during Israeli-Arab riots in October 2000, dismissed the theory that rubber bullets are safe. They reported a substantial number of severe injuries and fatalities inflicted by use of rubber bullets when vulnerable upper-body regions such as the head, neck and upper torso were struck, and further said that this ammunition is unsafe for crowd control.7 Since they caused many major injuries or deaths, especially of children or young adults, Israeli Defense Forces issued regulations of their use including a minimumfiring distance, not firing at children, and only firing at the legs.8 The organization Human Rights Watch has also called for these types of ammunition to be banned.

15. Controversy on Stun Guns

15.1.The National Institute of Justice in the US conducted research on stun guns. The research was on whether the stun guns harmed their targets. Their report stated that there was no conclusive evidence within the current research that there was either a significant risk of serious injury or death from the direct effects of Conducted Energy Devices (CED) exposure.

15.2.One of the key concerns from civil society is that stun guns can adversely affect those elements of the population who are 'at-risk', such as those with existing heart conditions, children, the elderly. Amnesty International expressed concern, for instance, that there are vulnerable elements of the population who would come into contact with the police, such as those are under the influence of drugs or alcohol, or people who are mentally ill.

16. Study to investigate Plastic baton round injuries in Ireland

16.1.In June 2001 the Home Office of the UK Government authorized the use of the plastic baton gun as ''a less lethal option'' by the police forces in the United Kingdom. In Northern Ireland the security forces have been using the plastic baton round, and its predecessor, the rubber bullet in civil disturbances since 1970. A new variation of plastic baton gun the L104A1 (Note: L104A1 is a version of the HK69A1, a 40 mm grenade launcher developed and produced by the German arms manufacturer Heckler & Koch (H&K)) and the L21A1 baton round were introduced for use in Northern Ireland in May 2001 with the removal of previous models. The new weapon also has an optional XL118E3 optical site for aimed firing. Up until the present date this weapon has been issued to eight mainland police forces including the London Metropolitan Police, the Merseyside Police, and the Stirlingshire Police.

16.2.The Defence Evaluation and Research Agency division of the Ministry of Defence carried out extensive test firing of the weapon. They concluded that it was essentially safer than its predecessor.

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[6] Human Rights Watch (2012), 'Human Rights Report 2012: Bahrain', *Human Rights Watch,* http://www.hrw.org/world-report-2012/world-report-2012-bahrain, as accessed on 29 October, 2012.

[7] BBC News 'Doctors urge rubber bullet ban' (http://news.bbc.co.uk/2/hi/health/2003999.stm, as accessed on 29 October, 2012.

[8] http://bmhlibrary.info/19696582.pdf

16.3.This was because of improved accuracy and flight dynamics of the baton round. However, they also concluded that for head wounds in specific circumstances it was likely to increase the chance of severe neurological injury. The new baton round was essentially of similar composition (polyvinyl chloride) and dimension (10 cm63.7 cm) to its predecessor. However, it is lighter (98 g compared with 133 g) and has a greater muzzle velocity (161 mph compared with 140 mph—measured at six feet from the gun barrel).

17. *Study Investigating Injuries caused by the attenuated energy projectile (Plastic Baton Round): the latest less lethal option*

17.1.Objectives of the Study: To review the injuries resulting from the attenuated energy projectile (AEP) in patients who present to emergency departments.

17.2.Method: Review of case notes of patients presenting with injuries caused by the AEP after three episodes of serious civil disturbance in Northern Ireland from July to September 2005.

17.3.Results: 14 patients with 18 injuries were identified and included in the study. All patients were male, with an average age of 26.3 years. There were six injuries above the level of the clavicle, to the head, face or neck. There were three chest injuries, seven lower limb injuries and two upper limb injuries. There were no abdominal injuries. Seven patients required hospital admission. Five patients required surgical intervention. One patient required protective, elective intubation and one patient required the insertion of a chest drain.

17.4.The attenuated energy projectile (AEP) is the most recent projectile to be developed as a less lethal system. It has been issued to the police forces in the UK and to the police force and the British Army in Northern Ireland, and has been available since 21 June 2005. It replaced the L21A1 plastic baton round, which itself had been in use since May 2001.

17.5.The L21A1 round was introduced because of a belief that it would be less likely to cause life threatening injury than its predecessor, the plastic baton round, when used by appropriately trained police officers. However, in certain circumstances, for example, high energy ricochets, the potential for more serious and life threatening head injuries existed. Accordingly, a study was undertaken under the direction of the Northern Ireland Office to develop a weapon system that would offer energy attenuating features and ricochet characteristics different from the L21A1. This led to the development of the AEP. The AEP is a projectile designed to deliver an impact to an individual, to dissuade or prevent an intended course of violent action, and, thereby mitigate the threat to law enforcement personnel and members of the public. It is not intended to cause serious or life threatening injury.

17.6.The AEP was designed to be more accurate, safer and reduce the injury potential compared with the L21A1, and especially to reduce the clinical consequences of an injury to the head. It does not fragment, which in itself reduces the risk of accidental injury and the potential for ricochet injury. The AEP was designed to be fired from the L104A1 gun using the same XL1 18E3 optical sight as the old L21A1 round. There were no changes in the guidelines regarding its use.

17.7.The AEP is made of polyurethane (owing to its temperature stability and the possibility of tightly controlling the material properties). The crumple zone is polyurethane, with an air gap in the nose. Its dimensions are similar (10×3.7 cm) to its predecessor, as is its weight (98 g). The mean velocity is 72 m/s. It delivers a slightly higher kinetic energy on initial impact than its predecessor, the L21A1 (254 J upon striking its target compared with 244 J), although its design means that there is less kinetic energy transfer once the target has been struck.

17.8.The L21A1 was last used in Northern Ireland in September 2002, and the AEP was first used in July 2005. It is important to point out that although the AEP had already been fired on a number of occasions by police forces in Great Britain, it may be used there against specific individuals who pose a major threat whereas in Northern Ireland, it is used against individuals in circumstances of serious public disorder and riot.

17.9.Discussion: Clinically, the nature of injury caused by the AEP is blunt trauma. Although the kinetic energy of the AEP on initially striking its intended target is slightly greater than that of the L21A1, its design means that after impact, there is less transfer of kinetic energy. The clinical description of the visible injury caused remains unchanged—that is, about a 4cm diameter circular abrasion with surrounding contusion.

17.10.A previous publication for reviewing injuries after impact from the L21A1 noted that none of the patients presenting had sustained injuries in these body regions. To our knowledge, in about 20 incidents in Great Britain in which the L21A1 was fired, there were no reports of head injuries and deaths. The small number of patients included in this study does not allow for statistical comparison with previous studies. However, with 36.67% of patients with injuries above the clavicle, the injury pattern is more in keeping with those described in previous studies by Sheridan and Whitlock,5 Rocke,6 Ritchie7 and Steele et al,8 which showed 40.5%, 41.4%, 23% and 19.2%, respectively, of patients presenting with injuries above the clavicle. It is important to note that 16.67% of injuries sustained were to the thoracic region and that there were no abdominal injuries. There was only one bone fracture, and in none of the injuries to the extremities was there serious soft tissue damage. The 14 deaths attributable to rubber or plastic bullets in Northern Ireland have all been due to head or chest trauma.

17.11.The stated objective for the AEP development and introduction was to decrease the possible risk of serious or fatal head injury. Although no deaths were attributable to the use of the AEP, a combined total of 50% of the injuries sustained were to the thorax or above the clavicle. In this context, is it fair to ask if there is such a thing as a "safer" head injury? It is clear that the AEP requires ongoing evaluation, and it is too early to conclude that it provides a safer alternative to the L21A1

(Note: Source of the above two studies is a research paper titled ' A Review of the Discharge of Baton Rounds By Police in England and Wales 2002 – 2004, by Home Office Scientific Development Branch, UK)

18. Medical Briefing: Riot Control Agents

18.1. The desired effect of all riot control agents is the temporary disablement of individuals by way of intense irritation of the mucous membranes and skin. Generally, riot control agents can produce acute site specific toxicity where sensory irritation occurs. Riot control agents are safe when used as intended. However, the widespread use of riot control agents raises questions and concerns regarding their health effects and safety. A large margin exists between dosages that produce harassment and dosages likely to cause adverse health effects for modern riot control agents such as CS and dibenz[b, f]1 : 4-oxazepine (CR).

18.2. Yet, despite the low toxicity of modern riot control agents, these compounds are not entirely without risk. The risk of toxicity increases with higher exposure levels and prolonged exposure durations. Ocular, pulmonary and dermal injury may occur on exposure to high levels of these substances, and exposure to riot control agents in enclosed spaces may produce significant toxic effects. Reported deaths are few involving riot control agents, and then only under conditions of prolonged exposure and high concentrations. Recently, concerns were expressed on the deaths resulting from law enforcement use of OC, a riot control agent generally regarded as safe because it is a natural product. (Source: Riot Control Agents: Pharmacology, Toxicology, Biochemistry and Chemistry, US Army, Edgewood Chemical and Biological Center)

International Law, Conventions and Treaties, and their applicability to India

19. Use of Less Lethal Weapons is subject to a number of international laws and conventions. There is no specific dictum for the use of LLWs/NLWs. However, their operability is governed by the rules of engagement or the law of war, and international conventions and laws. These include The Biological and Toxin Weapons Convention (BWC), the Chemical Weapons Convention (CWC), the Convention on Conventional Weapons (CCW) (also known as the Inhumane Weapons Convention (IWC)). This chapter discusses these aforementioned conventions in brief and their implications in the area of law enforcement.

20. <u>United Nations Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons (CCW) Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects of 10 October 1980</u>

20.1. This convention seeks to restrict or prohibit the use of particular conventional weapons that are considered extremely injurious, or whose effects are indiscriminate. It consists of 4 protocols (the 4th one added in 1995).9 Protocol I restricts the use of weapons with non-detectable fragments. Protocol II restricts the use of landmines, booby traps, and any other manually planted munitions and devices. It doesn't make any distinction between "lethal" and

[9] Fidler, David P., "The International Legal Implications of "Non-Lethal" Weapons" (1999). Faculty PUBGLications. Paper 699.http://www.repository.law.indiana.edu/facpub/699

"non-lethal" mines, booby traps and other devices.10 This Protocol was amended in 1996 to extend its scope to cover internal armed conflict while clarifying that the provisions of the Protocol do not apply to situations of internal disturbances and tensions, such as riots, isolated and sporadic acts of violence.11 Protocol III of the Convention deals with the restriction on incendiary weapons and prohibits their use on civilians. Here, incendiary weapons are identified as those designed to cause fire or burn injuries. Protocol IV, specifically deals with blinding laser weapons, prohibiting the use of those weapons that are designed to cause permanent blindness.

20.2. As of 26 July 2012, 115 States are parties to this Convention and India is one of them. India became a signatory to this Convention in 1981 and ratified Protocol I, II and III in 1984, Amended Protocol II and Protocol IV in 1999, and Protocol V (which address post-conflict remedial measures) and Amendment to Article I in 2005.12

21. Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction of 13 January 1993

21.1. Administered by the Organisation for the Prohibition of Chemical Weapons (OPCW), an independent organisation based in The Hague, the CWC criminalises the production, stockpiling and use of chemical weapons.

21.2. The Convention prohibits the use of chemicals that can cause death, temporary incapacitation or any permanent harm to both, humans and animals unless when used for military purposes not relying on toxic properties and for law enforcement including domestic riot control. It also makes compulsory the destruction of all existing chemical weapons and chemical weapons manufacturing units.

21.3. The convention distinguishes three classes of controlled substance, chemicals which can either be used as weapons themselves or used in the manufacture of weapons. The classification is based on the quantities of the substance produced commercially for legitimate purposes. Each class is split into Part A, which are chemicals that can be used directly as weapons and Part B which are chemicals useful in the manufacture of chemical weapons.

21.4. Schedule 1 chemicals (or Chemical Weapons) have few or no uses outside of chemical weapons. These may be produced or used for research, medical, pharmaceutical or chemical weapon defence testing purposes but production above 100 grams per year must be declared to the OPCW. A country is limited to possessing a maximum of 1 tonne of these materials. Examples are mustard and nerve agents, and substances which are solely used as precursor chemicals in their manufacture. A few of these chemicals have very small scale non-military

[10] Ibid, page 68

[11] International Committee of the Red Cross, 'Protocol on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devices', available at http://www.icrc.org/ihl.nsf/FULL/510?OpenDocument, accessed on 16th October, 2012.

[12] International Committee of the Red Cross, 'Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects', available at http://www.icrc.org/ihl.nsf/FULL/500?OpenDocument, accessed on 16th October, 2012.

applications, for example minute quantities of nitrogen mustard are used to treat certain cancers.

21.5. Schedule 2 chemicals (or precursor to Chemical Weapons) have legitimate small-scale applications. Manufacture must be declared and there are restrictions on export to countries which are not CWC signatories. An example is thiodiglycol which can be used in the manufacture of mustard agents, but is also used as a solvent in inks.

21.6. Schedule 3 chemicals (or dual use chemicals) have large-scale uses apart from chemical weapons. Plants which manufacture more than 30 tonnes per year must be declared and can be inspected, and there are restrictions on export to countries which are not CWC signatories. Examples of these substances are phosgene, which has been used as a chemical weapon but which is also a precursor in the manufacture of many legitimate organic compounds and triethanolamine, used in the manufacture of nitrogen mustard but also commonly used in toiletries and detergents.

21.7. The treaty also deals with carbon compounds called in the treaty discrete organic chemicals. These are any carbon compounds apart from long chain polymers, oxides, sulfides and metal carbonates, such as organophosphates. . The OPCW must be informed of, and can inspect, any plant producing (or expecting to produce) more than 200 tonnes per year, or 30 tonnes if the chemical contains phosphorus, sulfur or fluorine, unless the plant solely produces explosives or hydrocarbons.

21.8. Riot Control Agents (RCAs) are a special category under CWC and are defined as "chemicals which are not listed in any Schedule, which can produce rapidly in humans, sensory irritation or disabling physical effects which disappear within a short time following termination of exposure". Under the Convention, RCAs are prohibited as a method of warfare. However, they are permitted for the purpose of 'law enforcement including domestic riot control' and their declaration is required.[13] India became a signatory to the Convention on 13 January 1993 and ratified it on 3 September 1996. As a part of its obligation under the Convention, The CWC Act, 2000 was passed by the Parliament and assented to by the President of India.[14]

22. Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction –also known as the BWC (Biological Weapons Convention) or Biological and Toxin Weapons Convention (BTWC)

22.1. The Biological Weapons Convention is a supplement to the 1925 Geneva Protocol (which prohibited the use of biological weapons, but did not ban the production of them). According to the Convention, all signatory states must prohibit the development, production and

[13] Rosenberg B. (2003), 'Riot Control Agents and the Chemical Weapons Convention', On 1st May, 2003 for the Open Forum on Challenges to the Chemical Weapons Ban, The Peace Palace, The Hague.

[14] Ministry of Chemicals and Fertilizers, Government of India, *Chemical Weapons Convention*, available at http://chemicals.nic.in/chem4.htm, accessed on 16th October, 2012.

stockpiling of biological and toxin weapons, while also committing to destroying the existing ones.15 The Convention was opened for signature in 1972 and India ratified it in 1974. 16

22.2.Article 1 of the Convention states, "Each State Party to this Convention undertakes never in any circumstances to develop, produce, stockpile or otherwise acquire or retain:

22.3.Microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes;

22.4.Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.17

[15] The United Nations Office at Geneva, *The Biological Weapons Convention,* available at http://www.unog.ch/80256EE600585943/(httpPages)/04FBBDD6315AC720C1257180004B1B2F?OpenDocument, accessed on 16th October, 2012.

[16] Chowdhary S. (2011), "Thematic Debate on other weapons of mass destruction", Speech delivered on October 17, 2011at the first committee of the 66th session of the United Nations General Assembly.

[17] International Committee of the Red Cross, 'Convention on the prohibition of the development, production, stockpiling and use of chemical weapons and on their destruction' available at http://www.icrc.org/ihl.nsf/FULL/553?OpenDocument, accessed on 16th October, 2012.

Part 3: Technologies and Types of less Lethal Weapons

Less Lethal technologies used across the globe

1. This chapter looks at the various technology categories and discusses the current and emerging weapons available for law enforcement. The impetus for Less Lethal Weapons (LLW) has evolved post cold war era, and were primarily developed to migrate from conventional war operations to peacekeeping humanitarian operations and regional conflicts. There is an unprecedented increase in the available LLW technologies and their diverse capabilities. Various LLW technologies available today are presented below,

   1.1. Kinetic energy – Batons, Water Cannons, Dyes

   1.2. Electrical – Stun Guns, TASERS, Batons

   1.3. Acoustic – Flash bang, Stun grenades, LRAD

   1.4. Directed energy – Radio-frequency, ADS, Lasers

   1.5. Chemical technologies – RCAs, Malodorants, Incapacitants

   1.6. Barriers and entanglements – Vehicle Arresters, Spikes, Nets

   1.7. Combined Technologies – MSDD

2. Orkash team studied the various LLW technologies with regards to their application, effectiveness, constraints and delivery mechanisms as also their legal, moral, ethical and human right aspects. The most important aspect that has been focused is application of the LLWs towards crowd control. The observations that emerged with respect to LLWs are given below,

   2.1. Kinetic technology and electrical technologies are useful means towards individual incapacitation although; they can be lethal at short distances. Water cannons under the kinetic technologies can also be used as identification tool when mixed with dyes.

   2.2. Acoustic technology based LLWs not incapacitate the crowd by causing discomfort in ears but also act as a means to disable coordinated attacks by blocking human communications (the ability to hear). Certain acoustic devices like flash bangs (loud noise and bright flash) are primarily developed to create fear factor (temporary only).

   2.3. Barriers and entanglements primarily disrupt coordinated attacks and also help subdue violent action. Although these are mostly used as a means of own force protection by stopping speeding vehicles.

2.4. 'Directed energy' technologies have recently undergone substantial research both because of their application towards effective crowd dispersion and also because of minimal or no lethal damage caused by them. Although, such technologies have never been field tested.

2.5. Chemical based LLWs are the most controversial as there are no clearly defined international laws and regulations to govern their usage. There is no consensus whether these come under the Chemical Weapons Convention (CWC) or not. Such LLWs can be used for widespread or individual incapacitation depending upon delivery mechanism deployed. Usage of chemicals in such weapons creates substantial fear factor amongst the crowd.

A comprehensive overview of the above is summarized in the table 1 below,

Non-Lethal Weapons : Technologies											
Technology	Types	Operational Parameters / Efficacy									India Usage / Availability
		Crowd Dispersal	Individual Incapacitation	Prevent Coordinated Crowd action (communication blockages)	Degrade violence causing actions/behaviours	Limit injuries and deaths (Legal, moral and HR aspects)	Utilize/create fear factor to influence mob psyche	Neutralize mob leaders	Protect own troops and motivation	Identification mechanisms	
Kinetic energy	Impact projectiles	N	Y	N	Y	N	Y	Y	N	Y	Yes
	Water cannon	Y	N	N	N	N	N	Y	N	Y	Yes
Barriers and entanglement	Nets, chains, spikes, Caltrops	N	N	N	Y	N	N	N	N	N	Yes
Electrical	Stun weapons	N	Y	N	N	N	Y	Y	N	N	Yes
Acoustic	Acoustic-optical	Y	N	N	N	Y	Y	N	N	N	Yes
	Acoustic generators	Y	N	Y	Y	N	Y	N	Y	N	No
	Vortex generators	Y	N	Y	N	N	Y	N	N	N	No
Directed Energy	High-power microwave and Radio frequency (HPM/RF)	N	N	Y	N	N	N	N	N	N	No
	Millimeter wave	Y		Y	Y	Y	Y	N	Y	N	No
	Laser (low energy)	N	Y	N	N	Y	N	Y	N	N	No
	Laser (high energy)	N	N	Y	N	N	N	N	N	N	No
Chemical	Anti-Personnel (RCAs, Incapacitants, Maladorants)	Y	Y	N	Y	N	Y	N	Y	N	Yes
	Anti-Material (Anti-Material, Anti-tractions)	N	N	Y	N	N	N	N	N	N	No

Kinetic Energy

3. Kinetic energy based LLW technologies use kinetic force to impact individuals by causing temporary shock and pain followed by incapacitation.

Table 2: Kinetic Energy based technology

Types	Description	Delivery Method
Impact projectiles	Airfoil; baton (foam, plastic, rubber, sponge, wooden); drag-stabilized (beanbag); encapsulated (water, dye, RCAs, Malodorant); fin-stabilized; pads; pellets (single, multiple small/large)	Gun, shotgun, launcher, mortar etc
Water cannon	High-pressure jets (may be marked with dye, electrified or have chemical irritant additive)	Vehicle mounted backpacks or fixed-in place systems.

3.1. An example of Kinetic Energy is Expandable Baton

3.1.1. *Description*: This durable, standard black, shock-resistant baton may be used with either the right or left hand and expands from 23 to 36 inches. It weighs less than 35 ounces and has a 1.25-inch-diameter nonslip handle. A mounting device attaches the baton to the military police ensemble pistol belt.

3.1.2. *Operational Capability/Use*: This baton is used for fast defense and for preventing the crowd from rioting in conflict situations.

3.2. Another common example is water jet.

3.2.1. The above shown picture is a riot truck with water cannon used by the Colombian Police. It holds 11,500 liters of water. Armored up to 7.62 Nato (NIJ III)

3.3. AEP Round

3.3.1. The Attenuating Energy Projectile (AEP) is a projectile designed to deliver impact on an individual, to dissuade or prevent an intended course of violent action, and, thereby mitigate the threat to lawenforcement personnel and members of the public. It is not intended to cause serious or lifethreatening injury. It was introduced into operational service on 21 June 2005. As the successor to the L21A1 baton round, it is significantly safer, while retaining overall effectiveness.

3.3.2. It is a less-lethal projectile with range upto 40 meters; typical range is about 25 meters with optimum effect at 20 meters. It is a 37 mm Round and is currently aim fired through L104A1 gun. It can be fired from UBGLs and handheld MBLs.

3.3.3. The AEP was designed to be more accurate, safer and to reduce the injury potential compared with the L21A1, and also especially to reduce the clinical consequences of an injury to the head. It does not fragment, which in itself reduces the risk of accidental injury and the potential for ricochet injury. It is made of polyurethane (owing to its temperature stability and the possibility of tightly controlling the material properties). The crumple zone is polyurethane, with an air gap in the nose. Its dimensions are similar (10×3.7 cm) to that of its predecessor, as is its weight (98 g). The mean velocity is 72 m/s. It delivers a slightly higher kinetic energy on initial impact than its predecessor, the L21A1 (254 J upon striking its target compared with 244 J), although its design suggests that there is less kinetic energy transfer once the target has been aimed. .

Chemical Technologies

4. Anti-personnel chemicals are intended to prevent individuals or crowds from taking certain actions (i.e. to inhibit or incapacitate them, but only temporarily and with no lasting side effects). Anti-materiel weapons disable vehicles and prevent the operation of its electronic systems.

5. Anti-material compounds include combustion modifiers, fuel contaminants, lubricant contaminants and other agents which disable the function of engines and vehicles. Corrosives, abrasives and de-polymerization agents can be used against various types of infrastructure.

12.7mm Istiglal sniper rifle (IST-12.7 Anti-Material Rifle)

6. Anti-personnel agents comprise of RCAs, malodorants, and calmatives. RCAs include chemicals that irritate mucous membranes, cause lachrymation, irritation and inflammation. They produce rapid irritation and effects which may disappear rapidly. The best known RCAs worldwide are Chloroacetophenone (CN) and ortho-Chlorobenzylidene malononitrile (CS), commonly referred to as tear gas. Oleoresin capsicum (OC) is the active ingredient in hot peppers.

7. Malodorants are chemical compounds whose extreme stench acts as a temporary incapacitant. It attacks the olfactory and/or trigeminal nerves of the person exposed to the chemical. These compounds are usually composed of at least two ingredients: the malodorant compound and a carrier liquid. Some are natural odours while others are synthetics. Mixtures of malodorants and irritants are often used.18However, sensitivity and their effectiveness as agents diminish with exposure.

8. Calmatives also are of great interest as LLWs. High concentrations of calmatives lead to unconsciousness or death, but it is believed that they can be safely yet effectively used. Calmatives produce rapid onset of symptoms. Safe use of calmatives would necessitate a delivery system that limits exposure to below the levels that lead to death or cause serious harm.

[18] Sutherland R. (2008) 'Chemical and Biochemical Non-lethal Weapons: Political and Technical Aspects', Stockholm International Peace Research Institute (SIPRI).

Table 3: Chemical Technology

Types	Description	Delivery Method
Anti-Personnel (RCAs, Incapacitants, Maladorants)	They inhibit or incapacitate personnel, but only temporarily and with no lasting side effects.	Delivery mechanisms as described previously.
Anti-Material (Anti-Material, Anti-tractions)	They disable vehicles and prevent the operation of electronics and so hinder infrastructure function.	Delivery mechanisms as described previously.

9. *Chemical Agents*: Less lethal chemical agents can be classified as riot control agents, incapacitants, calmatives and malodorants. 'Riot control agents' is a general term that can also be understood to encompass all such agents. Some, such as CS, are 'traditional' or 'standard', while others, such as various malodorants, have never had wide application. It is important to consider both the physiological effects of such agents and guidelines for when and how to use them (e.g. in situations that do not involve 'riot control').

Riot Control Agents

10. It is designed to temporarily disable individuals by causing intense irritation of mucous membranes, eyes and skin. Its toxic effects should be limited to areas where sensory irritation has occurred. RCAs are intended to be safe when used according to the manufacturer's specifications, but their potential widespread use raises concerns about possible health and safety problems. There should be a large margin between the dosage of RCA that is effective and the dosage that produces adverse effects. High-level exposure can cause ocular, pulmonary and dermal injuries and the use of RCAs in enclosed spaces can produce toxic effects. There is a need for additional research to establish the biological and toxicological effects of RCAs, and this is especially true of the use of RCAs in law enforcement activities where they are often misused deliberately or through ignorance. RCAs have three common characteristics, which are - rapid onset of effect, brief duration effect, and high safety ratio (i.e. ratio of lethal dose, LD, to effective dose, ED).

11. There are three types of RCAs namely lachrymators, sternutators and vomiting agents. Early Riot Control Agents (RCAs), namely, CN and diphenylaminearsine (DM) have been replaced by CS and OC.[19] Other common RCA agents include dibenz[b,f][1,4]oxazepine (CR), bromobenzylcyanide (CA), trichloronitromethane (chloropicrin, PS) and bromoacetone (BA).

11.1."The main effects of riot control agents are pain, burning, and irritation of exposed mucous membranes and skin. These effects do not differ appreciably from one agent to another except in the case of DM.

[19] Olajos E. and Salem H. (2001) 'Riot Control Agents: Pharmacology, Toxicology, Biochemistry and Chemistry', *Journal of Applied Toxicology,* 21(5):355-91.

Eye: The eye is the most sensitive organ to riot control agents. Contact with agent produces a sensation of conjunctival and corneal burning and leads to tearing, blepharospasm, and conjunctival injection. The severe blepharospasm causes the lids to close tightly and produces transient "blindness," an effect that could inhibit the recipient's ability to fight or resist. However, if the recipient opens his eyes, his vision is near normal even if a significant concentration of the agent persists.

Because these compounds are solids it is possible for a particle or clump to become embedded in the cornea or conjunctiva to cause tissue damage. With the caveat noted below, there is no evidence that this complication has ever occurred. However, a recipient seeking medical care for eye pain after exposure should have his eyes thoroughly decontaminated and undergo thorough ophthalmic examination. It could be necessary to pick out the particles of agent from tissue.

Reviewers have examined the evidence for permanent eye damage from riot control agents. In each instance, the damage was from a weapon fired from close range (about 50% were self inflicted). The reviewers concluded that the blast force driving the agent deep into tissue (with or without the wadding of the weapon) was major cause of the permanent injuries. This should not happen under normal use.

Nose and mouth: Contact with the delicate mucous membranes of the nose produces a burning sensation, rhinorrhea, and sneezing; a similar burning sensation accompanied by increased salivation occurs after contact with the mouth.

Airways: Inhalation causes burning and irritation of the airways with bronchorrhea, coughing, and a perception of a "tight chest" or an inability to breathe. However, pulmonary function studies done immediately after exposure have shown minimal alterations.

An inhaled irritating compound might be expected to exacerbate a chronic pulmonary disease such as asthma, emphysema, or bronchitis, but this appears not to happen after CS or CN even though these agents have been used widely in mixed populations. The medical care provider should nevertheless anticipate airway problems in individuals with lung disease, particularly if they are exposed to higher than the average field use concentrations.

There is no evidence that CS causes permanent lung damage after one or several exposures to field concentrations. Following inhalation of lethal amounts animals died from severe airway damage 12-24 hours post-exposure, but survivors from large exposures had minimal or no pulmonary abnormalities. After multiple (50 or more) daily exposures to smaller amounts, animals developed laryngitis and tracheitis.

Skin: Contact with skin causes a tingling or burning sensation and may cause erythema, particularly if the skin is raw or freshly abraded (e.g., shortly after shaving). The erythema begins several minutes after exposure and generally subsides 45 to 60 minutes after termination of exposure.

Under conditions of high temperature, high humidity, and high concentration of agent there may be more severe dermatitis starting with erythema hours after exposure and followed by vesication. Generally these are second-degree burns not unlike, but more severe than, sunburn. Firemen who entered contaminated buildings after summer riots several decades ago developed these lesions. After stirring up the contaminating particles, they later developed erythema and blisters on their exposed skin.

Hypersensitivity may develop. In one instance, an individual developed generalized vesication and high fever after an uneventful exposure to CS more than 20 years after his only and equally uneventful previous exposure.

Gastrointestinal tract: Gastrointestinal effects usually do not occur with most riot control agents (DM is an exception), although there may be retching or vomiting if the agent concentration is high, if the exposure is prolonged, or if the individual is sensitive.

Cardiovascular: A transient increase in heart rate and blood pressure has occurred in people immediately prior to an exposure to a riot control agent or immediately after onset of exposure. The heart rate and blood pressure returned essentially to pre-test ranges while exposure continued and may have been caused by the anxiety or the initial pain rather than to a pharmacological effect of these agents. This "alarm reaction" may cause adverse effects in one with preexistent cardiovascular disease.

Oral ingestion: Children occasionally eat CS and several adults have swallowed CS pellets. Aside from bouts of diarrhea and abdominal cramps (which might have been from the cathartics and antacids used as therapy) their courses have been uneventful. In animals, the LD50 is about 200 mg/kg (which is about 14 grams/70-kg person), an amount unlikely to be ingested even deliberately. A few animals fed lethal amounts (or greater) had gastric irritation or erosions, and several had signs of intestinal perforation. Recommended therapy after ingestion consists of cathartics, antacids, and surgical observation.

Lethality: CN, occasionally in combination with DM, has caused deaths in people who refused to exit a confined space. In each case the agent was used in excess. Death generally occurred hours after initial exposure, and postmortem findings were those of severe airway damage similar to that seen in animals.

Metabolism: Animals given lethal amounts of CS by intravenous or intraperitoneal administration developed increased blood thiocyanate concentrations hours later, indicating that the malononitrile portion of CS had been metabolized to cyanide. Cyanide was not a factor in causing death (lung damage was). A significant increase in blood concentration of thiocyanate has not been noted after aerosol administration of CS. Several popular data bases mention this cyanogenic potential of CS and suggest that treatment of a CS casualty might require therapy for cyanide poisoning (this recommendation is apparently based on the i.v. or i.p administration data). After receiving lethal amounts of CS by inhalation animals died 12-24 hours later from severe airway damage; cyanide was not implicated in their deaths[20].”

11.2.Irritants have been used by the military for centuries, but scientific understanding of their use was developed during World War I. Ethyl bromoacetate, a lachrymator, was initially used by France. Germany introduced lethal gases in 1915 with the use of chlorine. About 30 substances were used in World War I for their supposed irritant activity. The use of riot control agents in war was pioneered by the USA in Vietnam. In 1968 France used RCAs for crowd control in Paris, and the United Kingdom developed RCAs for use in crowd control in Northern Ireland in the 1960s. Law enforcement agencies worldwide continue to use RCAs. A RCA that is frequently used for crowd control is CN, also known as Mace.

Incapacitating Agents

12. An incapacitant is a chemical agent which produces a temporary disabling condition that persists for hours to days after exposure to the agent (unlike the short term effects of RCAs). The term

[20] http://www.fas.org/nuke/guide/usa/doctrine/army/mmcch/RiotAgnt.htm, as accessed on 06 December 2012 at 1800 hours

denotes substances that temporarily impair performance by targeting the central nervous system. Anticholinergic agents appear to be most suited for the military use.

13. Medical treatment following exposure to an incapacitant may not be necessary but may facilitate recovery. Such agents: (a) are highly potent; (b) alter the regulatory activity of the central nervous system; (c) have a duration of action lasting from hours to days; (d) are not dangerous to life except at many times the effective dose; and (e) are not likely to produce permanent injury. These criteria eliminate many drugs, such as various opiates and sedatives, from use as incapacitants.21

14. Chemical and biological incapacitating agents can be categorized according to their principal physiological effects as: olfactory assault agents, vesicants, irritants or nausea-producing agents, psycho-chemical agents (substances whose most prominent effects are psychological or behavioural), stimulants, depressants, psychedelics and deliriants. Such agents pass the blood–brain barrier and affect the central nervous system (i.e. they interfere with higher brain functions). They are easily counteracted and, in theory, disable behaviour at a lower dosage than that which would produce lethal effects.

Calmatives

15. 'Calmative agents' (a military, not a scientific term) denote psychoactive substances that cause behaviors like unconsciousness and hallucination in individuals. The safe range (between unconsciousness and death) for the use of such agents is small because it is difficult to calculate the effect of their use unless the health and age of the target group is known.

Malodorants

16. There is no consensus whether malodorants fall under the Chemical Weapons Convention (CWC) or not.22 It has been argued that malodorants can be classified as riot control agents. The definition of RCAs includes malodorants as odorants that affect behavior and act as sensory irritants, similar to other RCAs.23

17. Malodorants are chemicals which produce very foul odour that stimulates extreme revulsion to persons. They are commonly referred to as Stink Bombs and their effect on olfactory nerves causes personnel to leave the area. While these chemicals do not cause injury, they can have the effect of causing nausea, vomiting, disorientation and other physical discomforts. The odour generated could be that of vomit, burnt hair, sewage, rotten flesh, among others. Compounds which are generally used in composing malodorants are sulphur compounds and the composition may include an appropriate amount of an odor intensifier, e.g., skatole, to provide malodorant

[21] Sutherland R. (2008) 'Chemical and Biochemical Non-lethal Weapons: Political and Technical Aspects', Stockholm International Peace Research Institute (SIPRI).

[22] Sutherland R. (2008) 'Chemical and Biochemical Non-lethal Weapons: Political and Technical Aspects', Stockholm International Peace Research Institute (SIPRI).

[23] The Sunshine Project (2001), 'Non-Lethal Weapons Research in the US: Calmatives and Malodorants', available at http://www.sunshine-project.org/pUBGLications/bk/pdf/bk8en.pdf, accessed on 16 October, 2012.

composition having low toxicity while providing the olfactory stimuli desired. Often used compounds include,

Sulphur Compounds	Hydrogen sulphide, Ammonium sulphide	Smell - rotten eggs
Carboxylic acids	Propionic acid, Caproic acid, Butyric acid	Sweat, rancid dairy, cheese
Amines	Ethylamine, Putrescine, Cadaverine	Fishy smell, Rotten meat
Heterocyclic compounds	Indole, Skatole	

18. The combination of these compounds is particularly effective in producing a malodorous stimulus for use in a variety of settings where non-lethal weapons are employed, all without permanently damaging the targeted subject or the surrounding environment.

19. Malodorants can be loaded in shells, grenades, mortar rounds, and other devices. Malodorants can be used to control civil unrest (e.g. to halt protests), and in combination with lethal weapons as a 'force multiplier' in counterinsurgency and close combat in urban and enclosed areas. The Israel Defense Forces (IDF) use a malodorant called Skunk. The IDF has used Skunk, sprayed from vehicle-mounted water cannon, to disperse crowds in the Palestinian territories. Critics, however, accuse the IDF of using it excessively, coating houses in villages after protests as a form of collective punishment.

20. The US Department of Defence has also been developing stink bombs. One of them is the US navy initiative for malodorant grenades which can be thrown, or fired from a grenade launcher. Previous efforts have failed because the undisclosed compound involved is highly volatile. Another malodorant that has been developed is The XM1063, a Malodorant round for 155-millimetre artillery. This scatters stink bomblets over a wide area.

21. In 1944 the US National Defense Research Committee (NDRC) produced a strong, lasting skatolic (faecal) odour for use in France and Japan. The NDRC stated in 1997 that a large 'odour atlas' was available and that it could duplicate any odour required. It could also use micro-encapsulation to allow for the delayed release of malodorants.

Electrical Technologies

22. Electrical technology based LLWs are devices that stun target individuals with an incapacitating high voltage, very low current, short duration electrical shock.

Table 4: Electrical Technology

Types	Description	Delivery Method
Stun weapons	Electrical incapacitation; stun guns, electrical baton, shield, net, water cannon, Stun belt, mine/grenade; "wireless" systems under development for use against people or vehicle electronics	From device: either direct contact with electrodes or remotely via wires and barbs; wireless systems will use projectiles with capacitor or pulsed laser for delivery of shock.

22.1.Example of the above technology based LLW: M–26 Advanced Taser

22.1.1.The M–26 advanced taser fires two probes up to 21 feet from a replaceable air cartridge. These probes are connected to the weapon by high-voltage insulated wire. The M–26 uses a new electro muscular disruption (EMD) technology that can completely override the central nervous system and directly control the skeletal muscles.

22.1.2.Operational Capability/Use: When the probes make contact with the target, the taser transmits a powerful electrical pulse along the wires and into the target's body through up to 2 inches of clothing. The EMD effect causes an uncontrollable contraction of the muscle tissue that result in physical debilitation regardless of pain tolerance or mental focus.

Acoustic Technology

23. Acoustic weapons, employing audible sound, infrasound or ultrasound represent one emerging non-lethal technology that is beginning to mature. They cause sensations such as debilitating dizziness, motion sickness, and nausea. These devices can also generate vibrations of body organs and result in extreme pain, seizures, and even death.

Table 5: Acoustic Technology

Types	Description	Delivery Method
Acoustic-optical	Flash-bang/stun grenades produce loud noise and bright light	Grenades
Acoustic generators	Devices that project audible, ultrasonic or infrasonic sound frequencies; may cause pain/discomfort, nausea, disorientation	Acoustic generator devices (fixed, portable or hand-held)

23.1.Example: LRAD (Long Range Acoustic Hailing Device)

23.2.Description: HIDA (High Intensity Directed Acoustic) devices such as the Long Range Acoustic Device (LRAD) are designed to deliver audible warning messages over long ranges (up to 1km). However, at closer distances it is considerably more incapacitating and can produce 120db of sound at 60m and peak levels of 130db at 4 meters. Hearing damage can occur at levels as low as 80db if exposure is over a long period.

Directed Energy

24. Directed energy based NLWs use the principle of focusing energy beams at targeted individuals or a group to cause temporary irritation resulting to incapacitation.

Table 6: Directed Energy

Types	Description	Delivery Method
High-power microwave and Radiofrequency (HPM/RF)	Radiofrequency (RF) energy designed to degrade or destroy electronic equipment; electrical or explosive generation of energy	Bomb/missile, fixed or portable device
Millimeter wave	"Beam" directed at people heats up water molecules in surface of skin causing burning sensation, e.g. "Active Denial System"	Vehicle or aircraft mounted system
Laser (low energy)	Red and/or green diode lasers to temporarily blind or obscure vision known as "dazzlers" or "illuminators"	Torch-like device (handheld or weapon mounted)

24.1.Example 1 of Directed Energy: Radio Frequency Jammers

24.1.1.A Radio Frequency jammer is a device used to disrupt or prevent communication by broadcasting transmissions on the particular frequencies used by the target devices. Cell phone jammers are often used, for example, to prevent the use of cellular telephones in a particular area. They do this by generating disruptive signals on the frequencies used by cell phones to communicate with cellular antenna towers. Infantry units, military security forces, bomb squads, anti-terror units, anti-drug units, riot control teams, checkpoint personnel, hostage negotiators and border control agents are prime examples of the types of law enforcement personnel who benefit greatly from the deployment of radio frequency jammers.

24.2.Example 2 of Directed Energy: Dissuader Laser Illuminator

24.2.1.*Description*: This handheld laser "flashlight" generates an extremely bright, variable-width beam of red light. The beam is certified eye-safe at all ranges and under all tactical conditions. The laser illuminator is suitable for law enforcement missions where revealing a drawn weapon is not advisable. This device can be used as handheld augmentation to side-arms carried on law enforcement missions; use of a sidearm enables quick conversion to lethal force.

24.2.2.*Operational Capability/Use*: The laser illuminator is suitable for law enforcement missions where revealing a drawn weapon is not advisable. This device can be used as handheld augmentation to side arms carried on law enforcement missions; use of a sidearm enables quick conversion to lethal force.

24.3.Example 3 of Directed Energy: Active Denial System (Heat Ray)

24.3.1.*Description*: This Heat Ray is designed for area denial, perimeter security and crowd control. It minimizes fatalities, any permanent injury and also is tested to not have any effect related to cancer, pregnancy etc. With a range of around 700 meters, its effect can be nullified by using reflective protective clothing.

Entanglements & Spikes

25. Entanglements and spikes are used to entangle feet, tracked vehicles, and the outboard motors of boats. Entanglement weapons may be disbursed by a net gun that can entangle a human or vehicular target. One such net is 18 feet wide and has glue-coated strands. Another is 28 feet wide and, when fired from cannon, can envelop a car or armored vehicle. Nets also may be electrified to release an electric shock when the assailant struggles.

Table 7: Entanglements & Spikes

Types	Description	Delivery Method
Nets, chains, spikes, Caltrops	Spikes/strips of spikes, caltrops, barrier to stop vehicles; launched nets to snare people or tangle boat propellers; rigid foams to block windows or doorways.	Net launchers; for foam: hand-held, backpack or vehicle mounted tank with spray device

25.1.Example of Entanglement and Spikes: Portable Vehicle Arresting Barrier (PVAB)

25.1.1.*Description*: The portable vehicle-arresting barrier is capable of stopping a light truck (up to 7,500 pounds) at speeds up to 45 mph. It can be installed by two people in less than an hour. Total weight of the system is 646 pounds.

25.1.2.*Operational Capability/Use*: This pre-emplacement capture system provides quick and mobile deterrence to unauthorized and/or potentially suspicious vehicles at checkpoints or entryways to high-value assets or facilities.

25.2.Example 2 of Entanglement and Spikes: Roadside Spike Strip

25.2.1.*Description*: The roadside spike strip is designed to be easily transportable and deployable. The spike strip punctures pneumatic tires as the vehicle makes contact. When the vehicle makes contact, the spikes pivot into the tire and the tip guards are pushed down. The spikes become deeply embedded in the tire; they pull out of the unit and remain in the tire. On the second revolution, they are pushed directly into the tire, allowing air to escape slowly without causing a blowout or sudden loss of control. The average tire picks up four to six spikes.

25.2.2.*Operational Capability/Use*: The spike strip deflates tires within 12 to 20 seconds.

26. Barriers

26.1.Crowd control barricades are used to maintain order by placing people behind a restricted area with the purpose of restricting their movement. The barricades are deployed at parades, political rallies, demonstrations and by riot police for crowd control. There are different kinds of barriers. The most commonly used ones are made out of heavier materials or steel. They are hot dip galvanized after fabrication to ensure quality and strength. This aspect also made them weatherproof and rust proof. Height and length are also significant characteristics. The standard height of a barrier is 43 inches. They can be made into 1-meter, 2-meter, and 2.5-meters in length. These are more stable against push by masses/crowd. They are made more formidable by the hooks that are attached on its side. Single barriers are easy for the crowd to pass. Hooked barriers enable the barriers to interlock with one another. Once hooked, they are transformed into an impassable arena which is more stable24.

Types of Barriers/Barricades

26.2.A common however not very advanced version of crowd control barricade is Wooden Sawhorses. They are generally 14 feet long. The picture below depicts the wooden sawhorses used by the New York Police.

26.3.The legs are generally attached to the horizontal beam. This type of barricades is heavy. The personnel find it difficult to transport and assemble. A lighter version of this is available. However, they are found to be incapable with respect to supporting heavy loads and are easily pushed over.

26.4.Wooden sawhorses have been replaced by Steel Barricades. Interlocking steel barricades are much harder to push over, and since they are connected to each other, people can't go in between them.

[24] http://www.crowdcontroldirect.com/Crowd-Control-Barriers-a/312.htm, as accessed on 07 December 2012 at 1200 hours

26.5.Steel Barricades are also referred to as French Barriers, and are half the size of the wooden sawhorses. They are lighter and easier to handle. Big events, such as rallies or concerts, use interlocking steel barricades which are heavy and are increasingly used in different designs and sizes. For instance, after the London riots of 2011, the metropolitan police have been using 10 feet high steel structures.

The above depicts a steel cordon which was imposed across the road in Central London.

26.6.Mojo Barriers: Another type of commonly used barriers is called the Mojo Barriers. These are specifically designed as temporary fencing for events in which stages are involved. They effectively keep the crowd away from the stage. These are easy to assemble.

26.7.Concertina Wires: Concertina wire is a type of barbed wire that is formed in large coils which can be expanded like a concertina. These are artificial obstacles designed to impede movements and

control the crowd. These wire rolls have also been used to block roads and restrict the movement of people in Kashmir and Telangana.

26.8.Vehicle Barriers[25]: Vehicle barrier systems include Portable Vehicle Arresting Barrier and X-Net (or Vehicle Lightweight Arresting Device, VLAD) which was reportedly used by the US Marines in Haiti. The X-Net is made from a strong polyethylene called Dyneema. Nets are also available to capture individuals. These nets can be electrified or have sticky substances added to them. Current research into new barrier systems includes work based on the principles of gas generated airbags.

26.8.1.Vehicle barriers are designed to block roads to disrupt/thwart vehicle based attacks. There are two main categories of vehicle barriers, permanent and temporary. Permanent barriers have a below-grade steel substructure that is cemented in place. They provide continuous protection at a single location. Types include Wedge, beam and Bollards barriers. Each of these barriers are discussed below,

26.8.1.1.Wedge barriers get their name because of their wedge shape when viewed from the side. These are also called plate barriers because the most common type uses a steel plate angled toward the approaching vehicle.

26.8.1.2.Beam barriers use a beam extending across the road. Generally the beam swings vertically to allow the vehicle to pass, but horizontal swinging versions and telescoping beams are also available. Some vertical swing designs require a massive steel counterweight (many thousands of pounds) to balance the beam, and a large capacity hydraulic system to move the beam.

26.8.1.3.Bollards are vertical cylinders. The name derives from the large cylinders used on wharves to tie down ships, and comes from an old English word for tree trunk. Retractable bollards are used to block roadways, whereas fixed bollards are widely used for perimeter security around a facility.

[25] http://www.probarrier.com/faqs/FAQs-TypesOfBarriers.asp, as accessed on 07 December 2012 at 1300 hours

26.8.2.Temporary Barriers, which rest on the road surface, are designed to be set up and removed quickly. They can be set up at any location and are usually used for extra security at high-profile events or during a threat escalation. Types include,

26.8.2.1.Mobile barriers are self contained trailers licensed for over-the-road travel that can be pulled by a heavy-duty pickup truck. The barrier is moved into position across a roadway, the axle and wheels disengage, and the barrier is lowered onto the roadbed. These barriers can be operated manually, powered by an electrical umbilical, or powered from a self-contained electrical generator or solar array.

26.8.2.2.Portable barriers are essentially identical to mobile barriers, except they do not have wheels and are not configured as over-the-road trailers. They are typically trucked to their deployment site and then placed on the roadbed using a forklift or mobile crane.

26.8.2.3.Semi-Permanent barriers straddle the definition between permanent and temporary. They are delivered to the site and then anchored. Some types are built on large steel plates that bolt to the road surface. Others have massive housings on each end that are filled with concrete, sand, or other material. They are temporary in the sense they can be removed without major roadway excavation. However, they lack the major advantage of temporary barriers: rapid setup and takedown in response to changing security conditions.

27. Combined Technologies: Combined NLW technology based weapons use a combination of one two or more of the technologies described above to impact a miscreant.

Table 8: Combined Technologies

Types	Description	Delivery Method
Combining various non-lethal technologies	Frangible projectiles containing chemicals (kinetic and chemical); laser delivered “wireless” electrical weapons (DE and electrical); modified water cannon (kinetic and chemical/electrical); “multi-sensory grenade” (acoustic-optical and chemical)	Delivery mechanisms as described previously.

27.1.1.**Multi Sensory Distraction Device (MSDD):** Still in R&D stage, this weapon unleashes a "simultaneous assault on 3 senses (sight, hearing & smell/taste) that will disorient unprepared adversaries and disadvantage even prepared adversaries. The "combined effects" of the MSDD trio will be "more than the sum of the parts”. It simultaneously assault 3 senses (sight, hearing and smell/taste) and has added ‘sting balls’ – small rubber projectiles.

27.1.1.1.**Delivery Systems:** The delivery systems are being designed to deliver chemical or other agents although the discussion of payloads is often non-specific and a variety of possibilities have been mentioned including irritant chemical agents (riot control agents), Malodorants, anti-traction chemicals, and incapacitating agents.

27.1.2. **Projectiles:** Paintball-type encapsulated projectiles were considered for delivery of incapacitating agents by Lawrence Livermore National Laboratory (LLNL) researchers and recently the idea has been proposed by Czech researchers. Such frangible projectiles and associated compressed air launchers are already in widespread use by police forces in the US for the delivery of powdered irritant agents such as CS, OC, or PAVA against individuals. The latest among the projectiles is the ASRAP (Advanced Segmented Ring Airfoil Projectile).

28. **Less Lethal Equipment/Launchers**: Relates to delivery of chemical agents at long range and over wide areas to target groups of people (as opposed to projectiles targeted at individuals). Examples:

- Overhead Liquid Dispersion System (OLDS)
- Airburst Non-Lethal Munition (ANLM)
- Multi Barrel Launcher *(used in India)*
- Gas Gun *(used in India)*
- Anti-Riot Gun *(used in India)*

Under Barrel Launchers – 40 mm bore; better compatibility

Dual mount (combination of lethal and non-lethal weapons)

MBL at Tekanpur

29. Modular Crowd Control Munitions

- Direct-fire, low-hazard device
- Stop, confuse, disorient, and/or temporarily incapacitate area targets or personnel at close range.
- Serves as a force multiplier

30. Unmanned Aerial Vehicles

Unmanned aerial vehicles (UAVs) are under development primarily for military tasks such as lethal weapons delivery, sensing, and reconnaissance. There is an increasing focus on usage of UAVs towards crowd control for local law enforcement.

Hand launching an FQM-f51 pointer armed with non-lethal payload during testing

30.1. Tactical UAV systems (for example: "Kentron's Seeker") are currently being deployed by law enforcement in South Africa for crowd monitoring and urban surveillance. The Pakistan Army's Bravo tactical UAV is currently used for border patrol and law enforcement. KFOR uses UAVs for persistent surveillance of borders. The CL-289, Phoenix and Predator have been utilized some loaded with combat weaponry had been used in war situation on a daily basis in Afghanistan and Iraq.

30.2. UK law enforcement have studied the use of small VTOL UACs with a still camera, daylight TV sensor and a live video downlink, for urban and crowd surveillance.

Table 9: INDIAN USAGE and R&D: Tekanpur Less Lethal Weaponry

Unit Type	Description	Technical Specifications		
		Fired From / Launch Method	Chemical Used/ Irritant Chemical	Range
Tear Smoke Shell (Normal)	Generate tear smoke at the target end from a long distance for crowd dispersal	38 mm Gas Gun	CS	135 +/- 10 mtrs
Tear Smoke Shell (Electric)	Similar to the Tear Smoke Shell (Normal) except that the initiation through an electric squib. (The electric impulse id delivered from 12 volt battery) and it is fired from Multi Barrel Launcher (Agnivarsha)			
Stun Shell (Normal)	Explodes in air with loud bang and blinding flash causing temporary stunning of miscreants	38 mm Gas Gun	Stun Composition	100 +/- 10 mtrs
Stun Shell (Electric)	Similar to the Stun Shell (Normal) except that the initiation through an electric squib. (The electric impulse id delivered from 12 volt battery) and it is fired from Multi Barrel Launcher (Agnivarsha)			
Dummy shell (Normal)	Functional trial for 38mm gas gun and for training purpose	38 mm Gas Gun	NA	135 +/- 10 mtrs
Dummy Shell (Electric)	Similar to the Dummy Shell (Normal) except that the initiation through an electric squib. (The electric impulse is delivered from 12 volt battery) and it is fired from Multi Barrel Launcher (Agnivarsha)			
Stun Grenade	A non- Fragmentation grenade which explodes with resounding bang and blinding flash causing temporary stunning of miscreants	Thrown by Hand	Stun Composition	35 +/- 10 mtrs
Tear Smoke Grenade	Generates large volume of tear smoke and designed for crowd dispersal. The plastic body starts melting on ignition and does not allow miscreants to throw it back on law enforcing agencies.	Thrown by Hand	CS	35 +/- 10 mtrs
Wood Piercing Shell	A fin stabilized shell, designed to defeat timber. The shell has lachrymatory filling for flushing out hold up miscreants.	38 mm Gas Gun	CS	60 +/- 10 mtrs
Dye Maker Grenade	It Explodes with a bang and spray an indelible dye on the miscreants for identification by law enforcing agencies.	Thrown by Hand	NA	35 +/- 10 mtrs
Self Protection Aerosol Device (SPAD)	Similar to small perfume bottle when sprayed on the miscreants it causes irritation in eyes and nasal passage , and cause temporary immobilization	NA	Oil of Capsicum	4-6 feet

Table 10: Tekanpur Less Lethal Weaponry - New Development Units

Unit Type	Description	Technical Specifications		
		Fired From / Launch Method	Chemical Used/ Irritant Chemical	Range
Plastic TS Shell with soft nose (JOE)	Plastic version of Tear Smoke Shell and has a soft nose which minimizes chances of serious injury when hit directly. The plastic body starts melting immediately on landing, with emission of smoke making it difficult to throw it away.	38 mm Gas Gun	CS	135 +/- 10 mtrs
Plastic TS Shell with soft nose (ANNA)	Generate tear smoke at 50 mtrs Due to very low velocity and a soft nose it will cause serious injury if hit directly.	38 mm Gas Gun	CS	50 +/- 5 mtrs
Dye Maker Grenade with irritant	It is a combination of irritant chemical and dye. Leaves behind dye marks on the clothes and body of miscreants to facilitate identification.	Thrown by Hand	Nonivamide	35 +/- 10 mtrs

Comparative Analysis of the Technologies

Table 11: RIOT CONTROL AGENTS

EFFECTS	COMMONLY USED / SUB TYPES	PROPERTIES	USAGE
Irritate mucous membranes, cause lachrymation, irritation and inflammation. High-level exposure can cause ocular, pulmonary and dermal injuries and the use of RCAs in enclosed spaces can produce toxic effects.	CN- Chloroacetophenone	It is a solid and can be disseminated as smoke. It is also available in powder and liquid formulations. CN is much more toxic than CS.	No deaths reported.
	CS - ortho-Chlorobenzylidene malononitrile (tear gas)	It is flammable, and decontamination is difficult because of its low solubility in water. Individuals can develop a tolerance to CS, especially if they are exposed to it regularly	No deaths reported. In use with police operations.
	OC- Oleoresin capsicum (pepper spray; replacement of CS) [its synthetic version, VN with various chemical names N-vanillyl nonanamide, pelargonylvanillylamide and nonivamide. It is commonly known as PAVA]	an oily extract of pepper plants of the genus capsicum a mixture of complex soluble phenols known as capsaicinoids Capsaicin (trans-8-methyl-Nvanillyl- 6-nonenamide) and dihydrocapsaicin make up 80–90 per cent of the substance	The use of pepper as a law enforcement technique was described in India in 1872, and a notable use of tear gas occurred in the Great Lumber Strike of 1935 in the Pacific Northwest of the USA. Although the safety of OC is disputable it is being used extensively in police operations.
	DM- diphenylaminearsine	Also known as Adamsite. A vomitting agent. It is not volatile and is insoluble in water. Much more toxic than other RCAs.	Several reported deaths.
	CR- dibenz[b,f][1,4]oxazepine	more potent but less toxic than CS. It is dispersed in solution (i.e. as a liquid) does not degrade in water and thus persists in the environment	
	CA - Bromobenzylcyanide	It is not stable and is corrosive.	
	trichloronitromethane (chloropicrin, PS)	lachrymator	cannot be used as an RCA under the provisions of the CWC
	BA- bromoacetone	lachrymator; prepared by reacting bromine and acetone	

The table 12 below compares various types of Anti-Material and Anti-Personnel Technologies,

TYPE	CATEGORIES	EFFECTS	COMMONLY USED / SUB TYPES	USAGE
ANTI PERSONNEL	Incapacitants	Produces a temporary disabling condition that persists for hours to days after exposure to the agent has occurred (unlike the short-term effects of RCAs) Medical treatment following exposure to an incapacitant may not be necessary but may facilitate recovery. This means that such agents: (a) are highly potent; (b) alter the regulatory activity of the central nervous system; (c) have a duration of action lasting from hours to days; (d) are not dangerous to life except at many times the effective dose; and (e) are not likely to produce permanent injury.	olfactory assault agents,	
			vesicants,	
			irritants or nausea-producing agents,	
			psycho-chemical agents (substances whose most prominent effects are psychological or behavioural),	
			stimulants- (amphetamines, caffeine, cocaine and nicotine- but not potent as incapacitants)	
			depressants- barbituates etc.	
			psychedelics - 3-Quinuclidinyl benzylate (BZ), but too potent to use	
			Deliriants	
	Malodorants	odorants that affect behaviour and act as sensory irritants	Bathroom Odor, butyric acid, vomit odour, sewage odour, burned hair, cherry–almond, cinnamon, lemon, menthol and vanilla, all of which have been given an 'odor repellency ranking	Systems under consideration- potentially useful for area clearing and area denial. Preliminary exploration for police actions.
	Calmatives	psychoactive substances that produce effects ranging from unconsciousness to hallucinations	Benzodiazepines (Ex: Diazepam, midazolam, eitzolam)	Opioid fentanyl by Russian army. Further research required involving effects, susceptibilities, safety, delivery methods and so on. Studies needed of onset time vs delivery method and mechanisms to control doses and explosures.
			Alpha2 Adrenergic Receptor Agonists (Dexmedetomidine)	
			Dopamine D3 Receptor Agonists (Pramipexole, CI-1007)	
			Selective Serotonin Reuptake Inhibitors (Fluoextine, WO-09500194)	
			Serotonin 5-HT1A Receptor Agonists (Busprione, lesopitron)	
			Opioid Receptors and Mu Agonists (Carfentanil)	
			Neurolept Anesthetics (Propofol)	
			Corticotrophin-Releasing Factor Receptor Antagonists (CP 154,526, NBI 27914)	
			Cholecystokinin B receptor antagonists (CI-988, CI-1015)	

ANTI MATERIAL	Anti-material	Microbes that are genetically altered to produce enzymes that have the ability to degrade substances including lubricants, fuels, paint, plastics and even cement.	embrittlement, caustic, corrosive, fuel contaminants	Difficulty of delivery of materials is a drawback; precise placement needed. They are proposed to be useful against electrical components and other material
	Anti-traction		slippery foams, adhesives	Demonstrations have been effective although require large quantities of material to be delivered. When spread on a walkway, makes simply walking across the area difficult; degree of delay must be sufficient to be effective; large quantity of material must be used (logistics problem).

New Technologies of Interest

31. Based on the above exhaustive discussion on the technologies that are available, following technologies/weapons are of much interest in terms of their applicable in the Indian context,

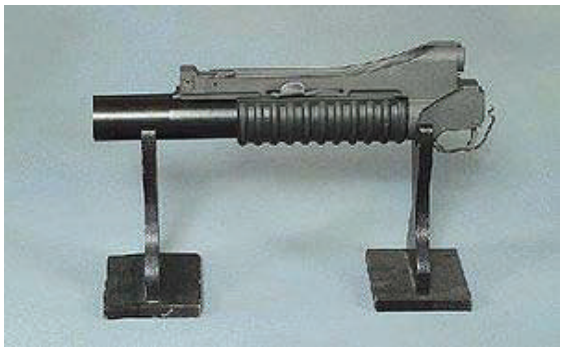
- Multi Shell Grenade Launchers (MSGLs) and UBGLs – Under Barrel Grenade Launchers
- Malodorants
- Chilli based munitions
- TASERs
- Acoustics based
- Radiofrequency jammers
- UAVs – surveillance and monitoring
- Combined Technologies – MSDD
- Protective equipment
- Light Armoured Vehicles
- Helmet Mounted Camera

31.1. Under Barrel Grenade Launchers (UBGL)

31.1.1. *Heckler & Koch AG36*: Extensive use of polymers and high strength aluminum in the AG36 launcher contributes to its low mass and durability. It is capable of firing almost all 40x46mm grenade rounds, including plastic training cartridges, flexible baton rounds, CS gas, and OC (oleoresin capsicum, the same chemical used in pepper spray) gas cartridges, white phosphorus, and HE ammunition. Once attached, the AG36 does not affect the accuracy of the rifle or its handling and operating functions. The AG36 can also be deployed as a stand-alone grenade launcher, independently of any primary weapon.

31.1.2.M320: It is the US variant of AG36. It is a 40mm single-shot add-on grenade launcher selected to replace the U.S Army's M203. The M320 can fire all of the high explosive (HE), armour piercing (AP), irritant gas, smoke, and illuminating rounds previously fired from the M203. However, because its breech opens to the side, instead of the pump-style of the M203, the M320 can also fire a variety of newer rounds that are longer, specifically certain non-lethal rounds.

31.1.3.*M203 grenade launcher:* An M203 equivalent is already in use by the Indian Army. Both AG36/M320 and M203 Grenade Launchers are single shot weapons designed for under-barrel use as an attachment with a rifle (an attachment for SLR/INSAS would need to be designed). They fire 40mm grenade shells, and also allow the soldier/policeman to use his rifle when necessary.



31.1.4.Both AG36 or M320 and M203 are extensively used all over the world (including the US Army). AG36 or M320 is however preferred as the M203 has a shortcoming: it cannot be loaded with high-powered or specialized grenades, because of its slide-locking barrel. This has been addressed in the side-loading M320 grenade launcher and the HK AG36 launcher (which has a similar setup where the barrel turns so that the breech is facing the user.

31.2.Handheld Multi Shell Grande Launcher (MSGL)

31.2.1. *Use of Multi-shell Grenade Launchers*: Based on our research, the modern handheld Multi Shell Grenade Launchers are a very effective means to achieve saturation and rapid rate of fire. These handheld MSGLs, which have the capability to launch 6 qty of 40mm shells within a few seconds, are fairly easy to operate. Apart from this, these launchers have a high degree of maneuverability and mobility because they are lightweight (6.5 kg versus the 70 Kg Agnivarsh multi grenade launcher which must be mounted on a vehicle for mobility reasons). The loading of these MSGLs permit the policemen to have a mix of tear-smoke/Chili/stun/ or other kinetic ammunition based shells into the equipment and use them as per the situation demands. These launchers not only score very high on their range (upto 400 meters or more depending on the type of ammunition) and reach but also are highly accurate due to very sophisticated sighting and calibration mechanism being mounted on them.

31.2.2.The MSGL M32A1 (40mm hand held multi-shell launcher) of Milkor USA by Milkor is in use worldwide. An old variant of this is in use by the India Army, as well as the US marines (and other 20 countries worldwide)

31.2.3. A multiple-shot weapon, intended to significantly increase a small squad's or platoon's firepower when compared to traditional single-shot grenade launchers like the M203 or other UBGLs. The MGL is designed to be simple, rugged, and reliable. It uses the well-proven revolver principle to achieve a high rate of accurate fire which can be rapidly brought to bear on a target. A variety of less lethal shells (in addition to lethal ones) are available in the form of anti-riot baton, irritant, tear gas and chilli combination, and pyrotechnic can be loaded and fired as fast as the trigger can be pulled; the cylinder can be loaded or unloaded rapidly to maintain a high rate of fire.

31.2.4. MSGL was test fired and evaluated on two separate demonstrations during the course of this study by police/para-military/BPR&D personnel in live demonstrations, and found suitable for platoon level deployment in anti-riot role. Both MSGLs and UBGLs would require high precision (low velocity) 40 mm non-lethal ammunition of various

types (Tear gas, Chili irritants, Kinetic Energy Rubber Baton/Rubber Ball rounds, etc), which are currently not being manufactured in India. Upto three MSGL are recommended in each anti-riot platoon, as these would provide a platoon the ability to saturate an area with tear gas/irritants and also fire kinetic energy baton rounds/rubber ball rounds at a high rate of fire. Such a capability is currently lacking in a platoon.

Protective Equipment

32. The protective equipment provides the individual officer with added protection to sensitive and vital areas of the body.

32.1.Riot Shield

32.1.1.Most of the riot shields are made of polycarbonate. Riot shields are intended to be used in riot control, to protect the user from shrapnel, thrown projectiles, and splash from various weapons such as a Molotov cocktail. Many riot shields are constructed from transparent high impact plastic to enable the bearer to see incoming thrown objects.

32.2.Varieties of riot shields

32.2.1.Riot shields come in various shapes, including:

32.2.1.1.Round: A common size is 2 feet in diameter.

32.2.1.2.Rectangular with rounded corners, curved in the horizontal cross-section to shed thrown objects. A common size is 20 or 24 inches by 3 feet. Some are tall enough for the bottom edge to be put on the ground.

32.2.1.3.Another type contains same features as above but also curved in the vertical cross-section at the top and bottom.

32.2.1.4.Some shields are "ballistic", i.e. strong enough to resist firearms fire.

Handle arrangements include:

32.2.1.4.1.A common type is with two large vertical handles at the same level: the user puts an arm (usually the left arm) through the arch of one handle and holds the other handle.

32.2.2.A tall rectangular riot shield can have three handles: two combination handles (that provide anchor with arm at two points), and also a small third lower handle for two-handed holding if a firmer grip is needed (e.g. for pushing rioters or demonstrators back).

32.2.3.A type that must be held in both hands does not let the user use a baton or gun in the other hand.

32.2.4.Riot shields are commonly used for protection from thrown objects or blunt/edged weapons, and not firearms. Ballistic shields are commonly known by the brand names "Body Bunker" and "Baker Bat shield".

32.2.5."Body Bunker" ballistic shields are opaque with a small clear armored sight window. Generally these types of shields have a bright light mounted on the frontal surface.

33. Riot Protection Helmet

33.1.Riot protection helmet is designed to protect its wearer's head, face and eyes from handheld melee weapons, and thrown projectiles such as bricks/stones. Many modern riot squad helmets are reinforced with materials that will protect the wearer from dangerous substances such as acids or industrial chemicals.

33.2.The simplest form is a hard shell with reinforced padding, and a chinstrap and a hinge-up (usually polycarbonate) visor, as in this image. These riot protection helmet visors are usually curved sideways and straight up-and-down. One accessory is a back-of-the-neck protector.

33.3.An example of a more complicated riots quad helmet is a French CRS helmet which has two visors: the outer visor is clear and hinges up outside the helmet; the inner visor hinges up between two layers of the helmet and has a finish which can be seen through from inside but from outside looks like opaque polished brass. Other possible accessories include built-in radio microphone and earpieces.

34. Personal Armor/Body Protection Suit

34.1.It is the whole of protecting clothing, designed to absorb and/or deflect slashing, bludgeoning, and penetrating attacks. In addition to military personnel, these are used to protect police forces. Two types exist: regular non-plated personal armor used by police personnel, and hard-plate reinforced personal armor used by combat soldiers, police tactical units and hostage rescue teams.

35. Torso

35.1. A ballistic vest helps absorb the impact from firearm-fired projectiles and shrapnel from explosions, and is worn on the torso. Soft vests are made from many layers of woven or laminated fibers and can be capable of protecting the wearer from small caliber handgun and shotgun projectiles, and small fragments from explosives such as hand grenades.

35.2. Metal or ceramic plates can be used with a soft vest, providing additional protection from rifle rounds, and metallic components or tightly-woven fiber layers can give soft armor resistance to stab and slash attacks from a knife. Soft vests are commonly worn by police forces, private citizens and private security guards or bodyguards, whereas hard-plate reinforced vests are mainly worn by combat soldiers, police tactical units and hostage rescue teams.

35.3. Modern equivalent may combine a ballistic vest with other items of protective clothing, such as a combat helmet. Vests intended for police and military use may also include ballistic shoulder and side protection armor components, and explosive ordnance disposal technicians wear heavy armor and helmets with face visors and spine protection.

36. Multi-Utility Belt

36.1. Multi Functional belt helps the police personnel carry various accessories and equipments (Baton, Radio set, Handcuffs, Spare magazine, Torch light etc) with ease. This type of belt has emerged as a one stop shop solution. The belt (fixed with tough grade plastic clip-on buckle with double locking system) besides assisting in carrying various accessories/equipment ends itself in promoting the "Hands Free Combat Ready Concept".

37. Gas Mask

37.1. Gas masks are typically used to provide the user protection from toxic gases and harmful pollutants. They are frequently deployed in riot control situations. These masks are effective against Riot Control Agents (RCAs), such as CN, CS, pepper spray etc. Some of the masks being used across the world are presented below,

37.2.Gas Mask

37.2.1.Twin Port Mask, has been developed to meet the respiratory protection needs of law enforcement, corrections officers, SWAT, and first responders.

37.2.2.It include a panoramic flexible visor, dark visor, Voice Projection Unit (VPU) with Microphone, EZ Air Unit, high-flow fail-safe hydration device, etc (sold separately).

37.2.3.It is NIOSH CBRN Cap 1 approved with the CBRNF12B filter and NIOSH 42 CFR 84 riot control CS-CN-P100 approved with the CTF12 filter (sold separately).

37.2.4.It also meets the latest NATO military standards. The filter side can be changed using Filter Mount Plug Tool (70501-161, not included).

37.2.5.This mask is used by Canada Police and was also deployed for G20/G8 Summit in 2010.

37.3.M-15 Gas Mask

37.3.1.Developed by Shalon Chemical Industries

37.3.2.Specifications

37.3.2.1.Lightweight

37.3.2.2.Specially formulated rubber material for high resistance to NBC agents

37.3.2.3.Impact resistant cylindrical plastic lenses with a wide field of vision

37.3.2.4.NATO-standard 40mm threaded canister housing

37.3.2.5.Central voice meter providing clear and effective communication

37.3.2.6.Drinking system with safety connections

37.3.2.7.GM10 filter canister is a part of the Gas Mask system whose weight is 228 gms

*37.4.*MSA Advantage 1000 CBA/RCA Mask

37.4.1.MSA supplies the majority of masks used by the U.S. Military. The Advantage 1000 mask is a clean, simplified respirator with Hycar face piece (based on a proven face piece design developed for the U.S. Armed Forces) that's up to 40% lighter than conventional full-face respirators and gives high performance, customized fit, comfort, economy, and excellent user acceptance.

37.4.2.Specifications

37.4.2.1.Flexible, 1-piece polyurethane lens with wide field of vision is bonded to durable Hycar™ rubber face piece

37.4.2.2.Dual-canister mount (bayonet) allows weapon sighting from either side

37.4.2.3.Fully elastic, 6-point head harness-easy on and off, adjustment, no hair pulling

37.4.2.4.Standard nose cup helps eliminate lens fogging

37.4.2.5.Standard mechanical speaking diaphragm included, or add MSA's optional ESP II Communications System

37.4.2.6.NIOSH-approved (No. TC-14G-0235) for protection against chloroacetophenone (CN), and chlorobenzylidene (CS) Tear Gas and P100 particulate efficiency level

37.4.2.7.Effective against OC (pepper spray)

37.5.MSA Advantage 4000 Full Face Respirator

37.5.1. The Advantage 4000 Face piece is available in both silicone and Hycar. It also comes in three standard sizes to ensure a perfect fit. In addition, options include either a rubber or net harness, and every mask comes with a standard nose cup for reduced fogging in low-temperature or high-moisture environments. When it comes to safety and protection, the Advantage 4000 Face piece covers all details, and provides the versatility and durability you need to go face-to-face with a world of environmental hazards.

37.5.2. Works with three different interfaces – Push-to-Connect (PTC), RD40 and the Twin-Cartridge Adapter

37.5.3. Revolutionary one-mask system that can adapt to a wide range of respiratory applications.

37.5.4. NIOSH approved.

37.6. 3M FR-M40b CBRN Gas Mask

37.6.1. The M-40 Full Face piece has been used for years by U.S. Armed Forces all around the world. It has been modified by 3M for easier breathing and is now available for CBRN applications. The 3M Full Face piece FR-M40B and FR-15-CBRN filter meet the new NIOSH standard for CBRN applications and deliver confidence and reliability to First Responders. It provides a comfortable, efficient, and reliable solution when it's most important—when lives are at stake.

37.6.2. This lightweight CBRN system has been tested by NIOSH against the most common warfare agents including sarin, mustard and numerous industrial chemicals, and meets the P100 particulate filtration efficiency standard, making it one of the most versatile pieces of equipment for First Responders.

37.7.AVON FM53

37.7.1.The AVON FM53 mask was developed to meet the unique requirements of specialist end-users in the field. The mask, based on the U.S. M50/JSGPM (Joint Service General Purpose Mask), provides maximum operational flexibility to counter multiple threat scenarios, including chemical, biological, nuclear, and radiological (CBRN) agents, Toxic Industrial Chemicals (TICs), and Toxic Industrial Materials (TIMs).

37.7.2.NIOSH certified mask with CTF12 or CBRNF12B filters

37.7.3.Integrated voice communications capability with internal microphone for both radio and voice projection unit use is included with Mask Assembly.

37.8.**Light Armored Vehicle**

37.8.1.Light armored vehicles provide greater mobility and operational maneuverability. They are lighter, less maintenance intensive and have good endurance.

37.8.2.Light Armored Patrol Vehicle is widely used by Police forces, SWAT, and other Security Agencies in North America and around the world. It is designed to provide Protection and Mobility, along with high level of comfort to its occupants in all climates.

37.8.3.LAVs have been extensively used in Britain for crowd control. They can provide excellent roadblocks and communication when dealing with disturbances. The ability to rapidly move to a location and establish a roadblock is extremely beneficial to the commander. LAVs can also remove roadblocks by crashing through them or using grappling hooks to remove them. All British LAVs involved in crowd control operations are equipped with barrier removal equipment. Another good use for them is forming an outer cordon to ward off people from entering a location.

37.8.4.Ashok Leyland has designed and manufactured Stallion Kavach 4X4 Armoured Troop Carrier, a tactical and armoured vehicle which can be used by the Military, police and other security bodies. It can transport 12 personnel including the driver and NIJ Level III grade Armour protection that can ward off rounds from light sub machine guns such as the INSAS rifle and the AK-47. The underbody can withstand blasts from two hand grenades and the entire vehicle can withstand blast of 5kg of explosives from a distance of 30 meters.

37.8.5. Another such vehicle is manufactured by Tata which is based on a Sumo platform and has a Quick Deployment Mobile Communication Terminal based on the LSV platform which offers better mobility solutions in light to moderate combat situations. The vehicle is tested to withstand all types of attacks – a direct hit at 90 degrees on all sides and 45 degrees on the roof from a distance of 10 meters using a 7.62X51mm FMJ, a 7.62X39mm steel core and 5.56X45mm SS109. The floor can bear the brunt of two hand grenades HE36/DM51 and the side can survive a 15kg TNT blast from a distance of three meters. It can accommodate six people including the driver with sliding type front and middle seats and a rear bench, each seating two personnel.

37.8.6. Light armor protection vehicles equipped with multi barrel tear gas launchers, communications, floodlight, and other needed paraphernalia can act as force multipliers by actually venturing into the crowd and for rapid re-deployment of police teams while ensuring adequate protection during such movements. These vehicles can also be equipped with a public address system, distinctive audible sirens and blue flashing lights, first aid boxes and video cameras.

37.9. Helmet Mounted Camera

37.9.1. Cameras mounted on the top of helmets can be useful for law enforcement as they can record real-time audio and video of incidents, which is stored and can be later analyzed. These cameras can be evidence gathering tools which could increase the number of offenders brought to justice.

37.9.2. Some of the police forces across the world have been using these for riot control.

Part 4: Field Inputs and Analysis

Riot Management in India

1. Public protests, agitations and demonstrations in India are often characterized by hostile crowds and at times anti state extremist elements (as in J&K, Manipur and Assam). As a democratic country which accords its citizens the right to protest, the police operational tactics and usage of less lethal weapons thereof are aimed at dispersal of unlawful assemblies by use of minimum force while protecting the police from violent tactics resorted to by the crowd. However, it becomes particularly taxing when the police agencies are challenged by situations where there is a possibility of lethally armed extremists/ anti-state elements taking cover behind the mob or there are elements motivating the crowds whose main purpose is violence (as in communal riots or rioting by rightwing elements). The 2010 riots in Kashmir valley represent the former. While on one hand India is challenged with Kashmir-like situations, on the other there have been instances of communal violence. For example, over 900 persons were killed in December 1992 and January 1993 Mumbai communal riots. Communal conflicts continue to uncover as civil disturbances in areas like Hyderabad and Assam (Bodo areas).

2. Riot control deals with various aspects including gauging and acting according to the crowd psychology, intensity/hostility levels, cause of violence (communal, anti-state, extremist fuelled, separatist etc), force escalation options, communication methodologies, effectiveness of (less lethal) means of engagement, force motivation and confidence, protection of police personnel, effective dispersal with minimum casualties and collateral damage with no human rights violations, retreat of the forces amongst many.

3. In Kashmir L&O is superimposed with terrorism/extremism. More often, the L&O situation is separatist/militant driven with armed militants or anti-state actors hiding within the violent mobs. Preparing and responding to such agitations is challenging and driven by uncertain repercussions. The J&K Police (and CRPF) face hostile crowds (that include women and children) who indulge not only in skillful and sustained stone pelting but also in attempts to provoking the police through abuses, throwing burning *kangries* and indulging in acts that hurt national sentiments during agitations. Rioters are adept at stone pelting with an average of 80 km/hr as the speed of the stone. Further, the houses of police men are targeted and burnt down during riots or their families socially ostracized by the locals, thereby impacting the morale of the police man.

4. Manipur has a distinct characteristic of women-led movements, and like Kashmir valley the rioters are often driven by high levels of emotions. Field inputs from Andhra Pradesh indicate that Telangana agitations often have political forces backing the riots and more often, the forces exercise restraint beyond the required levels owing to political sensitivities. Riots in Assam have influence of underground elements (UGE's) and are thus militant driven. Further, the riots reported in Assam also have a strong element of inter community rivalry e.g. Bodos versus the Bangladeshi immigrant community.

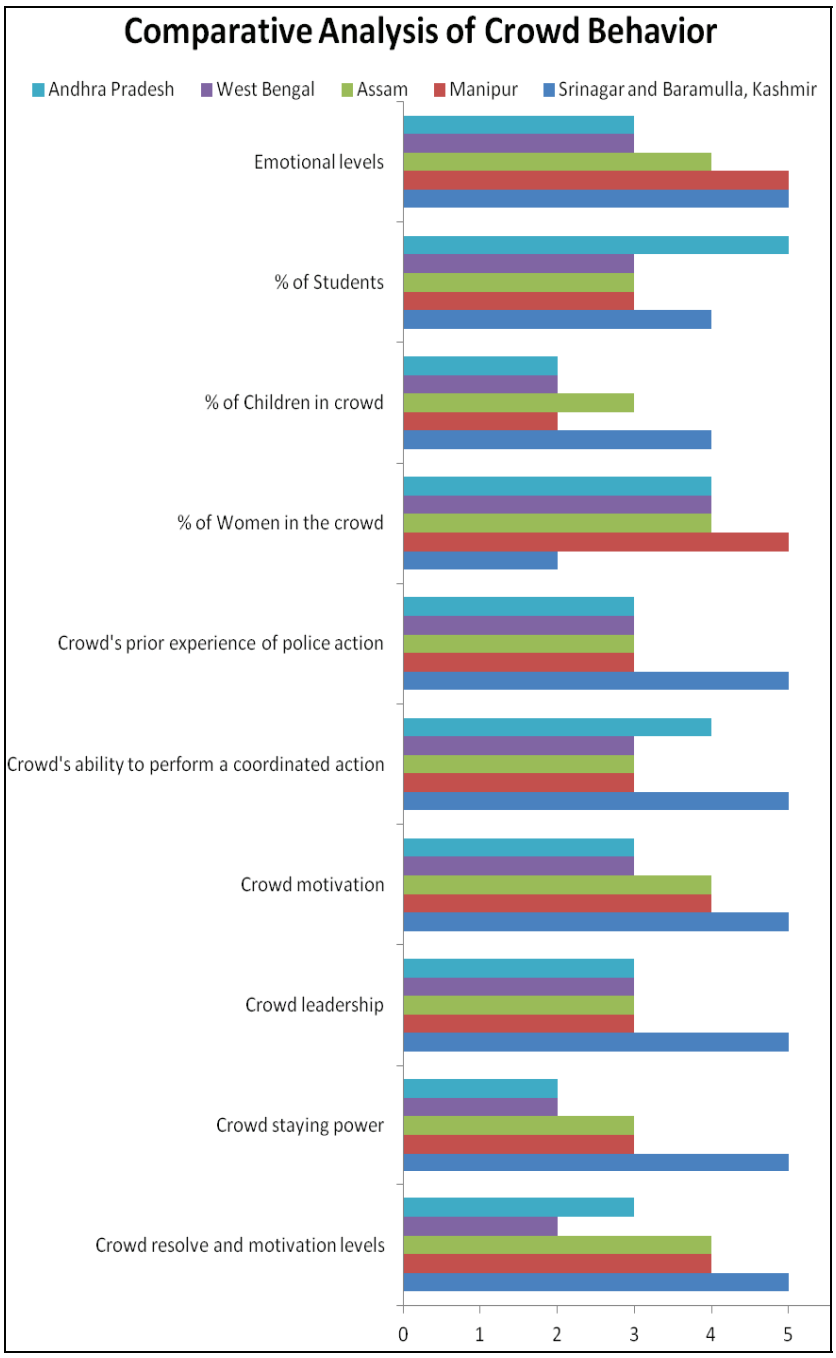
5. It was found that in many parts of India, insurgents/ militants are participating in the riot and direct the crowd action resulting in vulnerability of policemen to lethally armed militant.

6. Crowd control in national capital Delhi has a totally different backdrop where every move by the government/ police is monitored closely by national and international media.

7. Increasingly, less lethal weapons are emerging as a choice of the forces to deal with civil disturbances and have been used extensively in various parts of the country, be it the Kashmir valley by the J&K Police during and after the 2010 riots, the ongoing Telangana agitations in Andhra Pradesh, riots in Manipur, Assam, Punjab or the latest Kejriwal's India Against Corruption movement. Our research indicates that the states of J&K, Manipur, Assam and Andhra Pradesh use these more extensively as compared to the other states.

Crowd Behavior in Various States

8. Crowd behavior in the context of riot control is a vast subject. Attempts were made to cover its key aspect that includes crowd psychology, emotional levels of the crowd, impact of leadership on the crowd, ability of the crowd to perform coordinated actions, crowd resolve etc. Various aspects of crowd behavior in the riot control framework have been covered in a separate chapter to a greater detail. A comparative analysis of crowd behavior as found in different states of India is presented below,



Impact of Terrain, Geography and Weather conditions (Wind, humidity, temperature)

9. Terrain and geography is an important parameter that is to be considered not only for the actual riot control response but also in the planning and preparation stages. The challenges in terms of operational tactics to be used differ from open areas to built-up areas, hot and humid regions to cold and dry regions etc. For example, water cannons and vajra vehicles cannot maneuver

effectively in the lanes and by-lanes of Sopore and Baramulla (of Kashmir valley). Often, these heavy vehicles are the targets of stone pelters and armed rioters. Many times retreat of these heavy (and expensive) assets out of the riot area poses a challenge for the state police and CRPF.

10. Wind direction often determines where and whether to use the tear smoke munitions or any smoke based munitions. If not planned (and forces well trained) accordingly, the munitions that intended to disperse rioters may impact the forces themselves. Gas masks being used as on today are not capable of filtering smoke that emanate following the explosion of tear smoke munitions. The present day masks are intended for shop floor industrial usage where higher micron dust particles and carbon compounds are suspended in the air.

11. Weather is another significant aspect that determines the choice of less lethal weapons, especially those that are fired by means of ricochet, used by the police forces. As the ground loses its compactness and hardness during the rainy season, it negatively impacts the accuracy and precision of ricochet. In addition to this, varying humidity levels have different dispersal effects in the case of smoke based ammunition.

Target Response Characteristics – Rioters

12. The target response characteristics are the required characteristics that the police forces would like to achieve on the rioters during riot management. This essentially includes dispersal of the crowd with minimum number of casualties/injuries with the application of least amount of force. Various target response characteristics are listed below and possible means to achieve the same have been elucidated against each of these in the table below.

Required Characteristics	Applicable Equipment
Inability to communicate	Jammers for mobile phones, acoustic devices to degrade human communication (by impacting the ability to hear)
Reduced ability to sense	Stun grenades, tear smoke and chilli shells/grenades
Reduced ability to interpret	Stun grenades, tear smoke and chilli shells/grenades
Reduced ability to perform coordinated actions/attack	Jammers, acoustic LLWs, tear smoke and chilli shells/grenades, barricades, water cannons,
Reduced Motivation levels	take down the leader - 0.22 rifle and aimed ATP kind baton rounds (Precision bullets available these days)
Constrain Mobility	barricades and police formations with riot shields
Increased levels of Exhaustion	Kettling techniques (where crowds are diverted and enclosed in a street for prolonged periods till exhaustion sets in by putting diversions and barricades)
Required Levels of Pain	chilli grenades, pepper balls, rubber bullets, plastic pellets, baton rounds
Identification of the rioters	dye marker grenades and shells
Neutralizing of the leader	take down the leader, rubber batons (Precision batons available these days) and .22 rifle fire (which is less lethal than that from SLR, INSAS or 303 rifle)
Arrest of perpetrators	dye grenades, dye shells, stun batons/truncheons, plastic handcuffs/restraints
Area Denial	Manning the area along with barricades, surveillance and early warning

	intelligence, water cannons
Surprise factor	Combinations
Fear Factor	Posture, Dress and Equipment that looks intimidating, flag marches, etc
Increase discomfort and levels of irritation	Chilli grenades, tear smoke, irritant chemical munitions, etc

Required Incident Response Characteristics of Police Forces

13. These are the characteristics that the law enforcement agency would want their men to possess while facing the rioters in order to effectively manage a riot. A list of such required response characteristics can be derived for an ideal anti riot police force in terms of police manpower characteristics. These shall include aspects like maintaining an effective posture (friendly when the crowd is not violent, defensive to intimidating when violence brews etc), high motivation and confidence levels and possessing good physical fitness, maintaining calm and exhibiting tolerances to abusive language, to be able to perform coordinated action and effective communication etc.

14. All the above response characteristics would be an outcome of certain aspects like mental framework, training, leadership and body protection equipment.

Motivation of Police

15. Motivation of Police depends on aspects like provision of safer and better body protection equipment, continuous training and good leadership. Throughout our research, it has been a finding across all the states and forces we surveyed that the body protection equipment available is not of substantial quality. Current body protection equipment does not offer necessary protection to the person wearing it, thus impacting his/her morale and confidence levels. Continuous training in the form of refresher courses has resulted in better results. Wherever refresher training and regular motivational talks have been undertaken, a significant increase in the force morale is noticed. Forces in Kashmir are prepared before hand for not only the actual riot scenarios from an operational perspective, but also for softer aspects and emotional intelligence because of which, when faced with abusive languages directed at them and their families, they are able to exercise restraint and are able to refrain from resorting to aggressive tactics during riots. Regular pep talk and "Walk the talk" attitude of the senior officers has gained the buy-in at all levels of the forces.

16. However, body protection gear poses a serious gap in terms of riot control gear that exists with the police forces across the country.

Tactical mobility of the police forces

17. Tactical mobility of police is a crucial determinant of success of a riot control operation. Nowhere during our field surveys could we find vehicles that were effective for tactical mobility with respect to riot control operations, i.e. vehicles that can penetrate through the mob and reach to a point at the other end. Vajra vehicles and modified gypsy vehicles were found to be meeting the requirement in a limited manner only owing to its shortcomings like ad hoc design, limited protection and limited mobility. Field research revealed that Vajra vehicles often become the chosen targets of the stone pelters and rioters, who were armed with farm equipment, axes, hand-saws etc, because of its poor maneuverability (due to heavy weight and lack of power steering). In addition, rioters target these assets (like Vajra and Varun, the water cannons) as destroying them not only symbolizes anti-establishment actions but also causes capital loss to the government.

Riot Intervention /vehicle being used in Israel;

18. Mumbai police has recently acquired eight 'riot intervention vehicles' based on a SUV platform, but these lack the needed armour protection.

19. Anti riot squads in countries like Egypt, Israel and other developed economies like Germany and the United States have light armour protected vehicles that can effectively penetrate through the mob and transport troops to a point of better tactical and operational leverage. This enables them to carry out effective retreat and rescue operations. These vehicles are often of the size of a mini-van which can carry good required quantities of less lethal arms, ammunition, personnel safely as it is heavily armored from outside, while being dynamically stable with good maneuvering abilities.

20. The armoured gypsy vehicles that are in use in India are unstable and lose balance when loaded with people and also at times when the vehicles required to take a sharp curve (which is the case while maneuvering in lanes and by-lanes in most parts of the riot-prone areas). They often topple down and are set ablaze by the rioters.

21. Our field surveys revealed that during the operational response to a mob disorder, light armoured vehicles might prove useful for swift mobilization and judicious allocation of troops based on initial inputs. Light armour protection vehicles equipped with multi barrel tear gas launchers, communication facilities, floodlight, and other needed paraphernalia can act as force multipliers by actually venturing into the crowd, as well as for rapid re-deployment of police teams. These vehicles can also be equipped with a public address system, distinctive audible sirens and blue flashing lights, and video cameras.

Composition of Police Forces – Religion, Gender, Ethnicity

22. Especially in the regions that experience separatist sentiments (like Kashmir), separate state movements like Telangana, communal agitations like Gujarat and Hyderabad, the composition of police forces, their demographics and ethnicity play a great role in shaping the perceptions of not only the civil population but also the beliefs and view points of the policemen itself. Having women battalions in women dominated riot instances in places like Manipur is increasingly essential with the media and human rights activists extensively indulging in 'exploitive' coverage and allegations at the opportunity of male policemen handling a female rioter. Speaking of the newly trained women battalions of Srinagar, a senior police officer has said "…. they are my most important asset. They are no way lesser than their male counterparts. They are trained equally in every aspect of riot control at par with the other battalions consisting of male personnel. In addition, they are trained not only to tackle the crowd but also to protect themselves from any possible abusive/gender related assaults."

    22.1.Post communal riots of Mumbai, as the Krishna committee report notes,

"….On several occasions police station concerned did not even have persons knowing Urdu to interact with Muslims and feel the pulse of Muslim community or even to read and understand Urdu writings. This also led to their inability to keep themselves apprised of the communal Urdu writings circulating in the city."

"…The response of police to appeals from desperate victims, particularly Muslims, was cynical and utterly indifferent. On occasions, the response was that they were unable to leave the appointed post; on others, the attitude was that one Muslim killed, was one Muslim less. Police officers and men, particularly at the junior level, appeared to have an in–built bias against the Muslims which was evident in their treatment of the suspected Muslims and Muslim victims of riots. The treatment given was harsh and brutal and, on occasions, bordering on inhuman, hardly doing credit to the police. The bias of policemen was seen in the active connivance of police constables with the rioting Hindu mobs on occasions, with their adopting the role of passive on-lookers on occasions, and finally, in their lack of enthusiasm in registering offences against Hindus even when the accused were clearly identified and post haste classifying the cases in "A" summary."

Sensitisation of Police forces to the Cultural underpinnings of the Society

23. While we take pride in being a diverse country, often viewing ourselves as the melting pot for various religions, ethnicities and cultures from times immemorial, certain unrests of communal and ethno-cultural nature deteriorate the very fabric that our country has been built on. Often these have motivations that are politically inclined.

24. Police personnel especially at the constable, head-constable and inspector level, i.e. the first responders, need to be sensitised on various aspects of religious sentiments, beliefs, causes, ideological underpinnings etc to restore and reinstate the harmonious living in the country. This

requirement was articulated and rearticulated again and again throughout our research by the senior and middle level police officials across the country. Extensive training and motivational talks addressing these issues, as in the case of Kashmir Police, not only kept the force morale up, but also allowed them to rationalize their thought process towards better understanding of the emotional agony and psychology of the rioter, which in turn was found to be useful for a successful negotiation with the crowd. This entire exercise is aimed at winning the hearts and minds of the people, as police cannot afford it to be seen as an external party to the civilian society.

Quoting again from the Krishna committee report, *"The police should have realized that the Muslim community felt betrayed, hurt, humiliated and distrustful of the authorities on account of the demolition of the Babri Masjid inspite of the assurances and promises at the highest level and that too in the presence of armed police and para–military forces. Though there was some marginal violence like stone–throwing, it should have been controlled by use of persuasion and minimal force"*

Means to achieve the required response characteristics amongst the Police Forces

25. Based on the field findings, the inputs from the subject matter experts and eminent researchers in this field, required response characteristics have been mapped and analysed to arrive at the means to achieve these. The table below is the depiction of the same.

Required response characteristic – for Police Forces	Means to achieve
Ability to perform a coordinated action	Walkie-talkies, well trained formations and tactics, mock drills
Ability to use the weapon to its full performance	Training, personal equipment (very importantly the equipment-carrying equipment such as the web-kit of an individual
Seamless Communication	Walkie-talkies, mobile phones, standardized hand signs/ signals
Posture - Defensive till a level and then offensive	riot shields, shock shields, police formation, black suits, Mounted Police
High Motivation levels	Good quality body protection equipment, training, pep talk, protective equipment, - helmets, masks, kneepads, shin guards, elbow guards, torso protective jackets
High confidence levels	Better technology, training, pep talk, protective equipment, - helmets, masks, kneepads, shin guards, elbow guards
Higher comfort levels for persistence	body protection gear designed to suit humid and hot/ cold weather conditions
Safety	body protection gear of good quality, fire resistant material, impact absorption designs
Less no. of casualties/ injuries	Effective tackling crowd, training, awareness, tactics and right technology
To maintain calm and not get aggressive to the abuses	training and mock drills, mental ability training, awareness, sensitization at all levels
High levels of alertness and mental stability	Training, physical fitness and awareness
Physical fitness	Training and regular mock drills
Safe retreat	Tactics, better riot intervention vehicles, advanced Technology, protection gear, training and awareness

Escalation of Force

26. It has been observed through field interactions that three factors, namely, Situation, Behavior of crowd and Perception & Tactical Considerations play a major role as significant influencers in determining the decision to apply force or not. A more defined/structured way of the same is also referred to as 'National Use of Force Framework' in countries like Canada. These key influencers in turn are a potpourri of multiple factors which are explained in greater detail in the sections below.

26.1. ***Situation:*** The situation can be defined by aspects like prior knowledge of the rioters, environment in which riot is taking place, size of the crowd, crowd composition demographics (percentage of children, women, insurgents if any), political inclinations, standoff distances available at hand, potential violence indications, ability of the crowd to perform a coordinated action on the police by resorting to violent means etc. The situational awareness is a key to building the operational strategy. The aspects like geography, terrain, season, weather conditions, wind which indicate the physical scenario on one hand, crowd behavior, resolve, motivation levels, leadership of the rioters, riot root cause etc which explain the crowd scenario on the other hand play crucial role.

26.2. *Prior Knowledge of riot/ rioter*: Besides knowledge about the physical scenario and crowd scenario, the policeman on the ground is the game changer. Motivation of the Police forces, their ability to perform a coordinated action with seamless communication etc as explained in the earlier sections are vital to the success of an anti riot operation. In addition to the above, prior knowledge/ intelligence on the crowd as well as event/gathering also is a significant factor. However, field inputs suggest that there were many occasions when the teams were called in to tackle the agitating mob without informing them about the nature of agitation and the crowd. Our interaction with around 60 CRPF men at Guwahati revealed that they were called in to contain the agitation without even informing that whether they would be tackling insurgents or agitation by general public. Instances like this reveal the need for dissemination of information about the gathering among the men who would be tackling crowd to bring the situation to normalcy. The aspect of women participating in large numbers in protests and gatherings, as per our interactions, influence the decision to use less lethal weapons especially in the states like Manipur, Assam and West Bengal.

26.3. *Force Escalation as per the capability:* Field interactions also revealed that often police personnel were overpowered by the protesters. During our visit to one of the southern states we were told that the police machinery is under staffed as well as ill trained. It was stated that during the 30 September 2012 protests in Hyderabad by pro-Telangana men, police let them protest and took action only when the protesters crossed the barricades that were placed at a distance of 100 metres from the place where the police personnel were positioned. Further they explained that this tactic of disengagement or tactical repositioning is influenced by factors like letting protesters ventilate their grievances peacefully, waiting for reinforcement to arrive and also avoid police action as long as the crowd adhere to peaceful tactics without causing harm to either public or public properties.

26.4. ***Behavior of the Crowd***: Field inputs have brought out three types of behavior that has been displayed by the crowd. These are cooperative, resistive and combative types. However, as per our field findings the crowd display combined behavior at any point of time (a crowd tends to consist of multiple smaller groups, each of which may display different behavior). For example, the crowd can be resistive as well as combative at the same time. Moreover, within the larger crowd, a group of individuals may display co-operative behavior, and the another section exhibit combative behavior.

26.4.1. Our interaction with the police personnel in Srinagar indicated that on many occasions the crowd being separatist driven exhibit combative tendencies by resorting to tactics like stone throwing, burning public installations/property like and burning police vehicles. Similar views were expressed in Manipur. Our interactions with the officers of Uttar Pradesh police, Andhra Police and Rajasthan revealed that there were occasions like Gujjar agitation, Telangana agitation and farmers protest demanding compensation, where the protesters refused to leave the place (for days) and continued agitation ignoring warnings, and thus displayed resistive tendencies.

26.4.2. Our interaction with the personnel of Assam Police revealed that crowd in the state, during many occasions is either socially or politically motivated. Civil society organizations like Krishak Mukti Sangram Samiti (KMSS) regularly call for gatherings to protest against construction of a dam, and mobilization by civil society organizations like these are difficult to disperse, and crowd exhibit resistive behavior. Our interactions also revealed that many times the police personnel are faced with situation of sudden protests ignited by certain developments or for trivial reasons. For instance, in Assam revealed many times police face sudden violence in the evenings caused by drunken tea estate workers. We were also told that situations like these are both resistive and combative, and the police personnel find it difficult to bring them under control in a short period of time.

26.4.3. In addition to combative and resistive crowd behavior, we were also told that certain sections of crowd exhibit cooperative ways and carry out demonstrations/protests in peaceful manner.

26.5. ***Perception and Tactical Considerations***: Perceived capabilities of own troops as well as the rioters form a key decision parameter while adopting to force escalation. Many factors that often influence the extent and amount of usage of force include aspects like:

26.5.1. Availability of back-up (reserve battalions), availability of body protection equipment, armored vehicles etc which determine the perceived ability of own troops to go and perform an anti-riot operation successfully on one hand, and

26.5.2. Crowd size, perceived ability to attack the Police men or even overpower them, perform violent actions and cause damage to life and property on the other hand,

26.6. In addition to the perceptions of the officer and men in the field, tactical aspects have been cited as another significant factor in determining the strategy to be adopted with respect to crowd control. As per the officers we interacted the tactical issues that were looked at while

deciding action with respect to crowd control are, Standard Operating Procedures and guidelines, Geographical considerations, Strength in terms of Number of officers, Availability of backup, number and range of Equipment– weapons and body protection gear etc. As far as availability of personnel is concerned, in Hyderabad city for instance, out of 85 platoons that are stationed, around 35 are static while the remaining are deployed in law and order duty. Nevertheless, the police requested additional 50 platoons from the neighboring districts during September 2012 Telangana agitation. As per senior officials, at any point of time, of the allotted personnel in each platoon at least 12-13 personnel are not available for deployment for reasons like leave, training and vacancy. Thus preparation and reliance on back-up becomes crucial.

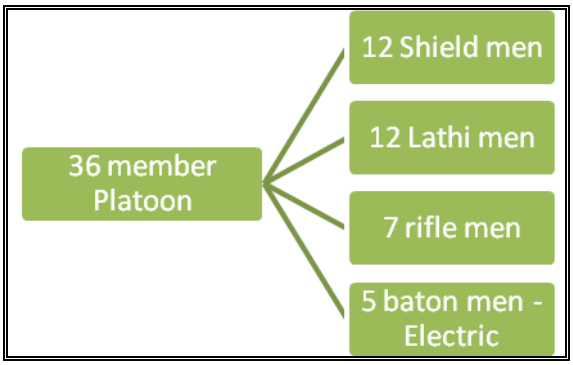
26.7. Field research with RAF deployed at Hyderabad revealed that 4 companies of RAF are stationed in Hyderabad, and each company comprises 120 personnel. The details of equipment and body gears were shared with the team, the screen shot of which is produced below.

DETAILS OF CONSTITUTION OF A COY. ARMS/ AMMUNITION/ MUNITION/ RIOT DRILL EQUIPMENT HAVING OPS STRENGTH OF 120 MEN.

	Insp	SI	UO	CTS	TOTAL	7.62 mm SLR	Amm. 7.62mm (Rds.)	Pistol 9mm	Amm. 9mm (Rds.)	Anti Riot Gun	Plastic Pellet	Ballistic Cartridge	Gas Gun (Federal Riot)	Long Range Shell	Rubber Bullet	Grenade Smoke		Gas Mask	Lathi Polycarbonate	Shield Polycarbonate	Body Protector/ Trauma Pad	Helmet
																Single Way	3 Way					
Team Comdr	08	-	-	-	08	-	-	08	80	-	--	--	--	--	--	--	--	--	--	--	08	08
Riot Control Element	-	-	08	40	48	-	-	-	-	-	--	--	--	--	--	--	--	--	48	48	48	48
Tear Smoke Element	-	-	08	16	24	-	-	-	-	-	--	--	16	128	128	24	24	24	--	--	24	24
Firing Element	-	08	08	24	40	24	960	08	80	08	80	80	-	--	--	--	--	--	--	--	40	40
Total	08	08	24	80	120	24	960	16	160	08	80	80	16	128	128	24	24	24	48	48	120	120

26.8. Similarly, our interaction with the officers at Punjab Police Academy revealed that they have 2 tear smoke squads of 15 men each. Each of these squads has 6 grenade launcher men and 6 men with gas guns. The officers also stated that a police team of 100 personnel can handle 500 rioters. These 100 policemen would be further subdivided specialized teams like tear gas squad to effectively tackle the agitation.

26.9. In Mumbai, our interaction with the Additional Commissioner of Police (Mumbai) revealed that they have specialized Riot Control Police to deal with riot situations. According to him, three RCP Companies are stationed at Naigaon, and each company has 3 platoons in it, and each Platoon consists of either 30 or 36 policemen. The composition of the platoon is given below:



26.10. Our interaction with the Mumbai police also revealed that platoon formation is one of the primary aspects that would be considered while planning anti riot operations. Our interaction with the senior officers of the Mumbai police as well as the personal comprising these formations revealed that the personnel are ill equipped to handle violent riots through less lethal weapons. The formation that was displayed to Orkash team is presented in the picture below:

A view contrary to the popular perception- Germany, US, Kosovo and others

27. Throughout the research, field personnel (of police and paramilitary forces) and their officials have expressed that India is not comparable to the rest of the world as the dynamics here are unique, hence the tactics and learning from there would not be applicable to the Indian situation. A deeper analysis into these opinions reveals interesting aspects. Our interactions with subject matter experts from Germany reveal that they have to continuously evolve newer technologies almost every year, since the rioters adopts to the technology and tactics of the police, and come up with the counter action. People there are technology savvy and are always devising newer ways and means to counter police action. In the words of experts, Germany experiences 'Professional rioting' where people are well prepared, often with a clear strategy, well equipped with various counter measures and most of the rioters would have had prior riot experience. Rioting is taken seriously and is considered as an 'art'. Moves and Counter moves are simulated before the rioters actually come on to the roads for a protest. Baseball bats with sharp metallic nails and Molotov cocktails (Crude petrol bombs) are a routine in any riot there. A whole industry that provides food and drinking water to these rioters is surviving in Germany with a monopoly player because of the riots! This is not the case anywhere in our country as of now. Indian rioter is not as prepared as the professional rioters of Germany. Perhaps, this scenario in Germany has necessitated the need for better body protection equipment which exists in the country today.

28. Another case to ponder over is about the experiences of our own RAF personnel who have visited Kosovo during the G-20 summit. In the words of the Commanding officer of the team that went to Kosovo, Indian team had to 'give up' fighting the mob and literally plead the rioters to stop attacking them, since the crowd were of very high resolve, overpowered the police and extremely violent. Added to the plight were the poor quality batons and shields. German riot-control SWAT teams had to be called for the safe retreat of Indian forces.

29. Yet another case in point is that of US. Across the field surveys, people have indicated that "our scenario" is tougher than that of US. In United States, certain states like Texas have liberal personal weapon license laws. Our interviews with the law enforcement officials and experts there have suggested that, about 80% of the youth carry weapons in certain parts of the US. Thus, when riot occurs in a student populated area, the law enforcement officials are posed with a situation where the rioter is armed as well as emotionally charged with nerves running down with adrenaline!

30. Our primary and secondary research revealed that in the countries like Israel, Egypt, Syria and Thailand while the cultural context might vary from place to place, the severity of the situation certainly cannot be undermined and thus there are lessons to be learnt.

Authorization and Decision making

31. While the Standard Operating Procedures lay down clear guidelines on when to escalate force and who is the authorized person, police forces have expressed dissatisfaction over this process and protocols. While they are prepared to adhere to the guidelines, they stated that conflict of interest always prevails in such decision making process often worsening the situation putting the police men at risk of casualties. Interactions with CRPF personnel who have served in various parts of the country have revealed that in some of the cases, the DM just refused to cooperate/ take calls or come to the field. These situations in turn affect the force morale and operational effectiveness. In Kashmir on many occasions, the magistrates have refused to accompany police on riot control duties.

32. The police personnel feel that their lives are put at stake for 'vested political interests many a times and often question the applicability of 'Human Rights' to the Police at the first hand. When posed with a similar question by the study team, senior officials and men from Kashmir have states that their own human rights take a back seat in their endeavor to protect the constitutional right to express dissent of the civilian society at large. These are conflicting perceptions often reflective of behind the scene natural constraints and limitations, but it is very important to address them through discussions, sensitization, and better operational procedures.

Cultural and Historical aspects in determining the options

33. Cultural aspects and historical aspects dating back up to the British era have their share in determining what options could be used for riot control. In West Bengal, for example, mounted Police (on the horses) cannot be used for the simple reason that they are identified with the British colonial rule, says the DIG of Training, Kolkata. Mounted Police is one of the most effective means of crowd control as it provides an intimidating posture increasing the confidence of the police man. However, West Bengal cannot employ this option. Similarly, shock batons cannot be used in West Bengal as they are culturally sensitive in terms of how the common man is being treated by the Police.

Usage of Dog Squads

34. In our primary and secondary research, we have identified certain countries which use the dogs squads for riot control operations. Poland is one such example. However, there are controversies on how the dogs are being used and violation of human rights etc. Even in Indian setting, usage of dogs may not be a viable option due to the cultural sensitivities involved given the media intervention and Human Rights scrutiny.

Multi Agency Coordination

35. In India, State Police (the first responders) have the primary responsibility of controlling a Law and Order Situation like riot. However, owing to the availability, numbers etc, services of Central Armed Police Forces are being utilized at the discretion of the State Police officials. In Kashmir, which we term as an ideal case scenario, multi-agency coordination (between CRPF and JK Police as also inputs from IB/ R&AW) happen seamlessly with mutual trust and synergy. There is a sense of ownership and trust amongst the Police and CRPF personnel at all the levels. Credit for success of a particular operation is generously shared between the two forces. They live in the same barracks, train jointly and operate jointly. CRPF and JKP leverage upon the strengths of one another, acknowledge them and move forward. In our interactions, IG CRPF has commented that the best intelligence is always with the State Police and that his force is present to act and operate at the discretion of the State Police force. The State Police officials in turn have mentioned that the CRPF personnel are good at operations and there exists a mutual understanding across all the levels. The Addl DG (L&O) noted that JK Police and CRPF are no different. "We are all Police men in uniform serving the nation. Our objectives are aligned, our cause is the same - that of upholding the sovereignty of this great nation called India and winning the hearts and minds of Kashmiris", he added.

36. This scenario, however, emerged as a result of a long period of working together in tough conditions and is not prevalent across the country. There have been instances where mistrust and questions about the other's abilities have been raised during our field research. However, the point here is to take lessons from an example that has been implemented by JK Police and CRPF in Kashmir and replicate the same elsewhere.

37. A very important aspect that emerges from this is the need for joint training and exercises at the troop level, where state police personnel and paramilitary personnel get the opportunity to work together and train, and improve common operating procedures and inter-agency coordination.

Intelligence– the game changer

38. When we looked at the rioting scenario in Kashmir for the past 5 years, as the numbers suggest, the intensity and the number of riots and casualties have significantly decreased. 2010 reported 112 deaths while 2012 reported none due to rioting. When we looked for the aspects to which we can owe this success, two major aspects of winning hearts and minds of local Kashmiris and precise intelligence have come across as the contributing factors from the field interviews. Surveillance was tightened and intelligence grid has been improved. At every death procession of a militant or a leader, there were police men in civil dress including women PCs in Burkhas. The 2011 and 2012 Amarnath yatra had hundreds of CRPF and Police men under cover whose duty was to just observe and collect any intelligence or abnormal activity and report updates. In the case of CRPF they were all given cell phones, they never carried their CRPF ID cards and reports were received seamlessly.

39. In all the states, especially militant infected/ UGE infected regions, Intelligence is considered to be vital.

Strengthening the Judicial follow-up - Legal action post riots

40. Across the country, Police officers have expressed that immediate legal action needs to be taken on the rioters that are arrested and produced in front of the court. More often, due to the pending cases, these cases do not get resolved. The same rioter who has been acquitted in one riot participates in the other since he has no fear of law. This does impact adversely on the morale of Police. The same was the case with Kashmir couple of years ago. Today, special courts which prosecute these cases in Kashmir have come up and legal action takes place within days. It has been told to us that the legal action takes place in a fair manner without yielding to any political pressures. Also, in the eyes of law, even a Police man is punishable if he commits a crime. However, more often they tend to get away with the wrong doings by the virtue of their post. In Kashmir, in contrast, two police men from one of the CAPFs have been arrested and sent to jail for injuring a local Kashmiri, which in turn has helped the Police to build credibility and trust amongst the people according to the officials.

The Survey Parameters for Assessing the Equipment

41. The surveyed participants from CRPF, BSF and State Police Forces are asked to distribute 100 points to various less lethal weapons. They were asked to imagine that they have 100 rupees and asked to allocate this to equipment based on what they think is important.

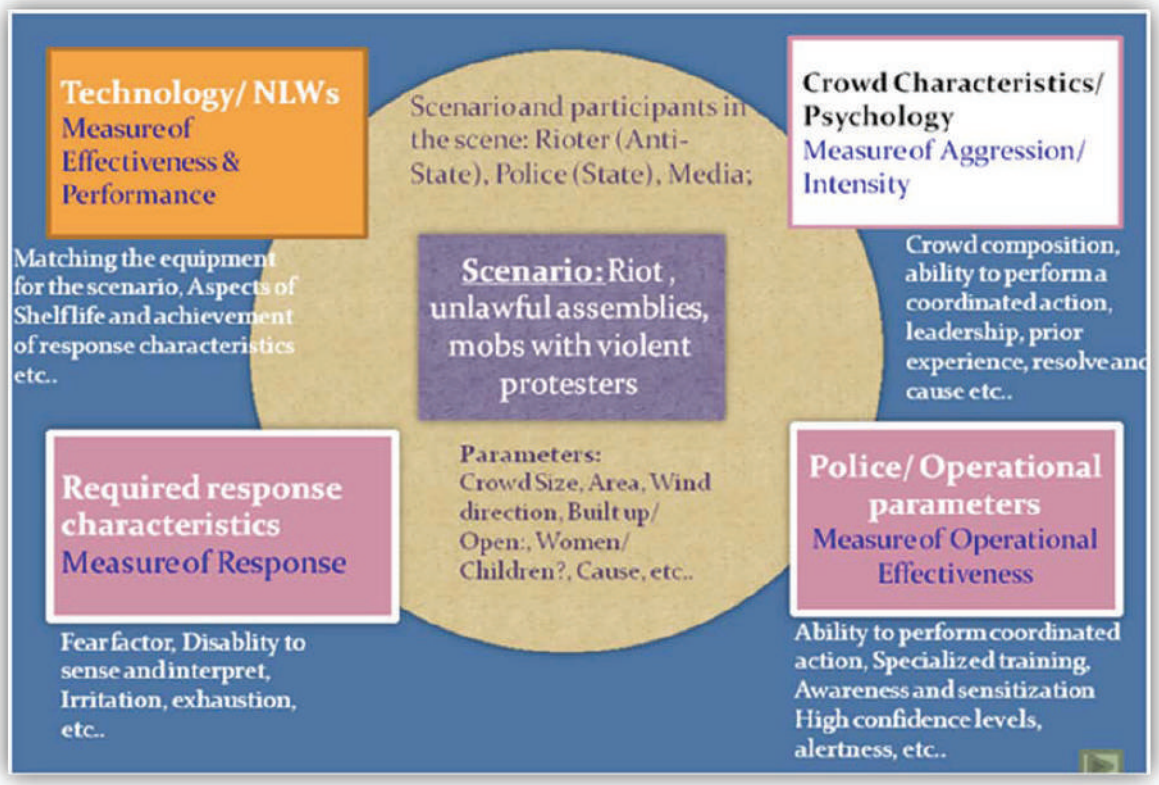
Riot Management Tactical Framework

41.1. For our survey a framework was designed which aims to tackle the problem of riots through a tactical approach. It illustrates the scenario and the interplay of various actors (their characteristics and required responses) and technology. This is based on "Assessment of the NATO SAS-035 Measures of Effectiveness Framework' for Non Lethal Technologies which was a combined effort by NATO and US to develop a methodology, and the supporting mathematics, for assessing LLW/NLW effectiveness. This methodology differs from the familiar approach for lethal weapons - calculating the probability of hit and probability of a kill given a hit - because NLWs are "*explicitly designed and developed to incapacitate or repel personnel, with a low probability of fatality or permanent injury, or to disable equipment, with minimal undesired damage or impact on the environment*."

41.2. The *scenario* here refers to an incident of riot, unlawful assembly or gathering of a mob with violent protests, with *three participants* – The *rioter (Anti-State), Police (State) and other external agencies such as media*. This also requires assessment/knowledge of certain basic parameters. These are – (a) the size of the crowd, (b) the direction of the wind; so that the NLW is used correctly, (c) nature of the space; whether it is built up or open – a built up space increases the risk of collateral damage, (d) nature of the crowd; participation of women and children as they tend to be used as shields by protestors and (e) cause(s) of the turmoil.

41.3. Alternatively, the decision making process would involve addressing the 4 'Ws'; What, Where, When and Who. 'What/How' would entail having the knowledge of the number of rioters, whether they are armed or not, and the kind of protest it is; violent or peaceful. 'Where' would mean ascertaining the location of the riot; whether the area is urban or rural, less populated/highly populated, consists of public infrastructure/private infrastructure and neighborhood area details. 'When' would refer to the time of the riot; time of the day (day or night), season (rainy/fog/clear/cold/hot) and if there are any festivals/public events occurring at that time. Finally, 'Who' would require ascertaining the rioter's profile, background, their resolve and purpose.

41.4. Then the framework looks at four broad characteristics pertaining to the crowd, police, the required response and the technology/NLWs to be deployed.



Measuring Aggression/ Intensity

41.5. Crowd/mob/rioters are analyzed from a psychological point of view since the counter action of the law enforcement agencies is driven by this. In this we try to ascertain their attitude, intensity and what drives them (their resolve and cause), composition (percentage of students, children and women), prior experience of police action, their staying power, ability to perform a coordinated attack and the leadership.

Measure of Operational Effectiveness

41.6. The role of the police which acts to prevent and disperse is analyzed from an operational point of view. This involves assessing their ability to perform coordinated action, level of training, the tools available to carry ammunition, level of preparedness and alertness, degree of awareness and sensitization etc.

Measure of Response

41.7. We need to look at the kind of responses that are being aimed at and accordingly match the NLW equipment for effectively tackling the situation. The responses could aim at generating fear, reducing the ability to sense and interpret, reducing motivation levels, area denial, reducing causalities, neutralizing the leader, constraining mobility, reducing ability to perform coordinated attack, identification of the rioters etc.

Measure of Effectiveness and Performance

41.8. Overall effectiveness and performance is dependent on the achievement of required response characteristics. The type of equipment that is to be used would determine the required responses. These responses are the ones that we want to achieve in not only the rioters but also in our own troops. For example, while we want to deter the mob from performing a coordinated action, we would want our forces to communicate, coordinate and operate effectively. This would greatly depend on the type of weapons/ ammunition/ equipment that we choose. Quick launching of oleoresin capsicum based grenades using a handheld multi grenade launcher, for instance, saturates the area and reduces the ability of the crowd to sense, interpret and perform coordinated action. At the same time, providing the Police troops with NIOSH certified gas masks would protect the forces from unpredictable winds and the effect of OR grenades.

Riot Control Gear – Weapons, Ammunition, Protective Equipment and other technologies

42. Field interactions with various state police forces and central armed police forces in the last 8 months have revealed that there is an increasing trend towards acceptance and adoption of less lethal weapons and munitions amongst the police forces. Incidentally, this is more predominant in those states that have witnessed the most number of riots and/or those that are the worst affected by the consequences of the riots (in terms of no. of casualties, image of police, post riot political instability etc). As the saying goes, necessity is the mother of all inventions; these states namely, Jammu & Kashmir, Andhra Pradesh, Assam, Manipur and Uttar Pradesh have pioneered the usage of less-lethal weapons and police at all levels have indicated that a basket of less-lethal weapons are very effective from a law and order point of view to maintain peace and harmony in the country. During Kashmir 2010 riots, 112 civilians and policemen died, 1,049 civilians and

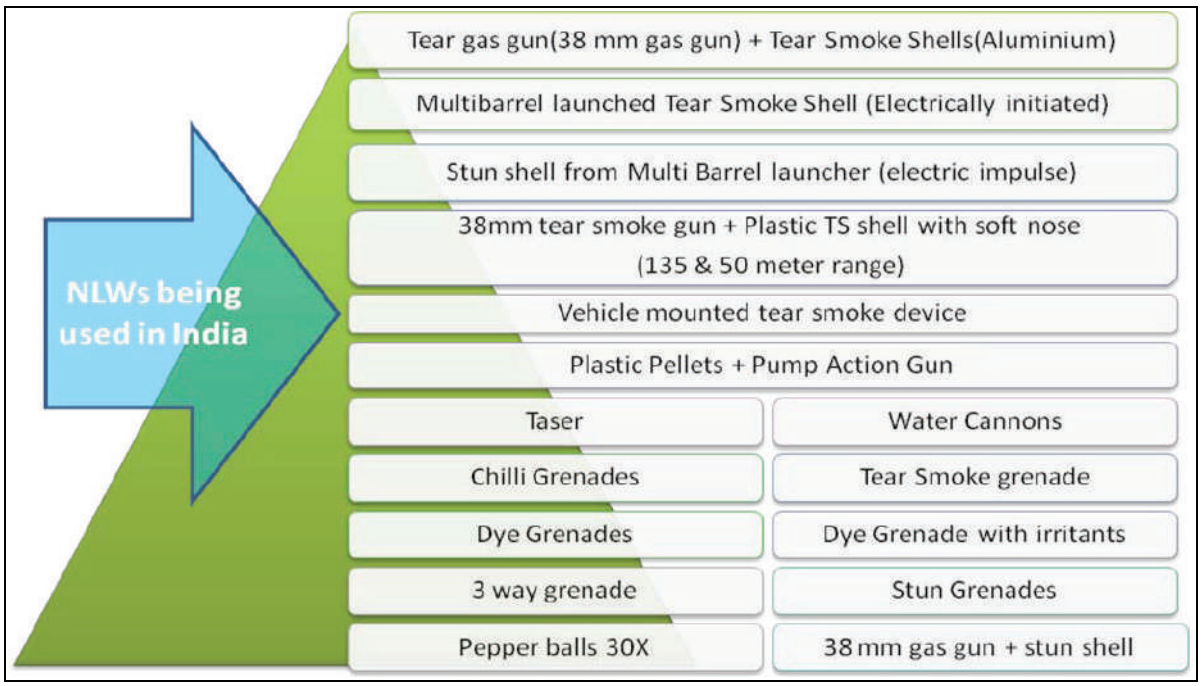
4,000 security men were injured in law and order disturbances and 825 security men had suffered critical injuries due to stone pelting26.

India's less-lethal armory – Batons, tear smoke, water cannons and rubber/plastic bullets

43. Having acknowledged the importance for less-lethal weapons, however, the less-lethal armory of the state armed reserve forces (IR/AR) consists of limited variety of less-lethal weapons. Most widely used amongst these across all the states include truncheon (lathi), tear smoke munitions and their delivery mechanisms (Multi Barrel launcher (electric), Tear Gas Gun, hand grenades) and water cannons. States like J&K and Andhra Pradesh which are the most affected have included other less-lethal weapons like rubber bullets, stun grenades and shells, chilli grenades (Oleoresin Capcicum based hand grenades), dye marker grenades, shock batons, stun guns, plastic pellets (using anti-riot gun, a modified version of 303 rifle), pepper cartridges (using Pump Action Gun27) etc. Equipment like TASER guns, pepper irritant delivery mechanism (Pepper Ball, USA made high pressure pneumatically launched TAC 700), Multi Grenade Launcher (Milkor made MG 32) etc have been procured in limited quantity or are being tried out on no cost and no commitment (NCNC) basis for future acquisition. The chart below depicts the less-lethal armory that exists in the country currently.

44. Tear Smoke and baton charge remain most widely used means of riot control across the country. In Kashmir alone, 90,000 tear smoke shells and grenades of different types have been consumed in the year 2011-12. Rubber bullets also are increasingly being adopted especially in the states of J&K and Andhra Pradesh. There were instances of High Court of Andhra Pradesh enquiring the state in 200728 as to why rubber bullets have not been used to quell a stone-pelting mob prior to firing lethal ammunition. Such interventions from the courts of law have further necessitated the usage.

[26] http://www.indianexpress.com/news/jkpolicetogetnonlethalweaponstodealwithmob/885421/0
[27] http://www.youtube.com/watch?v=rPSSMf2mOdc
[28] http://articles.timesofindia.indiatimes.com/2007-08-04/hyderabad/27967893_1_rubber-bullets-district-judge-tdp-leader



45. Grenades provide advantages of ease of handling and flexibility with less velocity and thus less fatality. Shells on the other hand provide greater ranges and increased stand-off distances, speed and precision. Performance of each of these weapons/ munitions and body protection equipment is discussed in detail below.

45.1. **Rating the efficacy of the equipment**: A framework has been designed to measure the effectiveness of a weapon or type of ammunition with respect to various parameters of relevance. The questionnaire based on this framework was administered to police personnel in various parts of the country in the form of focus group discussions and field surveys, workshop held on the subject for the state police officers, interviews of subject matter specialists etc.

45.2. The performance and efficacy of a weapon (be it lethal or non-lethal) depends on various parameters. These include dimensions like weight and size, aspects of mobility and maneuverability (as in the case of Vajra and water cannon vehicles), maintenance and mechanical efficiency which are weapon physical characteristics/ specifications, as well as attributes like ease of usage, confidence levels of forces while using the weapon, achievement of require response characteristics and impact in the mob with minimal casualties so on and so forth.

45.3. To address the framework, the participants are asked to rate the non-lethal weapons on a scale of 1-5 on various parameters like – (a) Weight (b) Confidence levels while using this NLW (c) Mobility/ Maneuverability (d) Maintenance/ Mechanical Efficiency (e) Impact on crowd (rate 5 if the impact is very good and rate lower if not) (f) Response Characteristic achievement (dispersal of crowd, area denial etc) (g) Less lethality (h) Ease of usage. A rating of 5 corresponded to the best case scenario and a rating of 1 to the worst case.

45.4. The graphs showing the efficacy of various types of equipment and munitions are placed at the following sections and explained further justifying the rating.

Tear Gas and its variants

46. Tear gas (CS) and chloroacetophenone (CN) are by far the most important pulmonary irritants. India currently uses CS based tear smoke shells and grenades. About 15 different variants of Tear Gas have been developed across the world. However, CS remains the product of choice due to high potency and low toxicity when compared to CN.29

47. Sensitivity to tear gases varies considerably between different individuals according to international studies. Factors influencing individual reactions may be emotional state, motivation, physical activity, ambient temperature and humidity.

48. Tear smoke grenades and shell are also available with CR filling (dibenz (b,f)-1,4-oxazepine). These are several times more irritating than CS filled munitions and can be used in special operations like flushing out of barricaded miscreants or dealing with violent mob. CR is very slow in water solution, even when alkali (soap) is added. CR is difficult to decompose or decontaminate under practical conditions, whereas CS can easily be inactivated by means of a water solution. This is the reason why rioters earlier used to apply moisture or wet cloth and minimize the irritation when CS was fired. CR resolves this problem. However, secondary research indicates that CR, CS and CN are all more dangerous as young (0-14 yrs of age), elderly (60+ yrs of age), pregnant women, and those with respiratory conditions are at health risks.

49. J&K Police have mentioned that the impact of CR based grenades/shells has been good and the field units are increasingly demanding these as they are deterrent to violent mobs. Tear Smoke products are supplied to various state police and central police agencies by Tear Smoke unit with BPR&D as the central coordinating agency. Field visits have suggested shortage of tear smoke products of various types on the ground for both riot control operations as well as training. TSU, however, has been able to meet the demand that has been placed with it till date. (Add details of orders and profits). Clearly, there is a gap between the requirements on the ground and the demand raised by the state procurement divisions (a factor of budgets available). However, this aspect has not been examined in detail by the study team as the scope of this study is limited.

50. Variants of tear smoke products have been developed by Tear Smoke Unit, Tekanpur. The variations are tweaked around parameters like launching methods (hand thrown or gun fired), initiation mechanism (electric impulse or pyrotechnic), delivery methods (hand thrown, Multi Barrel launcher, 38 mm Tear Gas Gun), physical characteristics (Aluminum or Plastic body, finstabilised, soft or hard nose, length and weight), chemical composition (CS, CN, CR, recent Oleoresin based) and the range.

51. Field interactions have brought out that tear gas grenades are easier to handle since they are hand thrown. The size and weight of the grenades also are found to be satisfactory by the forces.

[29] WHO, 1970; Hu et al., 1989; Colgrave and Creasey, 1975

However, the field personnel have stated that tear gas grenades do not act as a deterrent for agitated and determined crowds. In addition, carrying tear smoke munitions alone does not boost their morale. Earlier, tear smoke grenade body used to be that of Aluminum and mobs used to throw them back at Police. However, with the introduction of plastic body that starts melting on ignition the miscreants are not able to throw them back. Jammu and Kashmir has moved on to plastic tear gas grenades and shells. However, states like Manipur and Assam still use the Aluminum ones and face this issue.

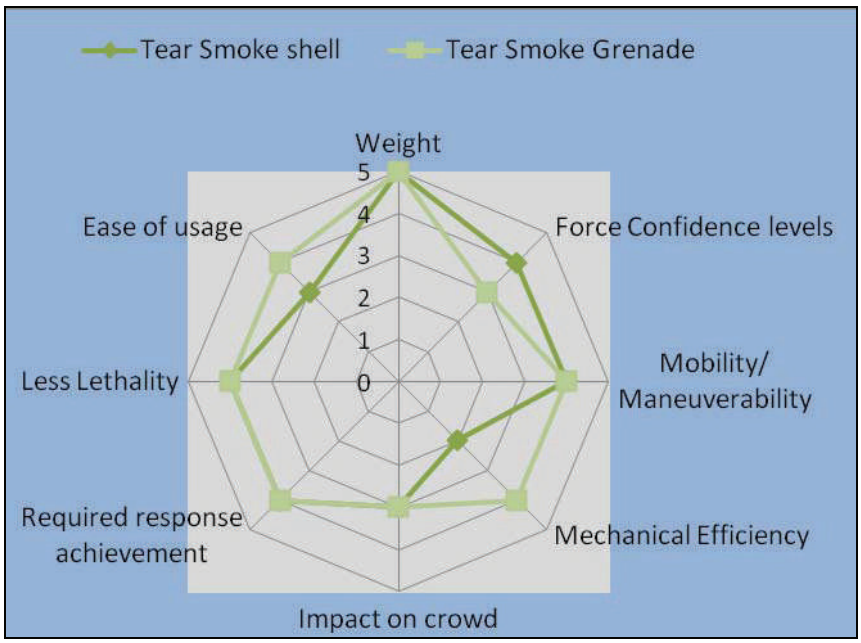
52. Further, the gas gun weapon also gets heated up fast restricting the amount of munitions that are fired. Our interactions with the Punjab police revealed that when the barrel gets hot following repeated use of gas guns, plastic handle fitted around the metallic barrel starts to rotate around the barrel which jeopardize the normal operation of gas guns.

53. *Three-way tear smoke grenade*: The grenade is made up of three parts which separate when the grenade bursts. Each part emits tear gas for 30+/- 10 seconds after a delay of 2+/=0.2 seconds. This is ideal for covering large areas quickly.

54. *Stockpiling of tear smoke munitions*: Concerns over stockpiling were expressed regarding the storage of tear smoke shells and their expiry across all the states. Field interactions have indicated that the tear gas products start leaking when stock-piled and suffocate the personnel entering the store. Interactions with industry and experts in this field have suggested that this occurs due to a phenomenon called sublimation (transformation directly from solid phase to gaseous phase without liquid phase). Sublimation occurs at temperatures and pressures below the substance's triple point30. Thus, the sublimation temperatures could be much lower than the melting point of the substance. Good ventilation and air circulation inside the store solves the problem to a large extent. Certain states where tear gas is not widely used because of lesser frequency of riots face the issue of inventory expiry of the TSMs. An inventory rotation mechanism amongst the states could possibly be a solution to this. First in – First Out (FIFO) approach could be used where the inventory that has been stocked first will be consumed first.

Ammunition	Range	Launching Mechanism
Tear Smoke Grenade	Short Range (20 to 40 mts)	Hand
Tear Smoke Shell – Electric; Aluminium	Long Range (125 to 145 mts)	Multi Barrel Launcher
Plastic Tear Smoke Shell – Soft Nose	Medium Range (45 to 55 mts)	38 mm gas gun
Plastic Tear Smoke Shell – Soft Nose	Long Range (125 to 145 mts)	38 mm gas gun
Tear Smoke Shell – Normal	Medium Range (45 to 55 mts)	38 mm gas gun

[30] In thermodynamics, the triple point of a substance is the temperature and pressure at which the three phases (gas, liquid, and solid) of that substance coexist in thermodynamic equilibrium.



Remarks

Parameter	**Details of the rating**
Weight	For both tear smoke shells and tear smoke grenades, forces have expressed that weight wise there are no issues and do not cause discomfort. However, if the weight can be reduced while keeping the effect of TS munitions the same, they will be able to carry more munitions.
Force Confidence levels	Forces are less confident while using the grenade since the effective distance of engagement is very less. Earlier, the Aluminum body TSMs were thrown back at the Police too. While using the tear smoke shells, the force confidence level is relatively higher than in the case of grenades. The reason mentioned during the survey was that the effective distance was greater. However, the confidence levels are not substantial even in the case of shells as the effective amount of ammunition that can be fired is quite low due to technical reasons like heating up of the tear gas gun, regular failures of the shear pin, time taken to load in conjunction with the time taken for the shell to disseminate the smoke.
Mobility/ Maneuverability	In terms of mobility/ maneuverability, both the tear smoke shells and grenades rate relatively higher since the ammunition/ weapon-ammunition is easier to carry and use.
Mechanical Efficiency	In terms of Mechanical Efficiency, the performance of the ammunition, both the shell and grenade has been found satisfactory. However, it is to be noted that the efficiency of a less lethal munition depends on the efficiency of the launching weapon. In the case of tear smoke shells which are launched using the tear gas guns, the mechanical efficiency of the gun is lower because of constant failures of

	shear pin, heating up of the weapon etc. Thus the tear smoke shells rank lower in terms of their mechanical efficiency.[31]
Impact on crowd	In terms of impact on the crowd tear smoke munitions (both shells and grenades) rate mediocre.
Required response achievement	Forces have explained that because of the inability of saturating the area with enough smoke due to various reasons like insufficient number of weapons, time delay etc, tear smoke munition does not achieve required response from the crowd. In addition, for a well resolved crowd with past riot experience as well as exposure to tear gas, it is less impactful.
Less Lethality	In terms of lethality, the study groups have not come across any significant instances where the tear smoke munitions have been lethal.
Ease of usage	Tear Smoke grenade is easier to use since it is hand thrown. Due to weight considerations and constant mechanical failures (heating and shear pin failure), tear smoke shells rate lower than tear smoke grenades in terms of ease of usage.

Stun Shells and grenades (Flash bang grenades):

55. Stun grenades and stun shells are designed to explode in the air with a loud bang and blinding flash. The required response characteristic from the miscreants in this case is temporary stunning. This is caused by momentary activation of light sensitive cells in the eye through a flash that blinds the person for approximately five seconds, until the eye restores itself to its normal state. The loud blast causes temporary loss of hearing, and also disturbs the fluid in the ear, causing loss of balance.

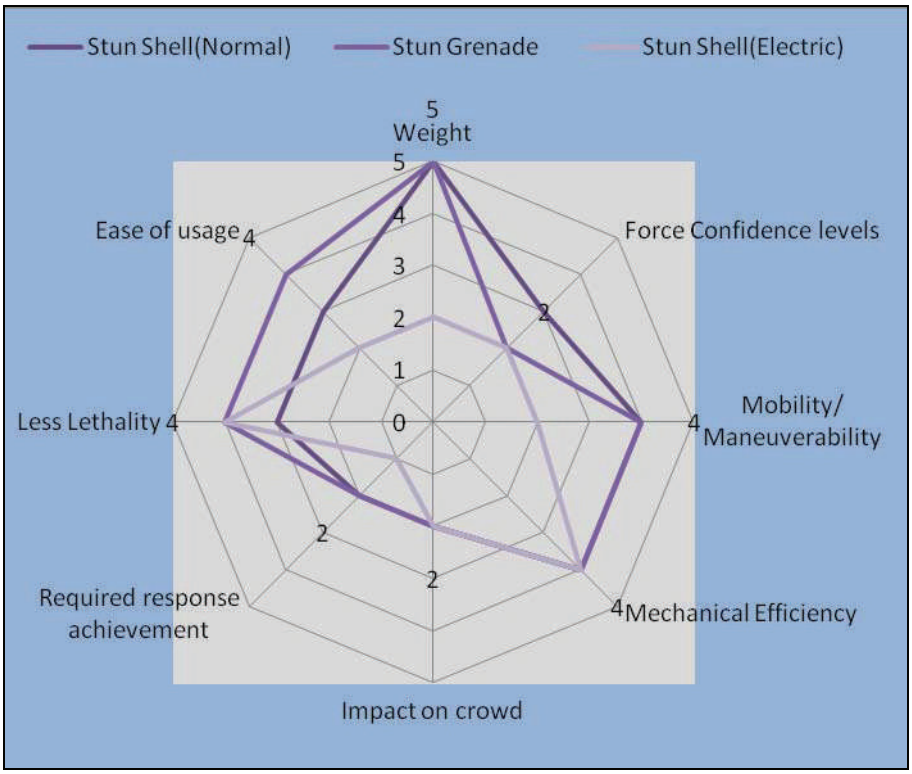
Ammunition	Range	Launching Mechanism
Stun Grenade	20 to 40 mts	Thrown by hand
Stun Shell – Normal	90 to 110 mts	38 mm gas gun
Stun Shell – Electric	90 to 110 mts	MBL

56. Field inputs from Kashmir, West Bengal and Manipur suggest that the stun shells are not very effective in deterring the agitated crowds. However, police feel that stun grenades/ shells could be combined with tear smoke munitions and other less lethal means to maintain a fear factor and surprise in the mobs as also degrade the ability to coordinate, communicate and concentrate on the riot. Field personnel have indicated that a grenade or a shell that has both stun effects as well as

[31] Mechanical Efficiency (denoted by η) of the tear smoke shell and anti-riot gun combination is calculated as the multiplication of ammunition and weapon efficiencies. i.e., $\eta_{ammunition} * \eta_{weapon} = \eta_{effective}$

tear gas effect would be more useful in controlling the riots. Stun grenade in isolation cannot be a deterrent for riot-control operations. It was observed that stun shells/ grenades are effective in dispersing women and children with minimum amount of force. However, Stun Shell (Electric) which is fired through multi-barrel launcher, Agnivarsha, has issues with mobility. This is primarily due to heavy Agnivarsha launcher as well as the constrained mobility of the vehicle on which it is mounted. In addition it was revealed that the stun shells fired through the Agnivarsha attract unnecessary attention from the children and curious onlookers due to the strange noise that it makes. Forces have expressed the need for ammunition comprising the characteristics of tear smoke munitions, stun shells, dye marker grenades etc so that by launching single ammunition relatively higher results can be achieved.

57. *2 in 1 shells - Combined Characteristics of Stun and lachrymatory effects*: Field interaction with the officials of TSU revealed that they have capability to manufacture ammunitions carrying combined characteristics, however, manufacturing will happen only if they receive demand from the states/BPR&D. Further, earlier TSU manufactured 2-in-1 shell which is a combination of stun and lachrymatory shell. Once fired, it splits into two parts. One part explodes in the air with a loud bang and blinding flash while the other emits tear smoke. It checks instances of the tear smoke shells/grenades being thrown back at the police by the miscreants. The resounding bang and high intensity flash acts as a deterrent to the crowd breaking their morale and causing them to disperse. However, it is not in the priority list of TSU. Nevertheless, our interactions with the officers in the field, especially in Punjab, revealed the need for it. Our interactions with the officers in states like Andhra Pradesh, Assam, Manipur, Jammu and Kashmir revealed that they have also used 2-in-1 shells, and found effective.



Remarks

Parameter	Details of the rating (Stun grenade and Stun shell (Normal) and Stun Shell (Electric))
Weight	For both Stun shells and Stun grenades, forces have expressed that weight wise there are no issues and do not cause discomfort. In the case of electrically triggered stun shells which are launched using Agnivarsha, weight of the launcher (~70kgs) constrains the effectiveness and thus is rated relatively lower.
Force Confidence levels	Forces are less confident while using the grenade since the effective distance of engagement is very less. While using the Stun shells, the force confidence level is relatively higher than in the case of grenades. The reason mentioned during the survey was that the effective distance was greater. However, the confidence levels are not substantial even in the case of shells as the effective amount of ammunition that can be fired is quite low due to technical reasons like heating up of the tear gas gun, regular failures of the shear pin, time taken to load in conjunction with the time taken for the shell to provide the stun effect. In the case of Agnivarsha launched stun shells (Electric), he force confidence levels are much lower as it attracts curious onlookers and children instead of dispersing them due to the strange noise.
Mobility/ Maneuverability	In terms of mobility/ maneuverability, both the stun shells and grenades rate relatively higher since the ammunition/ weapon-ammunition is easier to carry and use. However, stun shell (Electric) which is fired using Agnivarsha rates lower because of the constrained mobility of the vehicle on which it is mounted.
Mechanical Efficiency	In terms of Mechanical Efficiency, the performance of the ammunition, both the shell and grenade has been found satisfactory. However, it is to be noted that the efficiency of a less lethal munition depends on the efficiency of the launching weapon. In the case of stun shells which are launched using the gas guns, the mechanical efficiency of the gun is lower because of constant failures of shear pin, heating up of the weapon etc. Thus the shells fired through gas gun rank lower in terms of their mechanical efficiency.[32] Electrically initiated shells, however, rate higher in this parameter since no mechanical failures of Agnivarsha have been brought out in the field research.
Impact on crowd	Field inputs indicate that the stun effects used in conjunction with various other munition/ tactics including ear smoke, lathi charge etc have greater impact since the rioters are taken back with element of surprise, stress as also degradation of ability to sense and interpret effectively.
Required response achievement	Forces have explained that stun effects need to be used in conjunction with others as explained in the previous parameter. Stun effect is essentially a force multiplier. However, Stun Shell electric ranks lower since it unnecessarily attracts the

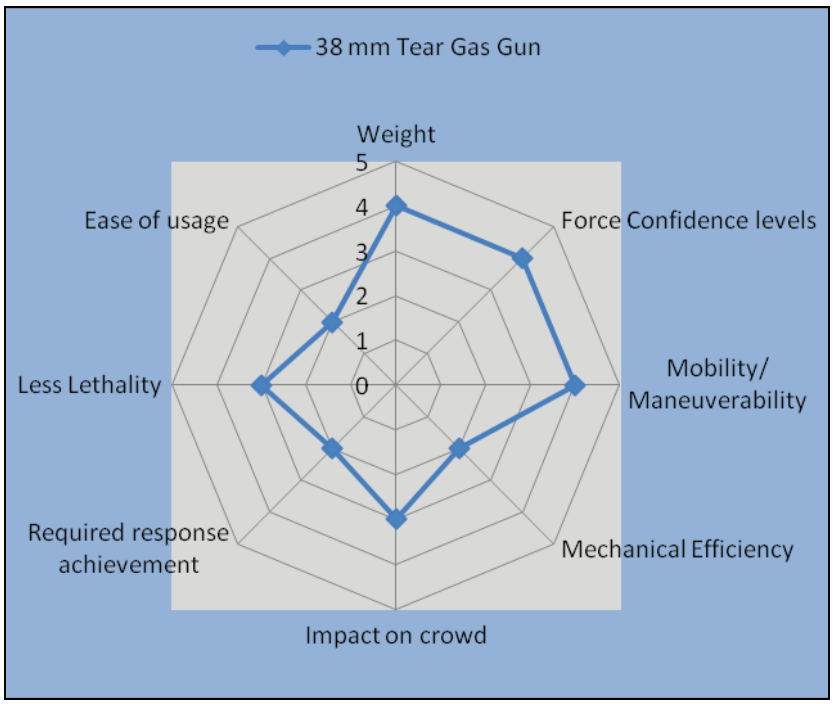
[32] Mechanical Efficiency (denoted by η) of the tear smoke shell and anti-riot gun combination is calculated as the multiplication of ammunition and weapon efficiencies. i.e., $\eta_{ammunition} * \eta_{weapon} = \eta_{effective}$

	attention of curious onlookers which increases the number of people in the riot.
Less Lethality	In terms of lethality, the study groups have not come across any significant instances where the stun grenades/ shells have been lethal.
Ease of usage	Grenade is easier to use since it is hand thrown. Due to weight considerations and constant mechanical failures (heating and shear pin failure), Stun shells rate lower than grenades in terms of ease of usage. Stun Shells fired through Agnivarsha rate much lower due to constrained mobility, vulnerability to become targets of stone pelters and other violent actions, weight etc.

38 mm Tear Gas Gun

58. Tear Smoke Shells and Stun Shells can be fired using 38 mm Gas Gun. Though Tear Smoke is one of the most widely used less-lethal weapon, tear gas guns are in short supply according to the field surveys. Troops are dissatisfied with the performance of the weapon from maintenance perspective. They have complained about shear pin malfunctioning while firing due to which they not only lose on reaction time, but also face difficulty in saturating the area with tear smoke. In addition, deposits of soot get formed in the barrel post firing and cleaning the weapon becomes a bottleneck while in operation. The weapon also gets heated up fast, thus limiting the amount of munitions that can be fired. These aspects have a direct impact on the effectiveness of the munition fired using the tear gas gun as the forces are not able to saturate the area with substantial amount of smoke. More often, the effect of the first tear smoke shell fades away by the time the second shell lands, thus not allowing the forces to fire multiple shots quickly and saturate the area which will have the required impact on the crowd.

59. For instance, we were told by the Punjab police that Anti Riot Squad of 15 personnel will be deployed at a place where the riots are happening, and of this 15, at least six men are specifically meant for launching shells through 38 mm gas gun. We were also told that if all the six men are launching shells simultaneously then at least 6 shells are launched in a minute. However, in most of the situation not all the six men will be asked to launch shells simultaneously. The reaction of the police will depend on the intensity of the riot and the behavior of the rioters.



Parameter	Details of the rating (38 mm Tear Gas Gun)
Weight	Forces have not expressed any concerns related to the weight of the gun. On enquiring, they have indicated that weight wise they do not have any qualms about the weapon.
Force Confidence levels	Force confidence levels are reasonably high while using the tear gas guns as the effective standoff distance is higher. However, the confidence levels are not substantial as the effective amount of ammunition that can be fired is quite low due to technical reasons like heating up of the tear gas gun, regular failures of the shear pin, time taken to load in conjunction with the time taken for the shell to provide the required impact.
Mobility/ Maneuverability	No significant issues related to mobility of the personnel carrying the tear gas guns have been indicated.
Mechanical Efficiency	In terms of Mechanical Efficiency, the performance of the tear gas guns is not satisfactory because of constant failures of shear pin, heating up of the weapon, formation of soot after one or two firings etc. Mechanical efficiency of tear gas gun is one critical field finding which is impacting the efficacy of the less-lethal munitions as well as the force morale. This is one area in which focus needs to be put in terms of modification of design, material and engineering of the weapon.
Impact on crowd	Impact on the crowd depends on the type of ammunition that is being fired from the weapon. However, tear gas gun rates moderate in terms on achievement of impact on the crowd.
Required response	The weapon is not able to achieve the required response due to reasons like

achievement	mechanical maintenance, failure of components etc. These reasons have significant impact on the parameters like achievement of intensity of smoke that can have substantial impact on the crowd, which in turn affects the required response characteristics negatively. Thus tear gas gun rates lower in terms of required response achievement.
Less Lethality	In terms of lethality, the field inputs suggest that the tear gas gun which is used to fire the shells can be slightly lethal if it is fired from close range.
Ease of usage	In terms of ease of usage, tear gas gun rates low as it is cumbersome to clean it every now and then during operation(as the soot gets deposited with one or two firings). In addition, loading is not automatic and it takes time.

Rubber variants: Rubber Baton Rounds (Known as 38mm rubber bullets), multi baton rounds (MUSHTI), paper cartridges

60. Three variants of rubber baton rounds (38 mm rubber bullets), multi baton rounds (MUSHTI) and Paper cartridges have been in use by the forces in many states which include the states of Jammu and Kashmir, Rajasthan, Gujarat, Andhra Pradesh, Kerala, Maharashtra etc. They are preferred across the country because of less fatality. However, there are instances where agitators have been killed due to firing of the rubber baton rounds.33

61. Rubber baton rounds or 38 mm rubber bullets as well as multi baton rounds are fired using the gas gun while paper cartridges are fired using the 12 bore Pump Action Gun. Field personnel have mentioned that training is critical for personnel firing these as it can turn lethal if not fired with right angle. The norm across the country is to fire the rounds at the mob by means of a ricochet and thus the aspects of surface onto which it is being hit, angle etc would determine the precision.

[33]According to a statement released by the Home Minister of Andhra Pradesh, people gathered in large numbers with intent to indulge in violent activities on February 28, 2012 opposing the construction of a power plant in Srikakluam district. About 700 people armed with sticks and rods surrounded the policemen in HN Peta and burnt one police jeep. About 200 people started pelting stones. Police on seeing the menacing crowd fired rubber bullets in which J Nageswara Rao and S Yerraiah died. The police used 34 plastic pellets and 17 rubber bullets.

62. Paper cartridges which are fired using 12 bore Anti-riot gun, contain multiple rubber spheres inside them. When fired, these rubber spheres get dispersed and hit the crowd covering a wider area. These are thus found to be more effective when firing from a distance.

63. Field inputs have mentioned in many instances that there were occurrences of lethal injuries due to firing of rubber batons. Owing to this factor of lethality, the officers we interacted in the states like Andhra Pradesh, Punjab and Haryana stated that they do not resort to the use of rubber bullets. Our interactions with a group of RAF men in Hyderabad revealed that they have not resorted to rubber batons in the last one and half years. Similar sentiments were expressed by the men at Baramullah with respect to rubber bullets (paper cartridges).

64. Our interaction with the personnel of Mumbai police and others like Jaipur and Srinagar revealed that rubber/plastic bullets cause lethal damages. Orkash team was explained by the Mumbai police about how the firing of rubber bullets at various ranges (50m, 75 m and 100m) aimed at plywood plank pierced through it. (Refer to the image below)

Figure showing penetration of rubber/plastic bullet fired from

65. Field personnel have mentioned that training is critical for personnel firing rubber batons since these can turn lethal if not fired with right angle. The norm is to fire rubber batons at the mob by means of ricochet and thus the aspects of surface onto which it is being hit, angle etc would determine the precision.

66. Focus Group Discussions with CRPF at Imphal, Manipur has revealed that public sit down squatted foot the moment Police opens fire (rubber bullets), , thus leaving them no option of firing rubber baton rounds since ricochet is the method of firing. In addition, the discussions noted that for shorter standoff distances, firing rubber baton rounds is not a viable option from short ranges since they can be fatal. They have also mentioned that rubber baton rounds cannot be used for precision strikes. Similar findings have also been interpreted by studies in other countries.

67. A retrospective study on the usage of rubber bullets during Israeli-Arab conflict in October 2000 by a study team 34 interpreted the findings as "Resistance of the body surface at the site of impact (elastic limit) is the important factor that ascertains whether a blunt or penetrating injury is inflicted and its severity. Inaccuracy of rubber bullets and improper aiming and range of use resulted in severe injury and death in a substantial number of people. This ammunition should therefore not be considered a safe method of crowd control."

68. As part of this study, Professor Michael Krausz and his colleagues at the Rambam Medical Center in Haifa, analyzed the medical records of 595 casualties admitted to hospital during Israeli-Arab riots in October 2000 and stated that rubber bullets are not safe. 93 (61%) patients had blunt injuries and 59 (39%) penetrating ones. Severity of injury was dependent on ballistic features of

[34] http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(02)08708-1/abstract

the bullet, firing range, and anatomic site of impact. Two casualties died after a penetrating ocular injury into the brain and one died as a result of postoperative aspiration after a knee injury.

69. Due to the above findings, Israeli Defense Forces issued regulations of their use which prohibits firing at children, firing only at legs along with specifications of minimum firing distance of 40 meters.35

Pump Action Gun

70. Paper Cartridges (with rubber pellets inside the cylindrical paper cartridge) of various sizes (7,8 and 9) can be fired from Pump Action Gun. These guns are being manufactured by the Gun Carriage Factory, Jabalpur. Pump Action Gun (PAG) is currently being used by J&K and Andhra Pradesh extensively. Manipur and other states also employ PAG. Surveys conducted in Baramulla range of Kashmir reveal that Pump Action Gun is heavy to handle (~3 Kgs). Currently this does not have automatic loading and reloading because of which time is lost. Self loading and automatic ejection features are required to be built-in.

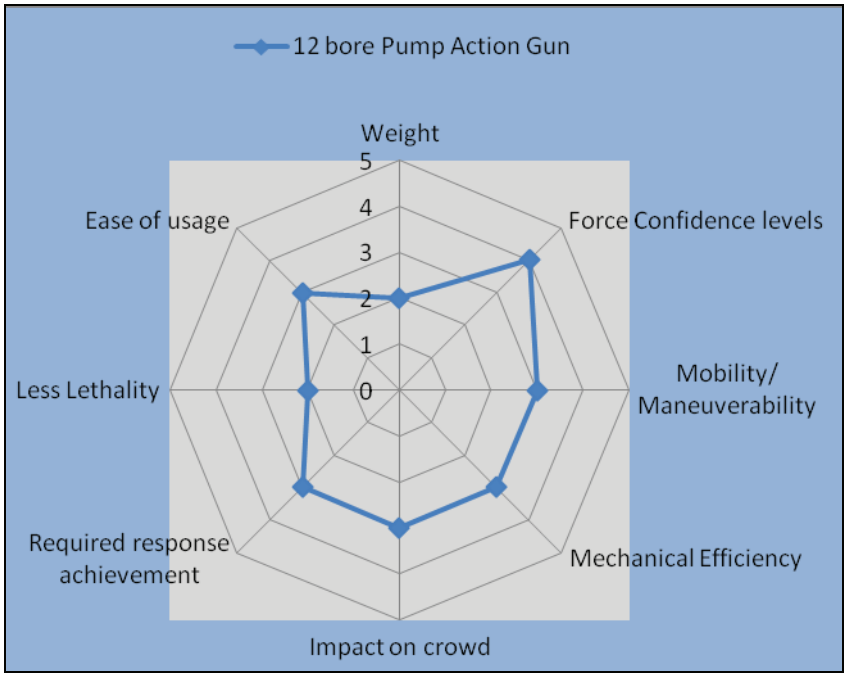
71. Also, they noted that if a foldable version of PAG can be designed, it would be easier to carry. Police (JKP and CRPF) have expressed that riot management in Kashmir is more of winning the hearts and minds of people and building goodwill for Police. Thus they have suggested that weapons and equipment, especially Pump Action Gun and body suit be designed in such a way that they look trendy and imitable. With such an approach, the kids and adolescents would try and imitate the Police man rather than the militant. They have also suggested that one of the National Institutes of Design can be employed to understand these requirements and thereby design the solutions.

Paper Cartridges – Fired using 12 bore Pump Action Gun

[35] http://palsolidarity.org/2006/05/israeli-soldiers-shoots-two-foreigners-in-the-head-at-bilin/

72. BSF of West Bengal has informed in the survey discussions that managing SOP for Pump Action Gun usage becomes difficult in real-life situations. In West Bengal- Bangladesh border, BSF noted that crowd gets accumulated very quickly supporting the anti-state elements (illicit traders, smugglers, drug leaders) since much of the economic activity happens around these people. In such scenario, maintaining 60 meter distance and firing rubber bullets (Close range firing using PAG is not allowed since it could be fatal) using PAG becomes almost impractical when the crowd quickly march towards the forces and take charge of them. The crowd turns out in huge numbers overpowering BSF at the border. Everyone in the border understand that BSF and Bangladesh Government have an agreement to deal with the crowd using less-lethal means and thus are not afraid of the riot-control operations of BSF. According to the survey, number 4 and 6 cartridges have little or negligible effect on the agitators since it does not cause enough damage and they resort to abuses and violent means. As a result, forces get agitated and controlling the police personnel from firing on the crowd becomes a challenge. A recent incident where it became very challenging to control the troops when one of the troop personnel got injured by mob violence was quoted to the study team as an example.

73. State Police of West Bengal and the officials of training academy at Barrackpore also have expressed concerns over the high ejection time of Pump Action Gun.



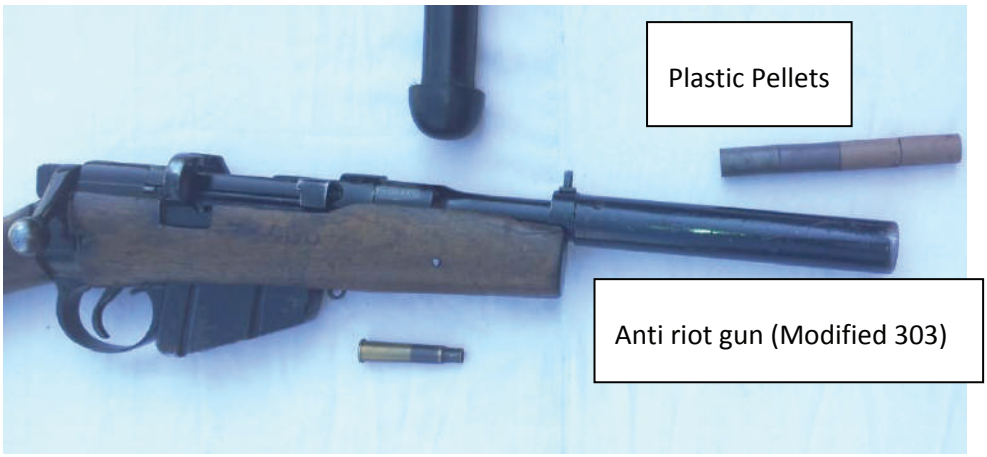
Parameter	Details of the rating (Pump Action Gun)
Weight	Forces have expressed concerns over the weight of the Pump Action gun. Pump Action gun is heavy and it is difficult to carry PAG and run along with the ammunitions.
Force Confidence levels	Force confidence levels are relatively higher while using Pump action Guns. The reason being the greater effective range (above 60 meters) as also the perception that the paper cartridges do cause enough amount of injury that deters the crowd.
Mobility/ Maneuverability	Since it is heavy to carry, the usage of pump action gun restricts mobility/ maneuverability. Thus, PAG does not rate well.
Mechanical Efficiency	In terms of Mechanical Efficiency, forces have not complained about the maintenance issues etc of the Pump Action Gun.
Impact on crowd	Impact on the crowd depends on the type of ammunition that is being fired from the weapon. Due to the perception of fear amongst the crowd on the Pump action Gun and the rubber bullets and the fact that they do cause pain and injury, impact on the crowd is reasonable according to the forces.
Required response achievement	The required response achievement is relatively higher due to the reasons stated above. However, it is not fast enough to fire enough ammunition that can have a combined effect on the crowd.
Less Lethality	In terms of lethality, the field inputs suggest that the paper cartridges can be lethal if fired at a distance of less than 60 meters (thus the minimum distance of firing has been set as 60 meter). The amount of pain and injury is substantial here relative to the tear smoke munitions. In addition, it can be lethal on children.
Ease of usage	In terms of ease of usage, pump action gun rates low as it is does not have automatic loading and reloading because of which time is lost.

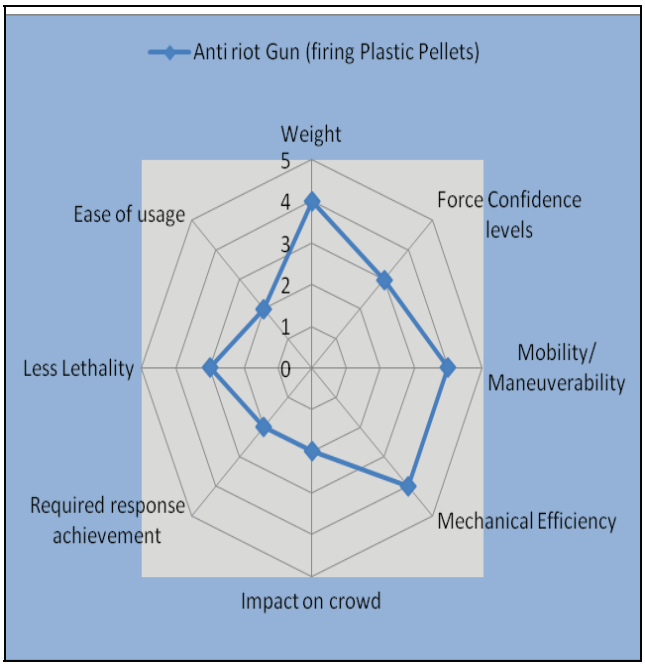
Plastic Pellets and Anti Riot Gun

74. Plastic Pellets of various sizes are employed during riot control operations. Anti riot gun is a modified 303 rifle. Police forces in Baramulla have mentioned that plastic pellets are not very effective in containing the Kashmiri mobs.

75. Manipur Police have noted that plastic pellets are less fatal than rubber bullets but, plastic pellets alone are not deterrent enough and large quantities of these needs to be utilized. Also, the forces have not rated very high of anti-riot gun in terms of performance. CRPF and State Police of Assam, Manipur and Jammu and Kashmir have noted that anti-riot gun, on the ground during riot-control, takes little less than 2 minutes to operate and fire plastic pellets as it is not automatic.

76. Also, anti-riot guns are used to fire blank cartridges which could be lethal. It is advised that the charge could be reduced in this case.





Parameter	Details of the rating (Anti riot Gun)
Weight	Forces have indicated that if the weight of anti-riot gun could be reduced. However, no significant complaints regarding the weight of the weapon have been come across.
Force Confidence levels	Anti-riot guns offer relatively moderate confidence levels as the effective standoff distances are greater in this case as also the amount of pain that can be inflicted on the rioter. However, due to time taking loading and reloading (which is currently not automatic), the confidence levels are lower.
Mobility/ Maneuverability	Forces have indicated that if the weight of anti-riot gun could be reduced, it would be easier to maneuver and handle the weapon.

Mechanical Efficiency	In terms of Mechanical Efficiency, forces have not complained about the maintenance issues etc of the anti-riot gun.
Impact on crowd	Due to the fact that they do cause pain and injury, impact on the crowd is reasonable according to the forces.
Required response achievement	The required response achievement is low as it is not fast enough to fire enough ammunition that can have a combined effect on the crowd.
Less Lethality	The plastic pellets are relatively less lethal when compared to the rubber baton rounds. However, they do cause pain and might cause serious injury if they strike sensitive areas like eyes, head etc. In addition, anti-riot guns are used to fire blank cartridges which could be lethal.
Ease of usage	In terms of ease of usage, anti riot gun rates low as it is does not have automatic loading and reloading because of which time is lost. This hinders the forces to cause significant impact on the crowd by using the plastic pellets which are fired using the anti-riot gun

Oleoresin Capsicum Grenades and Shells (Chilli Grenade)

77. Hyderabad based Premier Explosive Limited (PEL) manufactures the Oleoresin Capsicum grenades. The technology was reportedly developed by DRDO and has been transferred to PEL for commercialization. Forces in CRPF have indicated that chilli grenades are more effective as they cause intense suffocation and choking which will eventually degrade the ability of the rioter to sense, interpret and act. Chilli grenades have been used in Jammu and Kashmir also and the effect has been satisfactory. Interactions with J&K Police have indicated that these are quite good at deterring the violent mobs and there is an increasing demand from the field units. Forces have indicated that they have the requirement of chilli grenades and shells which can be used at both short as well as long range, which could be hand thrown or launched using an MBL (Agnivarsha) or a 38 mm gas gun.

Multi Barrel Launcher (Agnivarsha)

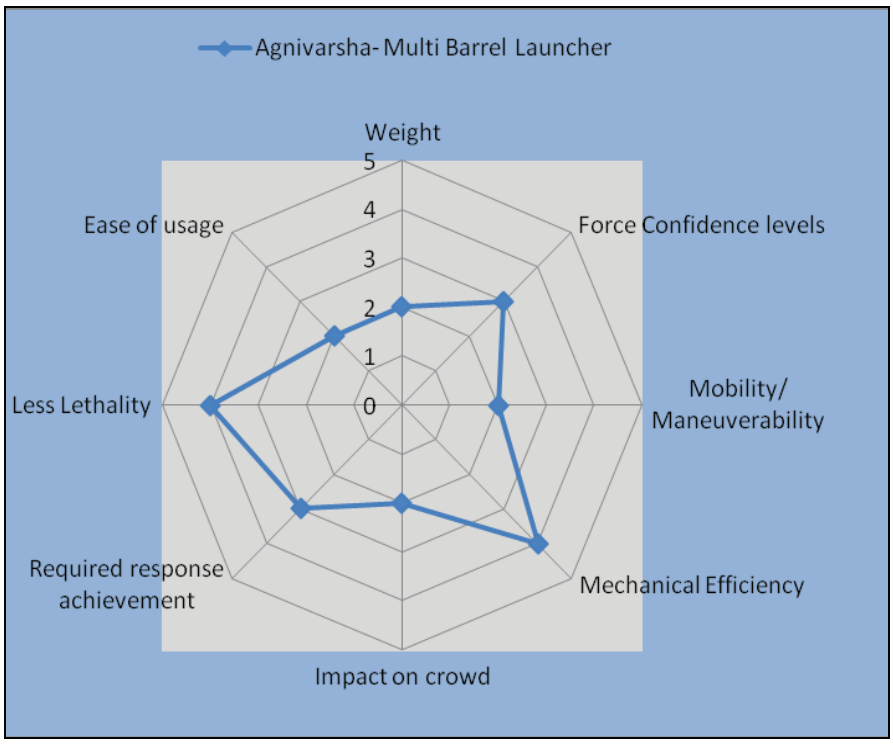
78. The multi barrel launcher, Agni Varsha has been designed, developed and is being manufactured by Central Workshop and Stores popularly known as CENWOSTO which provides engineering and ordnance support to Border Security Force. It is a seven-barrel device and has an electrically initiated firing system. Mounted on a tripod, it can be used either from ground or by fitting on any vehicle. It can fire any type of shells, either singly or simultaneously. The shells being used currently are tear smoke grenades and stun grenades, manufactured by Tear Smoke Unit (TSU).

SPECIFICATIONS

Total weight with period	70 kg
Weight of tripod	15 kg
Number of barrels	7
Area covered per launch	100m x 60m approx.
Power source	12 volt battery
Elevation	30 to 60 degrees
Traverse	360 degrees
Range	90-135 meters
Types of munitions fired	Short range, long range, stun, dual, 2-in-1 shell, tear gas grenade

79. Agni Varsha can be used for effective crowd dispersal, covering large areas and conduct of vehicle mounted operations. It has a user friendly design and its simple electric firing mechanism ensures a high firing rate. Further, combination of shells and grenades can be used simultaneously. However, Jammu and Kashmir police have noted that its electric spark ignition

creates sound and as such attracts onlookers in Kashmir; people gather out of sheer curiosity. This in turn aids riots and hence, they feel that it's better not to use it.



Dye Marker Grenade and Dye Marker Grenade with Irritants:

80. Dye Marker Grenade is developed to counter the dilemma faced by law enforcement agencies in most riot situations in identifying rioters. It is a hand thrown grenade which explodes with resounding bang, spraying an indelible colored dye on rioters.

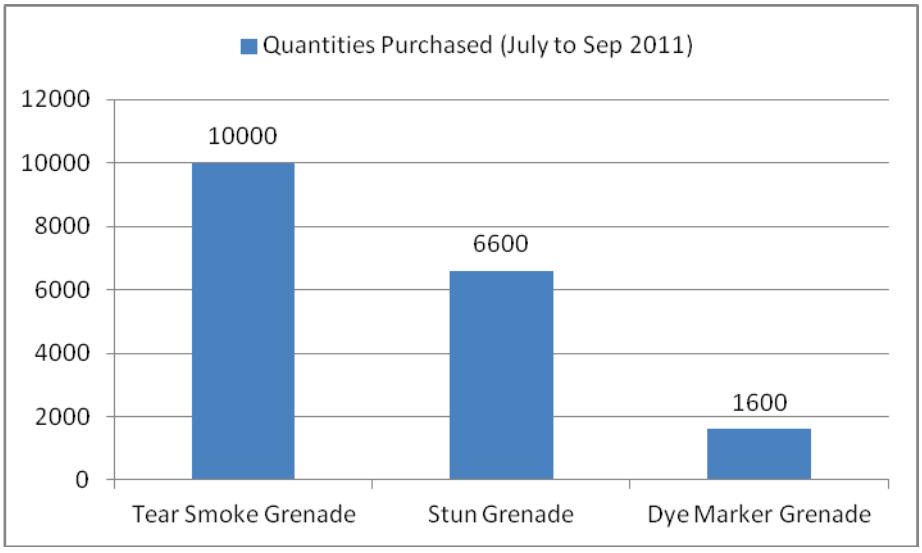
81. Dye remains on the clothes or on the person for reasonable period of time (on an average of at least 40 to 48 hours), thus helping the police in identification and proving categorically the presence of an individual in the disturbance.

82. Our interactions with the officers in the field revealed that loud bang and flash produced on explosion of the grenade acts as a deterrent for the rioters. They also stated that it demoralize the mob by causing panic in them which facilitates their dispersal in effective manner. Dye marker grenades being hand thrown, the officers rate this as an effective short range less lethal weapon along with tear smoke and stun grenades.

83. Since 2011, TSU manufactures Dye Marker Grenade with Irritants. Our field interactions revealed that this version of dye Grenade has proved successful in creating fear among rioters. It also emerged as a weapon of deterrence.

84. Significantly, our interaction with the officers at the field level revealed that there is unanimity among them about the influence of wind direction while launching Tear Smoke Munitions or Stun Shells or Dye Marker Grenades.

85. Orkash team through desktop research accessed the data titled "Details of Procurement Made/Supply Order Placed Centrally During the Quarter (July to September 2011)" at http://crpf.nic.in/RTI-RELTED/1160.pdf as on 17 October 2012. The details found pertaining to tear smoke grenade, stun grenade and dye marker grenade are presented in the chart below.



86. The chart revealed the popularity of tear smoke grenade, stun and dye marker grenade. Purchase of stun grenade in large quantities revealed that these grenades are equally effective along with tear smoke grenades. Moreover, as stated in above paragraphs the impact of stun grenades are substantial if used in combination with tear smoke grenades.

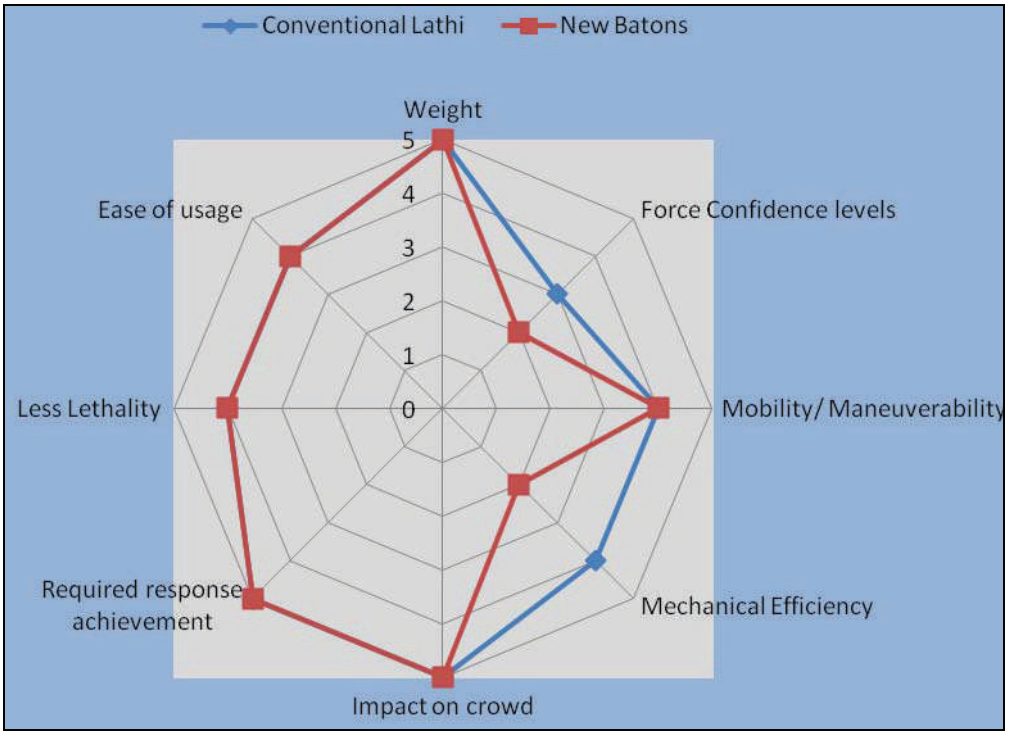
Traditional Lathis and new Batons

87. The lathis which are in use currently are the polycarbonate ones. These lathis have been found to be brittle and have the effect of rendering lathi charge, which is thought of by most police officials in our survey as the most effective means to deal with crowds, ineffective. This also has a direct impact on the morale of officers and it de-motivates them. Jammu and Kashmir state

police expressed this concern and suggested that either the material should be changed (to make it break resistant) or improvements in the design should be made.

88. Interestingly, lathi (baton or truncheon) is the most sought after mode of controlling a crowd. When inquired further, field inputs indicated several reasons like guaranteed pain and injury, greater number of blows within minutes, ability to hit multiple rioters in a very short period etc. However, violation of human rights and media monitoring puts usage of conventional lathi in an abyss. Interactions with senior officials have also suggested that this is one of the reasons why they have resorted to poly-carbonate lathis as they are transparent and do not catch the attention of media. However, these poly carbonate lathis break easily and the police forces are not happy with the performance of these lathis. This significantly reduces the force motivation as well as confidence levels.

89. This aspect has further been analysed in the simulation chapter which looks at various less-lethal weapons available and what parameters need to be changed for the effect to be equivalent to that of a lathi.



TASER

90. TASER guns are thought to be effective but only for close combat and not for crowd control. This was observed by the Assam State Police and J&K state police. It was noted that Taser can be used when you are dealing with 1 or 2 people, for instance the leader of the mob but not for dealing with the mob on the whole. Further, TASER can't be used in isolation and are effective only when used as one of the weapons.

Protective Equipment

91. Riot control gear is a combination of weapons, munitions and body protection equipment (suit, helmet, mask, gloves, shoes, knee protection, Shields). Field constable who fights a mob is successful only when he/she is able to effectively protect himself, coordinate and communicate with the riot-control team, use only required proportion of force while maintaining confident body posture under highly stressful situations. Body protection equipment thus forms a critical component of the riot-control gear.

92. Field inputs from the riot control teams that face the mob indicate that the motivation and confidence levels depend on the body protection equipment to a large extent. This has also been reinforced by the middle and senior leadership in the police forces. Officers have expressed their concerns about negative impact which low-quality equipment has on the morale of the constables, which in turn increases the number of casualties suffered by the police force. With the advent of new technologies and innovation in composites and materials engineering, design and manufacturing processes, especially in the western world, they believe that provision of high quality, standardized equipment could be a game changer in the riot control scenario, while acknowledging the fact that these equipment are way costlier compared to the existing ones.

93. The body protection gear currently used by the police forces, as in the case of less-lethal weapons, is not uniform across the country. It comprises body protection suit, steel toed shoes, cane and poly carbonate shields etc. The forces have customized the features of the above equipment depending on the need and availability. However, there is a general trend of dissatisfaction across all the levels in the state and central police forces in terms of performance of body protection equipment, attributing to the number of casualties that the forces suffer. A CRPF officer who went on a UN mission to Kosovo three years ago for G-20 summit lamented that the Indian team had to give up fighting the mob and literally plead the rioters to stop attacking them, owing to the poor quality batons and shields. German riot-control SWAT teams had to be called for the safe retreat of Indian forces.

94. J&K Police and CRPF, who work hand-in-hand with synergy in the valley, have reported that the BP equipment (helmet, baton, shield and suit) could not sustain the stone pelting of the kashmiri mobs. Vajra, the BP vehicle also got damaged from the exterior due to repeated stone pelting. However, personnel were safer inside Vajra.

95. Our interactions with a senior police officer in Hyderabad revealed that only 10 percent of the personnel involved in riot control operations are equipped with proper body gears, and rest are poorly equipped.

Anti riot vehicle – Vajra (BP bunker van)

96. Riot control vehicle, Vajra, is suitable for law enforcement operations and for transportation of forces to riot affected areas. Vajra, which is being used by the 5th RAC, Jaipur, is not bullet proof. Further, it suffers from the same issues as the Water Cannon; the retreat becomes difficult and it becomes a target for people as they aim at destroying it. Agnivarsha multi barrel launcher is fitted onto the Vajra vehicle. Unlike 38 mm gas gun through which only one shell can be

launched through a single shot, seven smoke shells can be launched in a single shot through anti riot vehicle. For example, in June 2008, the state police in Srinagar used Vajra to disperse the protesters who were protesting against the allotment of forest land to Shri Amarnath Shrine Board (SASB).

97. Our field interactions revealed that though Vajra is useful in saturating the area in a rapid manner with use of less manpower, it cannot be taken to small lanes and by-lanes which have emerged as one of its major drawback. Its mobility has been cited as another limitation, and the officers we interacted expressed the need for smaller versions.

98. Also, while using Agnivarsha, officers from Srinagar revealed that it creates unnecessary public attention owing to the noise it generates (the electric firing of the multi barrel tear gas launchers), and the officers expressed the need for the equipment that generates less noise.

BP suit

99. Prior to the introduction of Body Protection (BP) suit, chest guards were used for protection. The body suits which are being used currently are neither fire proof nor bullet proof nor offer adequate protection for intense stone pelting situations as in Kashmir, and tend to limit the mobility of the men on ground. In Jammu and Kashmir, the stone pelters throw stones at a speed of 80km/hr. In such a scenario, these suits become ineffective, leading to extensive injuries and lower the morale of the policemen. CRPF personnel in Manipur suggested that the suits should be both least bullet proof and fire proof. In addition, high protection shin guards and knee guards are needed.

100. Our interaction with industry players emphasized the need for testing certifications from prominent labs like Northern India Textile Research Association (NITRA), Ghaziabad, which is linked to the Ministry of Textiles.

Helmet

101. Anti riot helmets are designed to provide full head, neck, and face protection against non-ballistic threats such as rocks, bottles, sticks, etc. Our interaction with police forces across the country revealed that the helmets which are being used currently neither provide ear protection nor cover the neck area. In Assam, old metallic helmets are being used which cause severe discomfort. This observation was also made by Jaipur state police, who felt that the helmet was too heavy and difficult to carry and loose fitting (as a result policemen cannot run while wearing them as the helmets come over the eye). Jammu and Kashmir state police noted that these helmets do not have good cushioning and the wire mesh cannot sustain stone pelting and breaks with just one or two stone hits. There were incidents when stone splinters came inside and injured the eyes. They suggested that the helmet should be level II bullet proof, have a snug fit with eye visor and light weight.

102. Our interactions also revealed that the design of helmets currently used is of Personnel Armored Support Ground Troops (PASGT). We were told that it is a very old American design made for their army, and the design of helmets is such that it provides protection only at the top and it is not specifically meant for use in riot control operations. Complete ear protection, complete protection to full head, face and neck, visor with mesh on top, to protect against non ballistic threats such as

rocks, bottles, sticks etc. are stated as important requirements for helmet used in riot control operations. Our interaction with some private companies (such as the SRG Group) revealed that they have sold samples of helmets meeting these requirements to Gujarat police and National Police Academy, Hyderabad.

Gas Filter/ Mask

103. Gas masks are effective when tear gas and other Riot Control Agents (RCAs) are being deployed. Police forces across the world as well as the US Armed forces use NIOSH, (National Institute of Occupational Safety and Health), USA, approved gas masks which provide protection against CN and CS tear gas. They have a shelf life of 5-10 years, and do not deform eve after prolonged usage in extreme climates. But the masks which are currently being used across states in India are like the doctor's mask and cannot withstand chilli and tear smoke. Manipur State Police in particular noted this and expressed the need for protective masks.

Shields

104. Riot shields are widely used in crowd control. They are intended to protect the men from thrown objects and projectiles, and act as a barrier between the man on the ground and protestors. The riot shields currently being used are the Polycarbonate (PC) ones and are indigenously manufactured. The issue with these shields is that they develop cracks (particularly at the rivet points), either due to heat or due to stone pelting. Further, another criticism we heard on shields is that they are not tactically designed with law enforcement situation in mind.

105. The riot shields currently used (Mark IIB Shields) are of Polycarbonate (PC) ones and are indigenously manufactured. These are 4mm thick shields. Our field visits, especially the one at Baramullah revealed that the poly carbonate shields used by them develop cracks at places where there are rivets and bolts. These rivets and bolts are placed in the middle of the shield and they develop cracks either due to heat or due to hit of some hard objects like stone. It makes the shield weak. Our interaction with officers in Baramullah revealed that on an average 15 shields break in one riot incident. Further, the shield being used also passes the energy directly into the hands of an officer handling the shield. It lacked mechanism to stop direct transferring of energy onto the hands of the officer. Another issue with these PC shields is that when they are used to push the protestors backwards, the handle gets locked causing pain to the policemen. This was observed both in Jammu and Kashmir and Assam. Jawans as such prefer old cane made shields. Further, Jaipur state police noted that the shield glass being used was of poor quality leading to poor visibility.

Quality Testing

106. Our interaction with the officials of Tear Smoke Unit revealed that all the ammunitions manufactured at the unit are sent to states after proper quality testing. They also stated that confirming the quality of their products, the unit received ISO 9002 certification in 1998 and ISO 9001 certification in 2003 from BIS. They also stated that they have a separate quality control division and all the ammunitions have to pass through all the quality requirements in place. The products of TSU were tested on humans and animals in 1980s and 1990s, and found fit to be used

as crowd control weapons. Currently, since lot of data is available on the Riot Control Agents and its use on humans, TSU stopped carrying out tests. Further, they also stated that their testing labs are capable enough to carry out testing on ammunitions manufactured by other firms as well, however, so far they are yet to receive requests on this.

Other technologies in use

107. Role of Unmanned Aerial Vehicles (UAVs) in crowd control is seen as emerging technology. Through online videos and pictures, UAVs facilitates capturing the exact situation and facilitates the quick decision making. It has been stated that use of UAVs provides access to pro active intelligence about crowd behavior as well as size of crowd. UAVs are primarily used for surveillance and reconnaissance purposes.

108. In addition to capturing images, our desktop research revealed that in the countries like the Unites States tests have been carried out to check the possibility of releasing chemical irritants from UAVs.

109. India has witnessed usage of UAVs as a surveillance measure already but the usage remains largely limited. It has been used by civil police for crowd monitoring as well as tracking the movement of criminals. Further, it also been used in anti Naxal operations.

110. Netra UAs were used by the Mumbai police for surveillance and crowd management at Azad Maidan in August 2012. These UAVs relayed real time images to a control room set up at the City Police Headquarters. Netra is a UAV designed by Idea Forge in co-operation with the DRDO. It has a range of 2 kms and can fly for 30 minutes at a stretch before requiring a battery recharge. Each Netra costs around INR 1.5 to 2 million, and is currently being used extensively in anti-insurgency operations.

111. In April 2011, Chandigarh police becomes the first police force in India to acquire UAV to keep strict vigil on criminal movements and trouble mongers. The UAV named Golden Hawk is field trialed under DRDO. It weighs 3 kg and flies approximately 100 m from ground for about half an hour.

112. A compact UAV named T-MAV (Micro Air Vehicle) is a machine manufactured by Honeywell and weigh approximately 10 kg was successfully tested in Bastar region of Chhattisgarh in 2010. It provided thermal images of movements on the ground, IEDs and ammunition dumps. It can reach a height of 10,000 feet, fly at speed of 70 km/hr and can provide 240 minutes of sensory image to the round station. As claimed, it works well in pitch dark situations of the night as well.

113. The use of UAVs had been reported first in military, and the concept has been spreading to civil police currently. Reportedly, the age of the modern UAV began in 1982. Israel is the pioneer in this new form of warfare. The Israel Air Force (IAF) used it for the first time during the first Lebanon war in 1982.

114. The United States began to buy UAVs from Israel in the early 1990s. The U.S military initially used UAVs for surveillance and information gathering, and since the middle of the last decade,

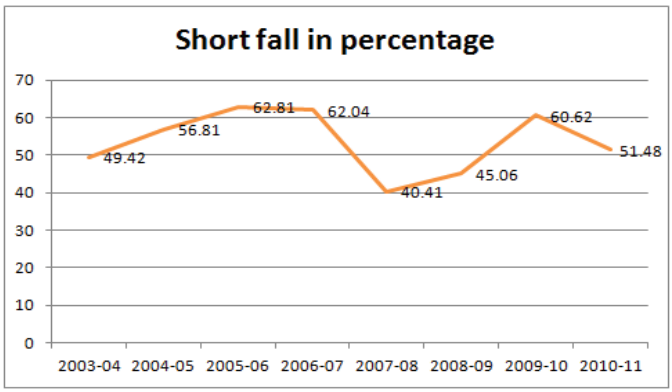
UAVs have been used more and more as hunter-killers, targeting terror-related targets in Iraq, Afghanistan, Pakistan, Yemen, and Somalia.

115. Reportedly, The U.S. administration is planning to induct UAVs into the basket of less lethal weapons used for crowd control. As per media articles, the purpose of this new approach is to develop non-lethal warhead which will be deployed on miniature precision munitions such as Lethal Miniature Aerial Munition System (LMAMS). LMAMS is a small, soldier-carried, soldier-launched loitering precision munitions system which is organic at the small unit level. LMAMS aim to offer soldiers a portable, non-line-of-sight precision strike capability against stationary or moving individuals. With LMAMS, soldiers will have a system capable of achieving high precision effect from covert positions, with a low risk of collateral damage.

Tear Smoke Unit of Tekanpur

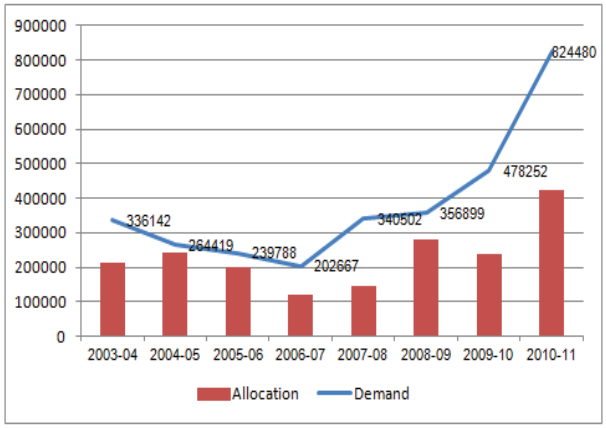
116. With respective to availability of tear smoke munitions, our field interactions revealed mixed response. The field personnel revealed that there is shortfall of munitions. However, our interaction with the officers at provisions team stated that the munitions are supplied in adequate quantity. Moreover, our interactions with the officers at Tear Smoke Unit revealed that they meet the demand from the states. It seems that the demand for tear smoke munitions at the field level is not fully realized, and there is a need for better understanding of the needs of the field personnel.

117. The chart below presents the shortfall in the gap between tear smoke munitions produced and demand.



118. The above chart reveal that the shortfall in the eight year period starting from 2003-04 to 2010-11, and in these years the level of short fall stands at anywhere between over 40 to 60 percent.

119. Further, in addition to the existing gap between demand from the states and the allocations. The chart below presents the gap between the demand and the allocation.



120. The existing gap between the requirement and the supply reveals that the demands of the field personnel are not adequately met.

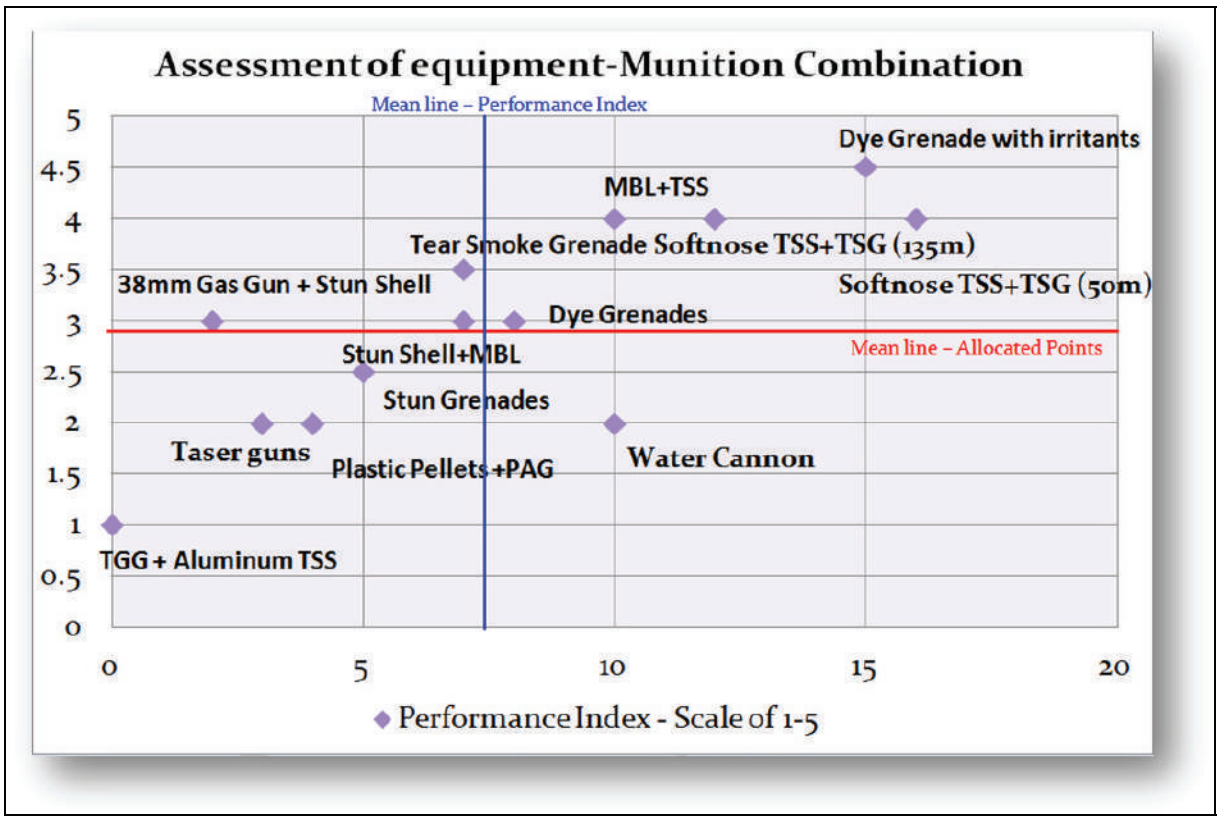
121. Our interaction with the officials of tear smoke munitions revealed that the unit is in the process of automating its facilities, and once the process is complete it is production is expected to multiply by 10 times of the current level (which is 400,000 munitions per annum).

122. Moreover, our interactions with a couple of private players in the market revealed that they are open to the option of transferring technology with respect to less lethal ammunitions and can look at the option of jointly manufacturing these ammunitions with Tear Smoke Unit.

Assessment of technology – Framework

123. This framework has been devised to understand the importance of a particular non-lethal weapon in the riot control operations. In addition, performance of an NLW on ground is evaluated to determine if any improvements are necessary. This was done by carrying out an exercise, where in, the police officers were each asked to allocate a total of 100 points for 13 combinations of weapons. The 13 combinations are the most frequently used / most widely used non-lethal weapons in India. The officers were asked to divide 100 points by allotting points as per their effectiveness/ usage A weapon/combination could be awarded zero points if the NLW wasn't useful at all. Further, the officers were required to rate the performance of these equipments on a scale of 1-5; 5 being the best performing and 1 being the least. It is also possible that an NLW which is deemed to be important might be a low performing one due mechanical inefficiencies or size and weight constraints of demographic reasons. The objective of this exercise is to determine the equipment that are most important and are not performing up to the mark. This weapon thus, by its nature, forms an important part of the basket of NLWs and thus its performance needs to be improved through intervention. The idea is to identify the equipment/ munition where intervention needs to be brought in. Below is the format for the survey questionnaire.

S no	Equipment and Munition combination	Allocated Points (Total of 100)	Performance Index - Scale of 1-5	Where has it been used? (Built up area or open area/ lanes/ by lanes/ places of religious significance/ monuments/ violent crowd or peaceful crowd?)
1	Tear gas gun(38 mm gas gun) + Tear Smoke Shells(Aluminium)			
2	Multi-barrel launched Tear Smoke Shell (Electrically initiated)			
3	Dye Grenades			
4	Stun Grenades			
5	38 mm gas gun + stun shell			
6	Stun shell from Multi Barrel launcher (electric impulse)			
7	Tear Smoke grenade			
8	38mm tear smoke gun + Plastic TS shell with soft nose(135 meter range)			
9	38mm tear smoke gun + Plastic TS shell with soft nose(50 meter range)			
10	Dye Grenade with irritants			
11	Plastic Pellets + Pump Action Gun			
12	Water Cannons			
13	Taser			



Comparative analysis of technology with respect to response characteristics achieved on the crowd

124.A comparative analysis has been carried out based on the field findings to relatively analyze the efficacy of the less-lethal equipment in achieving response characteristics like inducing fear and surprise factor in the rioters, constraining the mobility, prohibiting a coordinated action by the crowd, reducing the motivation levels etc. Red color represents greater efficacy followed by yellow and blue.

Equipment/ Technology ------->	Tear Smoke grenades	TS Shells	Chilli Grenade	Dye Grenade	Stun Grenade	Water Cannon
Parameters						
Fear Factor						
Surprise factor						
Constrained mobility						

Prevent coordinated action						
Inability to communicate						
Reduced motivation levels						
Neutralising the leader/ his ability	n/a	n/a	n/a		n/a	n/a
Identification of the rioter	n/a	n/a	n/a		n/a	n/a
Area Denial - Degrade ability to retaliate and reassemble						
Reduced ability to sense and interpret						
Pain / discomfort levels						
Reaction time						
Casualties/ injuries						
Exhaustion levels				n/a	n/a	n/a

Equipment/ Technology ------->	Pepper balls	Rubber bullets	Tear gas flush	Shock batons	Shock shields	Taser
Parameters						
Fear Factor						
Surprise factor						
Constrained mobility						
Prevent coordinated action						
Inability to communicate						
Reduced motivation levels						
Neutralising the leader/ his ability	n/a		n/a			
Identification of the rioter	n/a		n/a	n/a	n/a	n/a
Area Denial - Degrade ability to retaliate and reassemble						
Reduced ability to sense and interpret				n/a	n/a	n/a

Pain / discomfort levels						
Reaction time						
Casualties/ injuries						
Exhaustion levels		n/a		n/a	n/a	n/a

Equipment/ Technology ------>	Vehicle mounted TS	MBL launched shells	Plastic Pellets	three way grenade	Jammers	Acoustic NLWs	Malodrants	Calmatives
Parameters								
Fear Factor								
Surprise factor								
Constrained mobility								
Prevent coordinated action								
inability to communicate								
reduced motivation levels								
Neutralising the leader/ his ability	n/a	n/a		n/a			n/a	n/a
Identification of the rioter	n/a	n/a		n/a	n/a	n/a	n/a	n/a
Area Denial - Degrade ability to retaliate and reassemble					n/a	n/a		n/a
Reduced ability to sense and interpret			n/a		n/a			
Pain / discomfort levels					n/a		n/a	n/a
Reaction time								
Casualties/ injuries								
Exhaustion levels			n/a		n/a	n/a	n/a	

Critical Field Findings and Gap Analysis

125. This section identifies certain critical field inputs on which actions need to be taken as well as the gap analysis. For better comprehension, these inputs are regrouped into aspects that are training oriented, technical oriented, Demand-Supply related, Innovative tactics, Inventory Management, Need for better kinetic energy munitions of less lethality, Standards, Quality Aspects, Testing requirements, Need for faster legal action – certain options, Encouraging more players for healthy competition – development of indigenous capability (less lethal weapons and munitions manufacturing incentives, subsidies to be looked into)

125.1. *Mechanical inefficiencies and maintenance troubles of tear gas guns*: As explained in the earlier sections related to Field inputs regarding tear gas gun, constant heating of the gun body, formation of soot deposits in the barrel (which needs intermittent cleaning while in operation) and malfunctioning of shear pin have been indicated in the field observations. There is a need for better design of the weapon, material for gun body which would rectify the above aspects and improve the efficiency.

125.2. *Maneuverability of Vajra and Varun Vehicles:* Vajra and Varun vehicles often become chosen targets of rioters since they are vulnerable due to poor mobility. These vehicles do not have power steering as of now. In addition, due to their heavy build as well as the weight of weapons, ammunition and men that they carry, these vehicles are often plagued with poor maneuverability. Even armored gypsy vehicles are targeted as they have low balance and topple down when taking a sharp turn, which are then set ablaze by rioters in many instances.

125.2.1. There is a need for power steering and sophisticated design that takes into account the turning radius, weight and stability of the vehicle while designing the armor on these vehicles. In addition, field inputs have indicated the need for miniature versions of vajra and varun so that they can be maneuvered in the lanes and by-lanes of the riot prone areas.

125.3. *Weight of Pump Action Guns*: Field inputs suggest that the size and weight of PAG constrains the mobility of the personnel carrying these weapons often posing dangerous challenges especially in areas like Kashmir where the Police men are attacked, brutally injured and almost lynched to death. There is a need for development of stylish and lighter version of Pump Action Gun with a foldable butt

125.4. *Less Lethal Ammunition that can be launched from conventional (lethal) weapons*: Forces have expressed the issues of discomfort owing to carrying both lethal and non-lethal weapons at the same time which not only is difficult to carry, but also constrains the mobility of the person carrying them. Thus they have expressed need for less-lethal ammunition that can be fired from conventional weapons like AK-47, INSAS, SLR etc. Such ammunition exists in international markets. There is a need to develop this ammunition in India. They have also expressed that they need less lethal ammunition which can be fired using under barrel grenade launchers (UBGLs) which can be fitted to the conventional weapons.

125.5. *Need for hand held multi shell/ grenade launchers*: Forces have explained that quickly saturating the area with enough amount of tear and chilli smoke as well as usage of stun shells to create a surprise and fear factor is the need of the hour. Current equipment (38 mm gas gun) can launch only one TSM at a time (up to two shells at best in a minute) and is not able to achieve saturation of the area. Thus there is a need for a hand held multi grenade/ shell launchers that can launch shells/ grenades/ combination in less time and saturate the area.

125.6. *Design of Body Protection Equipment - Comfort, fire resistance, quality and style*: Across the latitude and longitude of the country, the concerns over quality and standards of body protection equipment reverberated throughout the study. There is a need for designing/ developing or procuring from outside, more robust body protection suits that can withstand the bullet-like stones pelted in Kashmir on one hand and the petrol bombs that are witnessed in the southern part of the country. In addition, there is a need for design considering the comfort of the police man who faces the rioters for hours together in hot and humid conditions. Style is also another component that needs to reflect the defensive posture of the Police man as also cause sense of fear amongst the rioters, which needs to be incorporated into the current look.

125.7. *Shields and Lathis to be more robust*: The latest shields and lathis of transparent poly carbonate material are reported to be of sub-standard quality as they are brittle. Field inputs from Baramulla revealed that about 15 shields and batons (lathis) were being discarded everyday during 2010 riots due to breaking. The team has been shown the poly carbonate shields that are vulnerable to stress and strain (mechanical failure due to either impact force or heat) in the areas where screws/ rivets are placed. Subject matter experts have indicated the poor design to be the root cause of these. There is a need for acquiring better quality lathis and shields that are robustly designed for riot control which take into consideration the aspects of mechanical and thermal stress and strain as well as material properties that cause the performance failures. A robust safety factor needs to be developed and designed accordingly in terms of impact (Kg/sq-cm) that the equipment is designed for.

125.8. Need for Prisoner's van: Our interactions with the field officers and senior police officers have indicated that every battalion should have at least two vans that can carry arrested rioters from the place of riot to elsewhere. Lack of such vehicles restricts the ability of the troops on the ground since they are not able to minimize the number of rioters at a given point of time.

Training related aspects

126. As discussed in the earlier section on Field inputs and analysis, there is a need for

126.1. Sensitization of police forces across the country on the cultural, communal, economic, ideological aspects of the people,

126.2. Joint training exercises for the State Police and CAPF units that operate together in riot-control environment,

126.3. Soft skills of negotiation and exercising restraint without being aggressive (this is more often an issue in almost every state)

126.4. Scenario based planning and simulation modeling

126.5. Framework based approach to riot control (as in the case of the developed countries which are often challenged with professional and tech savvy rioters)

Demand-Supply aspects

127. The forces have asked for Oleoresin Capsicum based grenades (manufactured by PEL, Hyderabad) across the country. In addition, shell version of these grenades is being developed to meet the requirement.

128. As brought out in a section about Tear Smoke unit, the figures indicate that there is a shortfall of supply. TSU officials have indicated that their capacity as on date is about 4,00,000 munitions in a year and are forecasting an increase in the demand because of which they are looking at increasing the current capacity by 10 times through automation. Enhanced capacity of TSU would help meeting the gap in the future.

129. TSU has mentioned during multiple interactions that they have been able to meet the demand placed by BPR&D till date. However, field inputs suggest that their demand for ammunition has not been met (this can be a budget issue at the state level). We do not have enough data to comment on this aspect. This aspect needs to be inquired into through internal official channels to find a solution.

130. In addition to the munitions, the forces face issues with insufficient numbers of tear gas guns. Currently, a company has only 2 tear gas guns.

131. There is a requirement for more numbers of effective and better quality Body protection equipment (BP suits, helmets, gas marks, eye protection) that are to be procured. Right now, not all police men involved in riot control are equipped with BP gear.

Innovative tactics / Ideas

132. *Bhut Jolokia Chilli*: The study teams have come across innovative tactics adopted by Police as also ideas for the future. These include using extract of Bhut Jolakia chilli of Manipur and Assam (rated as the hottest chilli in the world with a Scoville (Hotness rating) rating of 1,001,304 SHU) in the water cannon to cause irritation to the rioters.

133. *Diverting the mob*: Manipur Police have also mentioned that in one particular riot when crowd overpowered the Police, they started distributing food and water in a nearby lane with the help of few shopkeepers. This diverted the attention of exhausted rioters and diverted them into the other lane.

134. *Need for Combined Effect Munitions*: field inputs indicated that combined effects of stun, lachrymatory effects etc should be used for effective dispersal of the crowd. Thus they have

suggested that development of grenades similar to 2 in 1 grenades with OR capsicum as the chemical will be more effective.

135. *Pouches for carrying ammunition*: Field personnel have lamented that the pouches in which they carry the ammunition for riot control operations are same as the packaging material in which ammunition are received. They have suggested that BP suits need to be designed with pouched on the suit itself which can carry the ammunition. Police in Assam have also designed a belt with pouches that is kept in the Police station, filled with different types of munition, which can be picked up easily when a riot occurs.

136. *Use of Concertina Wire as Mobile Barricades*: CRPF in Kashmir valley has devised a procedure in which concertina wire coils are carried in a vehicle and can be laid out as barricades in a matter of minutes.

Inventory Management

137. As explained earlier, due to sublimation and expiry dates, many tear smoke munitions go waste. Good ventilation and air circulation inside the store solves the problem to a large extent. Certain states where tear gas is not widely used because of lesser frequency of riots face the issue of inventory expiry of the TSMs. An inventory rotation mechanism amongst the states could possibly be a solution to this. First in – First Out (FIFO) approach could be used where the inventory that has been stocked first will be consumed first. Such an inventory management platform (software and database) can be organized and managed centrally at the level of MHA.

Need for less lethal Kinetic Munitions

138. As per the field inputs, the existing kinetic energy munitions like rubber baton rounds, rubber pellets, plastic/rubber bullets (those fired from SLR), paper cartridges are not being used because of the perceived lethality when the field conditions do not suit the operation of these. More often, these are mired in controversies because of which Police tend to avoid them. There is thus, a need for better Kinetic Energy ammunitions which can be aimed at precision/ accurate shots to neutralize the riot leader etc.

Quality of Equipment, weapons and munitions

139. A great emphasis on the quality of the equipment being procured is essential since field inputs across the country have indicated poor quality equipment being procured. This has impact on the force morale and confidence levels. While some officers have expressed concerns over the L-1 process of the Government that selects only the lowest bidder, it is to be noted that robust QRs (qualitative requirements) if worked out prior to the release of RFQ could solve this issue.

Laying down the Standards

140. Currently, due to lack of industry standards, poor quality equipment are being procured according to the field inputs. Procurement procedures and quality requirements need to be laid down at the national level. Standards need to be either devised or existing riot control standards in the rest of the world need to be considered for the same. For example NIOSH standards are

accepted worldwide for tear smoke munitions while in India, we use a normal surgical/industrial mask. While the rest of the world has moved onto specifically helmets designed for riot control where there is protection for ears, neck and eyes, in most places in India the PAGT helmets that are designed for Military purposes are used. The basic function of these two forces is different and thus the designs vary quite a bit. In Kashmir, during 2010 riots, it was reported that due to lack of proper protection to eyes, ear and medulla oblongata area (neck), the forces have suffered severe casualties.

Need for Testing laboratories

141. Currently we neither have proper standards laid down, nor do we have any laboratories in India that can test the equipment. Industry experts also have indicated that there are certain labs which give the certification that the equipment meets riot management requirements in couple of hours. This is practically not possible if the tests are actually conducted. Experts have lamented that there is no focus in this area because no one loses anything when a Police man suffers injuries.

142. Police agencies across the world have undertaken research programs and involve academic institutions (like the Institute for Less Lethal Weapon Systems of University of Pennsylvania, Bradford, various consulting firms, research laboratories) who develop quality and testing standards for the riot control equipment, weapons and munitions. Extensive research is being done in the countries like Canada, US, Germany and UK.

Need for on-site mobile command and control systems

143. The existing vehicles can be modified with armour protection and necessary equipment into command and control rooms that would receive field inputs from various communication systems, augmented with map based systems, CCTV feeds etc which can be quickly analysed and commands can be passed on to the man on the ground. This would be more effective than to communicate with a police control room that is kilometers away from the riot site.

Need for Variety of less-lethal munitions and an ecosystem of industry

144. Currently, the less lethal armory of our police forces is limited with handful of weapons and ammunitions. Providing a variety of less-lethal weapons allows them to have flexibility to pick and choose force application that is relevant to the scenario. Market mapping also has indicated a gap in terms of lack of industry in this area. In the case of SMEs that cater to Defence needs, many subsidies and incentives are provided to the industry. However, in the internal security domain, no such incentive scheme exists. Provision of subsidies, tax rebates, and incentive schemes would encourage the private industry to invest in this area for better quality products.

Part 5: Demonstration trials, Review Meeting and All India Workshop

5. In addition to visiting states to ascertain the opinion of police personnel on the currently used less lethal weapons and also to understand their requirements in this sphere, Orkash as a part of this study conducted demonstrations of some of the new less lethal weapons. The demonstration of weapons was carried out twice, one on 12 September 2102 at BSF's Bhondsi firing range and another on 19 November 2012 at CRPF Academy, Kadarpur - Gurgaon.

6. Orkash also carried out an all India workshop at the Bureau of Police Research and Development (BPR&D) on 20 July 2012 to generate discussions on the interim findings, and a high level review meeting on the draft report.

Review Meeting on the Draft Report

7. Review Meeting on the draft report

7.1. The meeting was held on 20 November 2012 at the Conference Room, Orkash Services Private Limited – Gurgaon under the chairmanship of Dr. K N Sharma, DG - BPR&D. The meeting was also attended by Dr. B N Ramesh, IG – CRPF, Shri. Sandeep Shandilya, IGP – Internal Security, Andhra Pradesh, and Shri. A K Chowdhary, IGP-PHQ, J&K. The list of other officers participated in the review meeting is given in the table at the end of this chapter.

7.2. The purpose of the meeting was to review the draft report submitted by Orkash Services Private Limited on the study. In the meeting, the Team Orkash presented its findings and also discussed its overall suggestions and recommendations. Some of the aspects that were discussed in detail in the meeting are highlighted below,

7.2.1. *Launchers*: The need for better launchers especially to saturate the area using tear smoke grenades and shells were discussed. With respect to Multi Shell Grenade Launcher (MSGL), the DG – BPR&D has expressed the need to figure out whether it would be efficient or not.

7.2.2. *Gas Mask*: The need for better gas masks that protects policemen from the effects of tear smoke munitions in the field was expressed.

7.2.3. *Mobility*: Inability of the policemen to move into smaller and narrow lanes owing to the lack of smaller vehicles and equipments were highlighted. However, Dr. B N Ramesh, previous CRPF – IG (ops), Srinagar, stated that he found Tata 407 and Tata 207 vehicles address this issue to a larger extent especially in the Kashmir area.

7.2.4. *Barriers/Blockades*: The issue of placing barriers and blockades at various distances was discussed. The emphasis was placed on the better barriers like concertina wires.

7.2.5. *Range*: The lack of options to tackle agitating mob at a distance beyond 135 meters were highlighted. However, the option of using MSGL which has capabilities to launch less lethal munitions up to a distance of 800 meters were discussed.

7.2.6. *Grading of Equipments*: DG – BPR&D has expressed the need to grade the equipments based on its relevance to a particular situation. He emphasized the need to group the equipments based on aspects like cities, urban areas and rural areas.

7.2.7. *Testing Labs*: The absence of standard testing labs to test the quality of body protectors was highlighted. The possibility of entrusting this task to agencies like DRDO, Defence Institute of Physiology and Applied Sciences and IED Management School –Pune were discussed.

7.2.8. *MSGL – Trichy Ordinance Factory*: The possibility of exploring the induction of MSGL manufactured by Ordinance Factory – Trichy was discussed. However, concerns were raised over its applicability owing to the fact that it has not been used anywhere, Further, the Ordinance Factory has manufactured only prototype.

7.2.9. Dye grenades, chili grenades and mixing irritants with water and sprayed against protesters were appreciated as possible good options in the current scenario.

7.2.10. *Kinetic Munitions*: Absence of effective kinetic munitions was recognized. Incorporating the options like AEP baton rounds and modified plastic bullets were discussed.

Product Demonstrations

7.3. On 19 November 2012, a day before the review meeting, demonstrations of less lethal weapons were held at CRPF Academy – Kadarpur, Gurgaon. Similar demonstrations were held at BSF's Firing Range – Bhondsi - Gurgaon on 12 September 2012. Like the review meeting, the demonstration at CRPF Academy was held under the leadership of DG – BPR&D. The demonstrations at both the places were witnessed by the officers from CISF, RAF, SSB, and Gurgaon police, NSG, BSF and TSU. Further, the representatives from the state police of J&K (IGP – PHQ), West Bengal (DIG), Delhi Police (ACP) and Uttar Pradesh Police specifically travelled from their states to see the demonstration at CRPF Academy.

7.4. The names of the companies that participated in the demonstration are given below,

7.4.1. Milkor USA Inc,

7.4.2. Condor Less Lethal Technologies, Brazil,

7.4.3. PepperBall Technologies USA,

7.4.4.BSST India Private Limited and

7.4.5.Applied Systems, India.

7.4.6. PepperBall by SRG Group India

7.5.Except Applied Systems, all the other companies participated in both the demonstrations (CRPF Academy and BSF Bhondsi Firing Range).

7.6. Milkor USA: Multi Shell Grenade Launcher

7.6.1. This company has demonstrated the capability of M32A1. Aspects like precision target up to certain range, and launch of ammunitions in quick succession are found to be missing in the equipments relied upon by the officers in the field especially with respect to hand held launchers. 38 mm gas guns were found to be launching only one shell in a minute necessitating more equipment and more personnel. MSGL M32A1 (hand held launcher) of Milkor USA is found to be launching 6 shells in three seconds. Further, it also found to deliver pin point accuracy up to 150 meters with standard low velocity (LV) grenades, and pin point accuracy up to 250 meters with medium velocity (MV) grenades. Further, a multiple variety of ammunitions can be launched one after another through single equipment. It was demonstrated that all kinetic munitions, tear smoke and stun shells can be launched through MSGL M32A1. The ammunitions demonstrated by Milkor USA are given below,

- ALS Mono Baton 4000:220211
- ALS Mono Baton 4000:070611
- ALS Hornets Nest 4060:210211

7.6.2.The induction of equipments like this is likely to act as force multipliers as well as will result in effective utilization of man power in the field at the anti-riot police platoon level. However, Milkor MSGL uses precision 40mm ammunition of various types, which is current not in use by Indian law enforcement agencies. Weapons such as Milkor MSGL need high quality precision ammunition. If the ammunitions are of poor quality then it may cause stoppages in the weapon and even damage it. Our interaction with the officials of TSU revealed that they have manufactured 40 mm shells to be launched through Under Barrel Grenade Launcher (UBGL) attached to AK 47 and INSAS rifles. However, currently TSU is not producing ammunitions for 40 mm weapons, and we were told that they have the capability and can be manufactured on demand. UBGL is manufactured at Ordinance Factory – Trichy.

7.7.Pepper Ball Non Lethal Weapon System (pneumatic)

7.7.1. Pepper ball non lethal systems are another kinetic option for our officers to tackle agitating crowd at the short range of 20 to 50 meters. Unlike the kinetic munitions that are currently used in India which are launched through 12 bore Pump Action gun and 38 mm gas gun, the launch of pepper balls require separate launcher. This system is manufactured by PepperBall Technologies Inc, USA. Both the launcher and ammunition were demonstrated on behalf of this company by SRG Group during the demonstrations.

7.7.2. PepperBall Launchers as non lethal chemical agent delivery system uses High Pressure Air, Carbon dioxide, and electronic launchers to deliver PAVA powder projectiles from a distance. It combines chemical agent exposure with kinetic impact and pain.

7.7.3. It was demonstrated that through the PepperBall launchers trigger can be set for full automatic, three round burst or semi automatic mode. SRG Group demonstrated the capabilities of this launcher as well as PAVA irritant. On an average 700 rounds per minute/12 rounds per second can be triggered in full automatic mode. Range of fire on individual target is up to 20mts and for saturating an area it is up to 50mts.

7.7.4. Projectile of PepperBall launcher are of 0.68 caliber hard, plastic frangible (breakable) sphere designed for firing and break on impact resulting in cloud formation. These weigh about 3 gms each, have a velocity envelope of 300 to 350 fps (feet per second), kinetic impact of 10 to 12 ft/lbs of energy and can work in operational temperature range of minus 30° to plus 150° degrees Fahrenheit. The projectile that is suggested for use in India is Pepper Projectile - 30X Hot Pava Powder, which is filled with 15% PAVA (Capsaicin II) by weight. The use of PAVA as an irritant has been approved by Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT), which is an independent scientific committee that provides advice to the Food Standards Agency, the Department of Health and other Government Departments and Agencies on matters concerning the Toxicity of Chemicals in the United Kingdom[36]. The comments given by this Committee on the health effects of the use of PAVA as incapcitant spray is given below,

> "We recognize that exposures would be low and for a short period. It is impossible to calculate exposure with any accuracy, but we note that dermal exposure would be of the order of 30 mg PAVA from a one second burst, with about 3 mg being absorbed. Any systemic exposure is likely to be low (of the order of 0.04 mg/kg bw).
>
> The animal model data and experience in use do not give rise to any concerns regarding long term harm to the skin and eyes, arising from irritant effects. Although no conclusions can be drawn from the one available animal study to investigate skin sensitization, experience in use, including in human medicines for topical application, indicates that PAVA is not a skin sensitizing agent.
>
> The new in-vivo mutagenicity data provided (negative results in an in-vivo liver UDS assay conducted to internationally accepted guidelines) in conjunction with previously evaluated studies allow the conclusion to be drawn that PAVA is not an in-vivo mutagen.
>
> The ability of PAVA to induce adverse effects on the developing offspring following in utero exposure has been investigated in a prenatal developmental toxicity study in the rat using oral exposure (by gavage). The compound had low toxicity by the oral route, with no significant effects being seen in the maternal animals at doses up to 1000 mg/kg/day. The only effect seen in the developing offspring at this dose level was a small reduction in fetal weight. There was no evidence of any malformations, skeletal anomalies, or any other adverse effects at this dose level. The NOAEL for effects on the offspring was 500 mg/kg/day. This NOAEL is about 4 orders of magnitude above the expected exposure level arising from use of the spray; there are thus no concerns regarding developmental toxicity.

[36] http://cot.food.gov.uk/, as accessed on 04 November at 2330 hours

The data from inhalation studies in volunteers, including those with mild asthma, indicate that there are unlikely to be any adverse respiratory effects in healthy individuals. It is possible that some respiratory effects may occur in asthmatics, particularly since effects were observed in asthmatic volunteers at 0.1% PAVA, which is lower than the 0.3% used in the spray, and given the increased stress likely when the spray is used.

The available information, both from the toxicity data in experimental studies, and experience in use, indicates that the low exposures arising from the use of PAVA incapacitant spray would not be expected to be associated with any significant adverse health effects. However we recommend that monitoring of experience-in-use be continued."[37]

7.7.5. The representatives of PepperBall Technologies Inc, USA, claimed that it is effective on individuals as well as large group of people for riot and crowd control. This system is potential enough to be one of the effective kinetic munitions that can be used in India. However, this system being new to Indian context requires comprehensive trials.

7.8. Rubber Ball Non Lethal Weapon System (pneumatic)

7.8.1. Our field visits to various states revealed that rubber bullets are listed as one of the options to tackle agitating crowd. However, there were instances where rubber bullets resulting in lethal injuries on individuals. Our interactions with officers at Baramullah revealed that Pump Action Gun through which rubber bullets/paper cartridges are launched lacks automatic loading and reloading because of which significant time is lost while tackling agitating mob. Further, the guns are heavy (around 3 kg) which affects swift mobility of the officers. And, number of rubber bullets launched is also limited.

7.8.2. Our market research revealed that there are systems in the market which launches rubber balls in a quick time, and one such we have evaluated is Rubber Ball Non Lethal Weapons system. This weapon system was demonstrated by SRG Group. It is also pneumatic type launchers operated through gas. These types of launchers are new to India. It requires extensive field trials before the induction.

7.8.3. These launchers along with ammunitions were demonstrated on both the occasions (12 September and 19 November 2012). Rubber ball launchers are less weight and can fire 120 rounds of rubber balls in two minutes without reloading. The representatives also claimed that the ammunition being a ball type its likelihood of causing lethal damage on rioters is very less. It is another option to tackle agitating mob at a short distance of between 20 to 50 meters.

7.8.4. However, these types of rubber balls can't be launched through the weapons that are already available to use like 12 bore Pump Action Gun or 303 anti riot gun. It necessitates the need to buy both the launcher as well as the ammunition.

[37] Committee on Toxicity, Mutagenicity, Carcinogenicity of Chemicals in Food, Consumer Products and the Environment, Annual Report 2004, pp.97-98.

7.9.Condor Non Lethal Technologies, Brazil

7.9.1. Condor Non Lethal Technologies – Brazil is also represented by SRG Group in India. The ammunitions that were demonstrated before DG – BPR&D on 19 November 2012 are given below,

7.9.2.Rubber projectile (mono impact)

7.9.3.Three rubber projectile

7.9.4.Precision rubber projectile

7.9.5.Three cylindrical rubber projectile

7.9.6.Multiple rubber projectiles

7.9.7.Tear gas explosive projectile

7.9.8.Explosive projectile

7.9.9.Tear gas direct flush

7.9.10.Pepper direct flush

7.9.11.Triple tear gas grenade – hyper

7.9.12.High emission tear gas grenade

7.9.13.Tear gas grenade

7.9.14.Rubber ball tear gas grenade

7.9.15.The ammunitions namely – Rubber Projectile (mono impact), three rubber projectile, precision rubber projectile, three cylindrical rubber projectile, multiple rubber projectiles, tear gas

explosive projectile, explosive projectile, tear gas direct flush and pepper direct flush were fired through 12 bore pump action gun. The grenades, namely, high emission tear gas grenade, tear gas grenade and rubber ball tear gas grenade were launched through 12 bore pump action gun by fitting a launching cup. Similar to the demonstration of these grenades through 12 bore pump action gun, the demonstration of launching of these grenades also done through 38 mm gas gun by fitting launching cup at the mouth of its barrel. The specifications of all these ammunitions are given in the Annexure. These ammunitions provide the use the option of launching kinetic type, tear smoke type and stun type ammunitions.

7.9.16. Since all these ammunitions are not manufactured in India, extensive trials are recommended before its induction into the basket of less lethal weapons used in the country.

7.9.17. Moreover, the representatives of Condor Non Lethal Technologies – Brazil also stated that they are receptive to the idea of manufacturing these ammunitions at TSU – Tekanpur through transfer of technology (ToT) agreement.

7.10. Body Protection Equipment

7.10.1. Riot control gear is a combination of weapons, munitions and body protection equipment (suit, helmet, mask, gloves, shoes, knee protection, Shields). Our field visits revealed that the body protection gear currently used by the police forces is not uniform across the country. It comprises body protection suit, steel toed shoes, cane and poly carbonate shields etc. It was found that the forces have customized the features of the above equipment depending on the need and availability. However, there is a general trend of dissatisfaction across all the levels in the state and central police forces in terms of performance of body protection equipment.

7.10.2. J&K Police and CRPF, who work hand-in-hand with synergy in the valley, have reported that the BP equipment (helmet, baton, shield and suit) being used by them could not sustain the stone pelting of the Kashmiri mobs. Our field interactions revealed that the body suits which are being used currently are neither fire proof nor bullet proof, which tend to limit the mobility of the men on ground. The limitation in mobility is also due to weight of body protectors being used, and there were suggestions for lesser weight ones. In Jammu and Kashmir, we were told that stones were thrown at police at a speed of around 80km/hr by the protesters, which is equivalent to that of a bullet. In such a scenario, these suits become ineffective and lower the morale of the policemen. CRPF personnel in Manipur suggested that the suits should be at least bullet proof and fire proof. In addition, the requirement for high protection shin guards and knee guards were expressed.

7.10.3. It was found that the currently used body protectors are very cumbersome and generate lot of heat. Comfort and protection are two preferred aspects with respect to body protectors. Our interaction with officers in the field revealed that comfort is directly proportional to the weight of the body protector. If the weight is more then it restricts the mobility. And, the average weight of full body protectors currently in use are around 7 kg. Our interaction with CRPF personnel in Srinagar revealed that though they have been given full body protectors, owing to the aspects like cumbersome, heat and mobility, they

prefer using only leg and chest parts. We were also told that the current ones owing to its heavy weight are not known to be meeting the intended purpose.

7.10.4. Our interaction with professionals in the market as well as officers in the field revealed that unlike less lethal ammunition and equipment there are a lot many players in the market pertaining to body protectors. However, the quality of products offered by few or majority of them may not be meeting the required standards. Many suggested that quality of body protectors needs to be certified by labs like Ghaziabad based Northern India Textile Research Association (NITRA) which is linked to the Ministry of Textiles.

7.10.5. Our interaction also revealed that there are body protectors with lesser weight (2 kg) used in countries like the UK, and the advantage of body protectors (ultra light) like this is that it offers better protection and comfort and also generates less heat. Our interaction with market revealed that the cost of body protectors of ultra weight categories is around INR 25,000.

7.10.6. Moreover, our market mapping exercise revealed that the body protectors that are currently in use are outdated, made of old design pattern, not scientifically designed and is not ergonomic. They do not provide level 2 protection and adequate trauma protection. Further, the currently used cannot be upgraded into Level IIIA protection. Above all, they have limited shell life. Market mapping also revealed that body the currently used body protectors are made of materials like plastic and foams, and there are products which are made of materials like aluminum alloy which are not currently used in India.

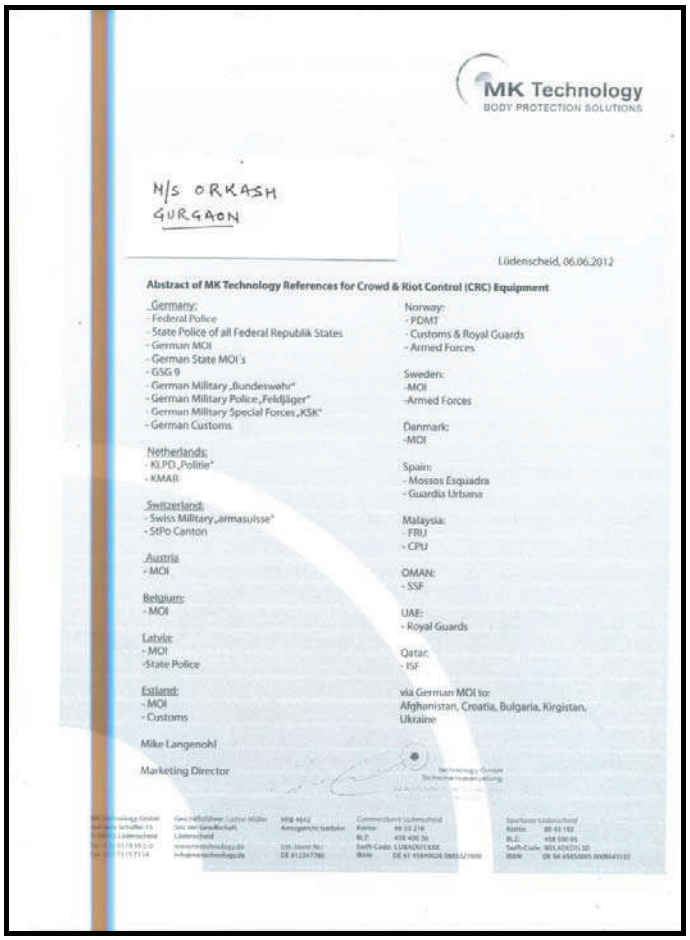
7.10.7. Our interactions with BSST India Private Limited revealed that they offer complete body protectors which is made of aluminum alloy, and though it is a German technology (M/s. M K Technology, Germany), the products are manufactured in India (Hyderabad) by BSST India Private Limited.

7.10.8. The comparison between the currently used body protectors and of MK Technology, Germany is presented in the table below, and this information is as per the data given to Orkash team by BSST India Private Limited.

No	Property	Conventional	BSST Product
1	Material	Plastic and Foam	Aluminum alloy
2	Flexibility	Less	Utmost as per the shape of Human Torso
3	Protection	Stones & Lathi only to certain extant with Trauma (protection upto 20 joules max)	Complete protection from Stones, Lathi, Axe, Stab, low caliber bullets and other sharp objects with minimum Trauma (protection upto 100 joules)
4	Weight	Low	Moderate
5	Shelf Life	Low (As plastic degrade with time)	Being an alloy a shelf life of min 10 yrs
6	Performance	Deformation of plastic/foam reduces the performance dramatically over short periods	No deformation of the material ensures the long lasting performance

7.10.9.BSST India Private Limited demonstrated the capability of their products at BSF's Bhondsi firing range on 12 September 2012 as well as on 19 November 2012 at CRPF Academy. This product was demonstrated by BSST India Private Limited during both the demonstrations.

7.10.10.The product of BSST is used in many countries. Below screen shot presents the glimpse of its client list,



MK Technology
BODY PROTECTION SOLUTIONS

M/S ORKASH
GURGAON

Lüdenscheid, 06.06.2012

Abstract of MK Technology References for Crowd & Riot Control (CRC) Equipment

Germany:
- Federal Police
- State Police of all Federal Republik States
- German MOI
- German State MOI's
- GSG 9
- German Military „Bundeswehr"
- German Military Police „Feldjäger"
- German Military Special Forces „KSK"
- German Customs

Netherlands:
- KLPD „Politie"
- KMAR

Switzerland:
- Swiss Military „armasuisse"
- StPo Canton

Austria
- MOI

Belgium:
- MOI

Latvia:
- MOI
-State Police

Estland:
- MOI
- Customs

Mike Langenohl

Marketing Director

Norway:
- PDMT
- Customs & Royal Guards
- Armed Forces

Sweden:
-MOI
-Armed Forces

Danmark:
-MOI

Spain:
- Mossos Esquadra
- Guardia Urbana

Malaysia:
- FRU
- CPU

OMAN:
- SSF

UAE:
- Royal Guards

Qatar:
- ISF

via German MOI to:
Afghanistan, Croatia, Bulgaria, Kirgistan, Ukraine

7.10.11.In addition to BSST, SRG Group also demonstrated the body protectors. The specifications of which are given in the Annexure. The picture is given below,

7.10.12.The test reports of full body protectors are given in the Annexure.

7.10.13.Applied Systems India also demonstrated body protectors. The specifications are given in the Annexure.

7.11.Helmets

7.11.1.Our interactions with the police forces across the country revealed that the helmets which are being used currently neither provide ear protection nor cover the neck area. In Assam, old metallic helmets are being used which cause severe discomfort. This observation was also made by Jaipur state police, which felt that the helmet was too heavy and difficult to carry. Jammu and Kashmir state police noted that these helmets do not have good cushioning and the wire mesh cannot sustain stone pelting and breaks. There were suggestions for bullet proof, snug fit and light weight helmets especially in the places like Srinagar and Imphal.

7.11.2.Our interactions also revealed that the design of helmets currently used is of Personnel Armored Support Ground Troops (PASGT). Reportedly it is an American design made for their army. Further, the design of helmets is such that it provides protection only at the top. Reportedly its design was made keeping army in mind, and it is not specifically meant for use in riot control operations. Complete ear protection, protection to full head, face and neck, visor with mesh on top to protect against non ballistic threats such as rocks, bottles, sticks etc. are stated as important requirements for helmets used in riot control operations.

7.11.3.Our interaction with SRG Group revealed that they have sold samples of helmets meeting these requirements to Gujarat police and National Police Academy, Hyderabad. Further, they also stated that the protection the personnel get from helmet is directly proportional to weight of the helmet. If the helmet is lesser weight then it is likely that it may provide adequate protection. A picture of the helmet demonstrated by SRG Group is given here. The specifications of the helmet are presented in the Annexure.

7.12.**Filter/ Mask**

7.12.1.Our interaction with personnel in the field revealed that though gas masks are being used by the personnel while launching less lethal munitions like tear smoke shells and stun shells, they

expressed the need for better quality ones. Manipur State Police noted this and expressed the need for protective masks.

7.12.2. Our interaction with personnel in the field as well as professionals in the market revealed that the gas masks used requires an approval of NIOSH (National Institute of Occupational Safety and Health), USA, for protection against CS and CN tear gas. The picture of the type of gas mask demonstrated by SRG Group is given here. Some of its feature includes,

7.12.2.1. Made of super-soft Hycar face piece which is up to 40% lighter than conventional full-face respirators.

7.12.2.2. Molded of black Hycar - a specially formulated combination of natural rubber and synthetic materials. (Resists chemical attack and temperature extremes withstand rugged daily use and still give a snug, comfortable fit).

7.12.2.3. Compliance to NIOSH approval TC - 14G - 0235 for protection against chlorobenzyhidene (CS) & Chloroacetphenone (CN) Tear Gas, P100 particulate efficiency level and particulates.

7.12.2.4. Canister should be also effective against Oleoresin Capsicum (OC).

7.12.2.5. A flexible, one-piece polyurethane lens to be bonded to the face-piece and not rigid lens (or lens rings) to eliminate uncomfortable pressure points.

7.12.3. The detailed specifications are presented in the Annexure.

7.13. Shields

7.13.1. Our interactions with professionals in the market as well as officers in the field revealed that shields that are used currently are of poor and sub standard quality and cannot withstand vigorous conditions and higher temperature. We were also told that shields tend to break with prolonged usage, and they develop cracks even under prolonged storage conditions. Further, another criticism we heard on shields is that they are not tactically designed with law enforcement situation in mind.

7.13.2. The riot shields currently used (Mark IIB Shields) are of Polycarbonate (PC) ones and are indigenously manufactured. These are 4mm thick shields. Our field visits, especially the one at Baramullah revealed that the poly carbonate shields used by them develop cracks at places where there are nets and bolts either due to heat or due to hit of some hard objects like stone. It makes the shield weak. Our interaction with officers in Baramullah revealed that on an average 15 shields break in a day due to factors like heat. Further, the shield being used also lack mechanism to stop direct transferring of energy into the hands of the officer. Another issue with these PC shields is that when they are used to push the protestors backwards, the handle gets locked causing pain to the policemen. This was observed both in Jammu and Kashmir and Assam. The Jaipur state police noted that the shield glass being used was of poor quality leading to poor visibility.

7.13.3.Our interaction with market emphasized the need for testing certifications from prominent labs like Northern India Textile Research Association (NITRA), Ghaziabad, which is linked to the Ministry of Textiles. SRG Group demonstrated riots shields that are approved by National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited laboratories. A picture of the shields demonstrated is given below,

7.13.4.Some of the features of the shield are given below, and the comprehensive details are given in the Annexure.

7.13.4.1.Made up of high quality poly carbonate material

7.13.4.2.Holding points are designed in such a way that it permits the use by right or left hand. It also supported by the other free hand as needed. Near V-shaped front face of the shield is designed to conduct blows aside.

7.13.4.3.Handle support is a clip- open type aimed to prevent injury to hand in case shield is pulled out from user.

7.13.5.Shock Based Systems

7.13.5.1.Shock shield, shock baton and shock belts were demonstrated by SRG Group. Human rights and ethical aspects with respect to use of shock based systems were raised by the officers who attended the demonstration including DG – BPR&D. The general consensus that emerged was that these systems can be used only if it is non controversial and ethical. The details of the systems are given below,

7.13.6. *Shock Riot Shields:*

7.13.6.1.The features of the shock shield demonstrated are given below,

7.13.6.1.1.High voltage, non-lethal, safe yet effective shock via securely fitted conductors all over the front area of the shield.

7.13.6.1.2.Guard in full control with press button operation situated in molded handle as well as on/off indication L.E.D.

7.13.6.1.3.Visible shock sparks to act as added deterrent.

7.13.6.1.4.4mm thick see through clear polycarbonate shields aimed at offering protection against thrown objects.

7.13.6.1.5.Fully rechargeable including nickel-cadmium rechargeable battery with AC/ DC charger as well as L.E.D indicators.

7.13.6.1.6.Sealed detachable electronic housing for easy maintenance.

7.13.6.1.7.Unlike with use of firearms or Batons, no permanent damage or use of unnecessary force.

7.13.6.1.8.Approved and tested by South African Bureau of Standards.

7.13.6.1.9.The specifications of the shield demonstrated are given in the Annexure.

7.13.7.Shock Baton

7.13.7.1.It delivers a massive, painful yet Non-lethal Shock at the flick of a switch working through heavy clothing including leather jackets. The features of the baton include,

7.13.7.1.1.High voltage, non-lethal, safe yet extremely effective shock.

7.13.7.1.2.Activated by self-return trigger switch.

7.13.7.1.3.Visible shock sparks acts as an added deterrent.

7.13.7.1.4.Light weight materials.

7.13.7.1.5.Adjustable wrist straps.

7.13.7.1.6.Fully rechargeable comprising of Nickel Metal Hybrid rechargeable battery and plug-in charger.

7.13.7.1.7.No firing of dangerous projectiles

7.13.7.2.Causes no permanent damage or use of unnecessary force.

7.13.7.3.Approved and tested by South African Bureau of Standards.

7.13.7.4.The specifications of the baton are presented in the Annexure.

7.13.8.Shock Belt

7.13.8.1. It is used to prevent escape and to ensure protection of personnel or innocent bystanders from attacks. It is able to deter or immobilize a prisoner / aggressor in the process of restoring order with minimum force.

7.13.8.1.1.Its features are presented below,

7.13.8.1.2.Long range remote control activation, 50-100 meters.

7.13.8.1.3.110-dB Ear-piercing Siren that serves as a warning to attract audible attention.

7.13.8.1.4.High voltage, non-lethal, safe yet effective shock all round the belt from one point to another, in other words the total belt does not have to make contact on one specific place.

7.13.8.1.5.Pre-set adjustable timer for duration of warning siren and shock.

7.13.8.1.6.Cables throughout the belt prevent it from being cut with a knife.

7.13.8.1.7.Wrist and arm restraints as well as handcuff d-ring attachments.

7.13.8.1.8.Velcro plus D-rings ensures belt to be lock tight.

7.13.8.1.9.Fully rechargeable complete with nickel-cadmium rechargeable battery and charger.

7.13.8.1.10.Unlike with firearms or batons, no permanent damage or use of unnecessary force.

7.13.8.1.11.Tested by South African authorities.

7.13.8.1.12.Fully warranted in accordance with the Force manufacturing warranty.

7.13.8.1.13.It is tested and approved by South African Bureau of Standards. The test reports with respect to shock riot shield and shock riot baton are given below in the screen shot form,

Suid-Afrikaanse Buro vir Standaarde
South African Bureau of Standards
Dr Lateganweg 1, Groenkloof/1 Dr Lategan Road, Groenkloof

Privaatsak X191/Private Bag X191
PRETORIA 0001

U verw/Your ref: Receipt no. 62666

Ons verw/Our ref: 17/14/77

Navrae/Enquiries: GFJ Brough

☎ (012) 428-6202

The Managing Director
Force Group of Companies
PO Box 39118
BOOYSENS
2016

TOETSVERSLAG
TEST REPORT

No 775/80040/L07

Bladsy/Page 1 van/of 3

OUTPUT SAFETY TESTS ON ELECTRIFIED FORCE RIOT SHIELD AND FORCE SHOCK BATON

1. DESCRIPTION OF SAMPLE

1.1 Force Riot Shield. The sample, designated L07A and marked Ser. no. # ES 94-06002, consisted of a see-through poly-carbonate plastic riot shield, with two separate metal conductor grids on the front plane, one being the high tension (HT) grid, the other the earth, or 0 V grid. When energized, arcing occurs at a predetermined location, between the two grids, on the aggressor's side of the shield, to deter anybody from touching it. The energizer unit consisted of a black insulated enclosure of length 120 mm, width 70 mm and height 30 mm. It is powered by an 8,4 V, 150 mAh nickel-cadmium rechargeable battery, having the same dimensions and battery clip as the normal 9 V alkaline batteries. Activation of the energizer occurs by switching on the main on/off toggle switch, located on the energizer enclosure, and by pressing and holding the red push button, located on the handle grip. A 2 mm female mono jack plug connector on the enclosure serves as the charger connecting point. A 3 mm red LED indicates charging activities. Overall dimensions of the shield are: height 935 mm and width 615 mm.
Refer to Appendix A, page 2, for a photograph of the sample.

1.2 Shock baton. The sample, designated L07B and marked Ser. no. # B 94-10154, consisted of a black poly-carbonate plastic baton with a built-in energizer, powered by an 8,4 V, 150 mAh nickel-cadmium rechargeable battery, having the same dimensions and battery clip as the normal 9 V alkaline batteries. Activation is achieved by pressing and holding a momentary type rocker switch, located at the top part of the handle. A 2 mm female mono jack-plug connector at the end of the baton serves as the charger connecting point. A 3 mm LED indicates charging activities. At the far end of the baton, two uninsulated pins serve as contact pins for improved energy transfer to the aggressor. Arcing also occurs between the two pins, when energized, serving as deterrent. Furthermore, there are two rows of pin holes drilled along the length of the baton, on opposite sides, electrifying that area to prevent any person from grabbing the baton. Overall dimensions of the shock baton are: length 555 mm and diameter 35 mm.
Refer to Appendix B, page 2, for a photograph of the sample. /2. **METHOD ...**

2. METHOD OF TEST

2.1 At the request of the sponsor the samples were tested to determine if the output characteristics of the units can be classified as safe, using the following specifications, covering non-lethal fence energizers, as guides:

2.1.1 SABS 2220 - 3.1 'Electric Fence Energizers' Clause 10 (Output characteristics);
2.1.2 SABS IEC 1011 'Electric Fence Energizers' Clause 10 (Output characteristics); and
2.1.3 Government Gazette Notice R1593, 12 August 1988, No. 11458, Vol. 278, Gazette 4241; Energizer output for the connection to electric fences.

3. RESULTS

All measurements were taken with a 500 Ω ± 5% non-inductive resistive load, as specified in the above specifications, connected directly to the output of each energizer output, with the shock circuits (grids) disconnected.

Characteristics	Specified in Government Notice No. R1593	Specified in SABS 2220 - 3.1	Specified in SABS IEC 1011	Measurements: Riot shield See Appendix A	Measurements: Shock baton See Appendix B	Results
Separation time between impulses	≥ 0,75 s	≥ 1 s	≥ 1 s	373 ms	379 ms	*
Peak value of voltage, maximum	10 kV	Not specified	10 kV	2,05 kV	1,58 kV	Complies
Maximum duration of impulse	50 ms	100 ms	50 ms	11,7 µs	24,0 µs	Complies
Maximum quantity of electricity per impulse	2,5 mC	Not specified	2,5 mC	21,6 µC	17,6 µC	Complies
Maximum discharged energy per impulse	8,0 J	8,0 J	8,0 J	26,2 mJ	15,1 mJ	Complies
Maximum peak current	Not specified	< C_2 line	10 A	4,1 A	3,16 A	Complies

* See Paragraph 5 - Conclusion.

NOTE: See Appendices A and B. Measurements on the graphs were made between cursor points, as specified in SABS 2220 - 3.1.

4. TEST EQUIPMENT USED

4.1 Equipment: SABS No.:

Fluke 87 multimeter	24996
Computer operated energy measurement system	25150
Tektronix probe & voltage divider	25505

/4.2 Environmental ...

4.2 Environmental conditions:

Altitude: ± 1 400 m above sea level
Ambient temperature: 22 °C ± 2 °C

4.3 Uncertainty of measurement:

The uncertainty of measurement is estimated to be ± 2% for a confidence level of 95%.

5. **CONCLUSION**

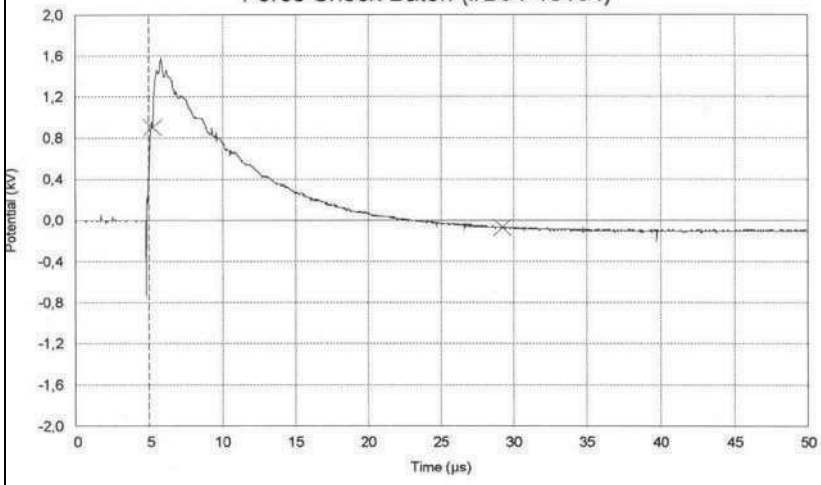
Although the separation time measured between impulses was found to be less than the minimum duration specified, both the riot shield and the shock baton tested are considered safe under normal use, as all the other output values were far below the maximum values as specified in the specifications used as guides - see Paragraph 2.

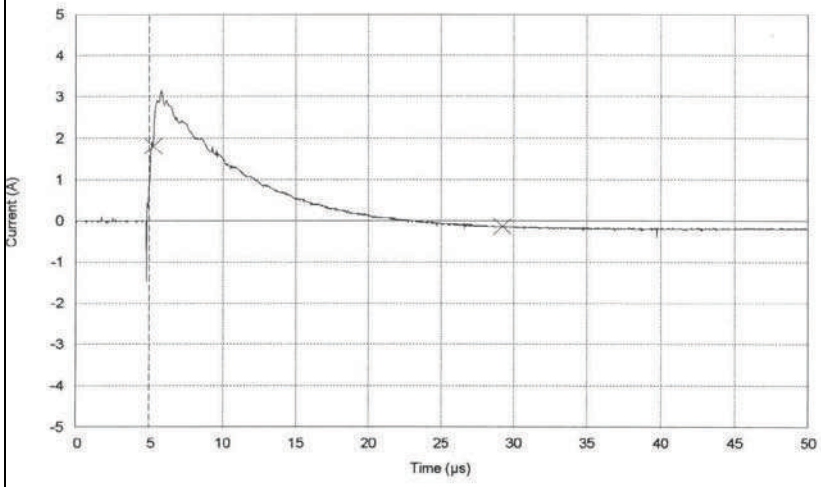
GFJ Brough
TECHNICAL OFFICER

FJ van Jaarsveld
SECTION HEAD
ELECTRICAL SECURITY TECHNOLOGY
for PRESIDENT

APPENDIX B:SABS TEST REPORT No.775/80040/L07 (P1 of 2)

Force Shock Baton (#B94-10154)





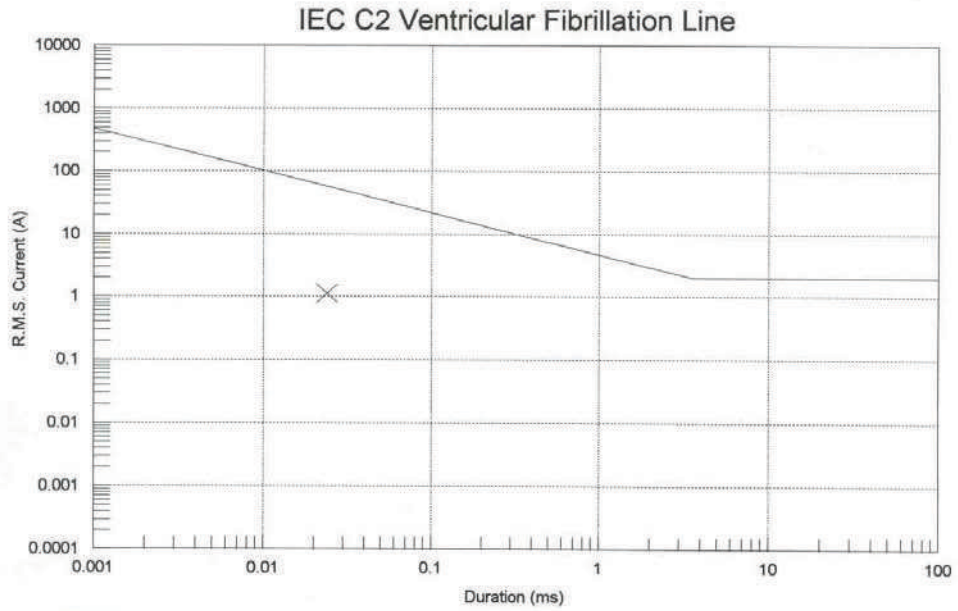
Time acquired: 10:36
Sampling rate: 40 MHz
Load resistance: 500 Ohm
Left cursor: 904 V
Right cursor: -69,5 V
Comment: 775/80040/L07

*Impulse duration: 24,0 µs
Pulse interval: 379 ms
Peak voltage: 1,58 kV
Peak current: 3,16 A
*Pulse energy: 15,1 mJ
*Pulse charge: 17,6 µC
*R.M.S. current: 1,12 A

*Between cursors

S.A. BURO VIR STANDAARDE
S.A. BUREAU OF STANDARDS

APPENDIX B:SABS TEST REPORT No.775/80040/L07 (P2 of 2)



7.14.**Multi Purpose Belt**

7.14.1.It was demonstrated that the pouches for the following are available,

7.14.1.1.Universal Pistol Holster with height adjustment facility.

7.14.1.2.Hand Held Radio Set/Walkie-talkie Pouch with stretchable elastic.

7.14.1.3.Expandable Baton/Dagger Pouch (9cmx5.5cmx5cm).

7.14.1.4.Glove/Spare Pouch (12cmx9cm).

7.14.1.5.Self-locking Handcuff Pouch (11cmx10.5cm-max).

7.14.1.6.Tonfa/Torch Holder (Ring diameter-2.5cm), and

7.14.1.7.Dual Pistol Magazine Pouch (Base-13x13cm).

7.14.1.8.The detailed specifications are presented in the Annexure.

7.15.**Expandable Baton**

7.15.1.They are made in non-hardened (ordinary) version in two lengths with one type of handle or in hardened (police) versions in five different lengths with two types of handles. The baton is opened by sharp flick and stays firmly fixed in this position. The baton serves for fast self-defence in different conflict situations. This product is suitable for the police (hardened version), security agencies, and guards, against an assailant armed with a knife, for walking in the country alone or with a dog.

Part 6: Crowd Behaviour

Crowd development

6. Interactions with the officers in the field and inquiries into the nature of riot incidents faced by them revealed that nature of the agenda determines the nature of the crowd.

7. **Gathering**: Our field findings revealed that the activities of the members of the crowd or agitators depends on factors like their leadership, trigger issues and ideologies, demographic composition of the people gathered, and the persons behind the gathering. In areas like Srinagar, the agenda of the gathering is largely determined by the separatist groups. Based on our field findings, we classify the public agitations into seven categories which are discussed in brief below,

   7.1. *Political*: Officers stated that a large proportion of public agitations are political in nature which range from petty issues like local factional clashes to issues of national level like price rise and foreign investment. We were also informed that political rallies and meetings attract people in large numbers.

   7.2. *Social*: Apart from political gatherings, protests and agitations also happen on societal issues like construction of dams, rehabilitation and corruption. They also stated that civil society organizations drive some of these gatherings.

   7.3. *Disturbed Areas*: In places like Srinagar and Imphal, some of the gatherings are also called by separatists and insurgents. They also stated that the threat level posed by these gathering is high.

   7.4. *Communal*: Communal agitation is another type. The people gathered are violence prone, and target particular religious community.

   7.5. *Community*: There are occasions where members of various communities gather at a particular place/venue to demand more benefits to their community. The recent agitation by Gujjars in Rajasthan manifests this aspect. The gatherings like these are guided and influenced by community level leadership cutting across political party lines.

   7.6. *Religious*: Religious congregations attract large gatherings. These gatherings happen at religious places like temple towns or at places where a religious leader addresses devotees. Such gathering can easily turn into a mob if there is a trigger or incitement that hurts religious beliefs or sentiments.

   7.7. *Labor and Trade Unions*: Labor is another type of agitation across the country. They gather in large numbers in response to the calls by labor leaders. Labor agitations are prone to violence and arson.

Types of crowds

8. The types of crowd that are relevant to this study are considered here.

8.1. *Crowd led by well defined leadership*: This type of crowd is easy to handle probably because the security forces are aware of the persons whom to talk to, and also the leadership exercises control over the crowd. During the Gujjar agitation in Rajasthan it was widely believed that their leader K S Bainsla exercised influence over the crowd, and the latter was responsive to his orders and directions. Similar was the case with protests called by Anna Hazare and other social personalities like Medha Patkar.

8.2. *Crowd Devoid of Leadership*: The crowd devoid of leadership is referred to as a mob. It tends to be directionless and driven by emotions, even though some degree of leadership exists even in such crowds. Such crowds tend to be formed of numerous small groups of people who are known to each other. Such a crowd tends to be unpredictable and prone to rumors and sudden violence. It poses tough challenges for police forces. Communal violence, inter-community violence etc are often categorized under this category. The spontaneous incident of violence by students also falls in this category. The recent violence at Masuri in Ghaziabad in Uttar Pradesh is placed under this category.

8.3. *Crowd Using Women and Children as Shield*: Unique to certain parts of the country, the crowd/mob place the vulnerable sections of the society like women and kids in the front to avoid swift action from the security forces. This type of crowd has been witnessed in the states like Manipur, Assam and West Bengal. It tends to be well organized and indulges in planned acts of violence.

8.4. *Crowd Driven by Insurgents and Separatists*: Another type of crowd/mob witnessed in India is of those driven and guided by insurgents and separatists (or right wing fundamentalist elements). Individuals in the crowd are emotionally exploited though use of various ideologies by the leaders, and misguided. It is the case where the collective energy of the crowd is channelized in the negative direction. Significantly, the 'resolve' of the crowd is well determined and the individuals also exhibit their readiness to face the risk of the use of police force against them. Some of the agitations and gatherings reported in areas like Kashmir and Manipur are classified under this type. This type of crowd tends to indulge in well planned violent activities and protest demonstrations.

Crowd behavior – Key Elements

9. It is believed that on a majority of occasions the people gathered for a public agitation do not intend to indulge in violence. They express their protests peacefully. The crowd turns violent resisting the attempts of the security personnel to detain them or resist their attempts to demonstrate. Further, at times law breaking elements sneak into the crowd and trigger violence. The violence in Mumbai in the second week of August this year during the demonstration called by several Muslim organizations to condemn Assam riots manifests some aspects of this behavior.

Overall, the inter play of social and psychological factors plays a large role in influencing crowd behavior. Some of the unpredictable drivers of violence by crowd are fear and panic, manipulation and emotional response to immediate events in their surroundings. Leadership, societal values, literacy, deprivation, standard of living, ethics etc are considered as the social factors influencing individuals in a crowd. Emotions, frustration, impersonality, anonymity, panic, imitation etc are considered as the psychological factors influencing individuals in a crowd.

Diversion in Focus

10. People congregate at a place demand or oppose certain things. However, the nature of the crowd turns violent when the crowd starts focusing or shifting their anger on the individuals or institutions involved rather than the issues.

Faction

11. Group clashes within the gathering arising from different leaderships also result in violent behavior. Each faction intends to prove their supremacy and dominance over the other as well as to their top leadership. The attack on the office of a local daily in May 2007 at Madurai in Tamil Nadu reflects this trend. The attack was believed to be carried out to prove the dominance of one faction within a major political party in the state over the other. The behavior of crowd is collective expression of emotions, sentiments, resentment, prejudice etc of gathered individuals. Crowd is vulnerable to manipulations. This manipulative nature of the crowd poses significant threat to law and order.

Leadership

12. In addition to social and psychological factors, the physical factor like leadership in the crowd plays a significant factor in channelizing the crowd energy. The protests against corruption in Delhi were channelized by their leader Anna Hazare. There are occasions where the crowd is devoid of proper leadership. The occasions like this are proper platform for miscreants to divert the energy of the crowd into a negative direction. The fleeing of the people belonging to north eastern region of the country from southern cities like Bangalore, Chennai and Hyderabad reflects the influence of negative rumours, and the manifestation of collective energy being channelized into generating fear in a section of the community by local community leaders.

Emotions

13. The role of emotions must not be underestimated in the crowd behavior. Emotions drive people. The emotion, positive or negative, is contagious. Emotions provide psychological unity among the people in the crowd as well as bystanders. This unity, though a temporary aspect, can be dangerous, and it adds collective power to the crowd. Moreover, it is the time when the crowd turns into mob, and unleash their behavior in a negative direction influenced by multiple of factors. Individuals under the anonymity of a mob e find opportunities to release their personal prejudices which were kept restrained under normal circumstances. Individuals in the crowd lose

their respect for authority, law and order, and concern for self discipline and their own safety. Emotionally driven situations pose a serious threat to law and order, as well as many times question the tactics, weapons and equipments used by the security forces to being the mob under control, and disperse the crowd.

Crowd Tactics

14. Crowd in India resorts to varying tactics to deter security personnel. Some of the tactics are universally applied across the country, and a few are unique to particular region.

    14.1. *Stone throwing*: High intensity and sustained stone pelting is widely prevalent in Srinagar and surrounding areas. Most parts of India experience mild stone pelting during public agitations.

    14.2. *Assault/arson on public property*: It is a practice prevalent across the country. This tactic has been used by violent mob cutting across various types of riots - communal riots, community clashes, water disputes, political demonstrations and labor strikes. Common manifestation of this tactics is burning of public transport buses.

    14.3. *Using Women and Children as Shield*: Unique to certain parts of the country, the crowd/mob place the vulnerable sections of the society like women and kids in the front to avoid swift action from the security forces.

    14.4. *Road and rail blockade*: It is another common tactic used by rioters and mob across the country. It is widely resorted during strikes called by political leaders as well as community leaders.

    14.5. *Enforced Bandhs - Closing shops and commercial establishments*: It is another common tactic found across the country.

Part 7: Case Studies and Operational Scenarios

Disclaimer: The scenarios below are solely designed to demonstrate the application of various LLWs/NLWs in the field, their usage and efficacy under various situations as key takeaways. The scenarios assist in better understanding of the operational tactics and various other practical aspects related to field conditions that are otherwise quite obscure to comprehend. Please note that the scenarios have no bearing with any actual-present/past situations, places or people. These scenarios have been developed based on trends and events that have happened in different parts of the country.

1. During our field interactions we have observed different circumstances and situations in varied parts of the country. These myriad situations also portray different patterns of public agitation and the response mechanisms to deal with them. To holistically examine various types of Riot Control Less-Lethal weapons, ammunitions, technologies and protective gears that are required for each situation; their usages and efficacy under different circumstances, we have come up with various scenarios covering different locations of the country. Together, they help to evaluate the overall requirements viz. quantum, type and quality of resources needed to meet those situations.

2. For the purpose of building the scenarios, we have identified the following locations and formulated the respective scenarios around each one of them,

   2.1.Jammu and Kashmir (primarily Srinagar)

   2.2.Manipur

   2.3.Delhi

   2.4.Andhra Pradesh (primarily Hyderabad)

3. These distinct locations present a unique set of principles governing the riot behaviour, nature of crowd gatherings, their motivation and preparation levels, their modus operandi and also the police response mechanisms to control such rioters. Collectively through these scenarios, we have tried to comprehensively cover the various types of riot situations and the NLW technologies, equipments and ammunitions presently in use across the country. Few of the parameters while building up and assessing these scenarios would include the following –

   - Kind of protest
   - Number of rioters
   - Armed/un-armed rioters (type of equipments)
   - Time of day – Day/Night

- Season- Rain/Fogy/Clear/Hot/Cold
- Day – Festivals/Public events/Normal days
- Event based rioting
- Location of riots
- Surrounding and neighboring area details/terrain
- Urban/rural area
- Population – less/more
- Public / Private Infrastructure
- Rioter's profile
- Background/motive of riots
- Historical Data analysis (if available)

Kashmir

Situation Description

4. Kashmir in India is one of the most troubled areas of the country not only because of the cross-border terrorist activities but also due to the internal tensions that exist between the local population and the state machinery. This tension frequently takes the form of protests and demonstrations against the forces. In Kashmir, Law & Order situation is superimposed with terrorism and frequent terrorist activities. More often, the Law & Order situation is separatist/ militant driven with armed militants or anti-state actors hidden behind the violent mobs. Preparing and responding to such crowds is challenging and driven by uncertain repercussions. The J&K Police (and CRPF) face hostile crowds (which include women and children) who indulge not only in skilful stone pelting but also indulges in attempts to provoke the police by abusing, throwing burning kangries, hurting national sentiments etc. during agitations.

5. Rioting in the valley is traditionally known to be of a violent nature involving large gatherings of crowds. The rioters are usually a mix of separatist forces and are politically motivated. They usually are very heavily charged with emotions and use lethal fire at times to counter the police forces. Owing to a high frequency of such incidents, the rioters in this area are well-versed with the standard police response mechanisms. This has led the rioters to formulate a well-prepared counter attack unleashed as an offensive against the police forces. .

6. Rioters in Kashmir mostly constitute of men, predominantly the youths who are almost always at the forefront while there exists a small section of women rioters as well. e. These riots are usually not aggressive in nature when rioters are in smaller numbers but as the numbers expand, the rioters take violent steps against the police and start throwing anything that is available in the vicinity over the police personnel. Taking cue from riots in North East, recent trend observed in Kashmir riots is that women, children and elderly form the forefront of the riot to act as shield against the police offensive. Stone pelting on the police forces is a common feature in this region which results in casualties in the police forces. At times, lethal ammunitions are also smuggled by the rioters at the scene and are used against the police forces. Apart from these arms, rioters carrying with swords, bows, petrol bottles etc. are also a common sight.

7. Riots in the valley happen usually in urban areas, at congested places like bazaars, choke points and other populated areas. Locations which are typically targeted by rioters are government installations, railway lines, arterial town roads, highways, religious places etc.

8. Compared to any other place in the country, police forces are reasonably well prepared to counter any such agitations in the valley. Since the situation is always volatile in this area, the forces are always on the look to avoid any such untoward incidents. Apart from conventional lethal ammunitions, the non-lethal stable of the forces in Kashmir includes equipments and ammunitions like Water-canons, MBLs, Gas Guns, Tear Gas Shells (metal and plastic), Pepper

Grenade, Dye Grenade (long and short range), Pump Action Gun (for projecting rubber pellets – unused for more than 2 years), Lathis etc. Amongst the above mentioned weapons, tear Gas, pepper grenade, dye-grenades and water cannons (not for narrow lanes ex. of Baramulla) are found to be most effective. CRPF in the valley are also equipped with TASERs but their usage is not found to be effective against a larger crowds.

9. The police forces are also well equipped with protective gears that include helmets, body armour, protective screens and protective pads. Despite the availability of such equipments, there remains a serious concern about the applicability and the quality of these equipments. The scenario depicted in the photos presents a situation where-in an attempt is made to reflect on the impact of the usage of a combination of the above available weaponry.

Scenario

10. The current situation that we have been facing is due to a reported vehicle run-down incident resulting in skirmishes between different ethnic groups within Srinagar. The incident got fuelled when police while trying to take control of situation intervened which led to opposition and resulted in protests.

Observations

11. Reportedly within an hour there was already a decent crowd size of 500 odd people that had gathered at Badshah Chowk to stage protests against the police actions and this mob size continuously increased at a fast pace with people (separatists, men, women, children etc.) gathering from at least 3-4 by-lanes leading to the Chowk. There was also a sizable population of on-lookers (primarily shopkeepers, commuters etc.) within the by-lanes who seemingly were non-rioters but were hard to distinguish from the rioters. Police personnel tried to put barricades at the by-lane junctions to stop the rioters from entering the Badshah Chowk but it had little effect owing to the large number of rioters. These barricades also didn't serve the purpose of scattering the rioters in different directions as there was no time & plan to

strategically place the barricades. All this while, police continuously made public announcements to the rioters through their hand held speakerphones (bullhorns) to stop their march but it had little effect on the resolve of the rioters.. A few police personnel who tried to engage the rioters in a dialogue were also threatened and had to pull back. A group of rioters started voicing their demand for the removal of AFSPA. The demand of this protest was quickly picked up by other groups within the assembled mob and in turn they started rallying for the removal of AFSPA.

12. The rioters were increasingly growing violent as their numbers multiplied.. Police personnel tried to subjugate them using the tear gas shells, smoke and stun shells to create fear and panic amongst the rioters. This measure also had marginal effect due to the lack of number of ammunitions available to contain such a huge crowd and also the incapability of police to deploy the available ammunitions within a short time. The wind direction and the open terrain also didn't support the usage of these shells. Increasingly the crowd grew stronger and aggressive and started using stone pelting measures and petrol-bombs against the police forces. The police was prepared with protective gears and shields which served as a defense against high velocity stones and petrol bombs. It was reported that couple of handheld protective shields incurred damages at the weak points of riveted bolt junctions due to stone pelting. A number of policemen were severely injured due to stone pelting and had to be evacuated from the riot scene immediately. At this stage, the forces started using water canon to disperse the rioters from the action scene which led the crowds to go into hiding in the narrow lanes to avoid the force of water cannon. Subsequently, the police tried to barricade again the by-lane junctions at which stage the crowd suddenly started using petrol bombs on them thereby disrupting this critical operation. Water cannons quickly ran out of water (with no backup supply) and could not be maneuvered in the narrower lanes. The crowds therefore emerged back into the chowk area.

13. By this time, the crowd size had grown to a number of 2000 and its proximity was only a few 10s of meters forcing the police to use a combination of Tear Smoke Grenades, Stun Grenades and also fired plastic bullets from the conventional SLR weaponry. It was observed that the forces were hesitant with the usage of plastic bullets as they feared that this ammunition can lead to fatal injuries within this distance. Although these equipments which are traditionally found to be quite effective against a small mob were not able to contain the large mob. As reported by police personnel on ground, a section of rioters who got directly exposed to these NLWs did get deterred but the crowd was largely unaffected. Another problem that got reported was the difficulty to identify key miscreants among the huge crowd. Senior police officially said that even if they had identified the chieftans, it would have been

very difficult to selectively neutralize them. They were also not sure if even that would have had an effect on the berserk rioters.

14. Despite the usage of close range NLWs, the rioters further surrounded the police forces and threatened to attack them. At this junction, a lathi charge order was issued with around 120 policemen in 4 groups of about 36 each, started lathi charging on the rioters. Lathi charge had immediate effect on crowd dispersal and the rioters started to flee in all directions. A few rioters were able to overpower the police forces and use their lathis as well but were eventually subdued by the police muscle.

15. The mob dispersed due to lathi charge but regrouped within 20-30 minutes, this time led by youths with burning torches, fuel canisters and heavy stone throwing. 2 such mob groups attacked the police personnel from different directions. Due to this, the police formation was broken and they had to disperse resulting in the loss of control over the situation. The mob seemed to be going berserk putting fire to shops in that area, vehicles and attacking individual policemen. At this stage, the DSP ordered firing of live ammunition to gain control over the situation. About 20 rounds were fired, 6 people were found lying on the ground d out of which 2 died on the way to the hospital. This action immediately brought the rioters at a halt and they dispersed back into the by-lanes. Additional reinforcements were moved in to take control of the situation. Post this, the forces properly barricaded the area and issued a curfew in the area until further notice. This was being aptly communicated through public announcements (bullhorns).

16. The incident again highlighted the volatile law and order situation in the troubled territory. There was also a heavy coverage of the entire incident through the media personnel and activists from various fronts. The safety and security of media personnel etc. was another concern for the police since after repeated requests the media didn't refrain from exposing themselves to danger so as to cover the ground realities.

Key Findings

17. The usage of tear gas ammunition is found to be ineffective for multiple reasons. Most notably, the police forces are not able to take charge of the area with the ammunition to create a significant impact on the ground to deter people. Rioters also have devised ways to counter the tear gas shells by throwing water cloths on the shells and also by wearing improvised gas masks.

18. It was realized in the post incident de-briefs that many of the gas guns used during the operations malfunctioned after firing 4-5 tear gas shells. This was as a result of accumulation of carbon and non-functional firing pin due to deposition of carbon at the base of the barrel and also due to malfunctioning firing pin assembly.

19. There was a glaring lack of the required number of barricades to cordon the areas to prevent mob aggression. .

20. Police personnel were hesitant to use plastic bullets as the bullets could cause fatal injuries.

21. Protective gears worn by the policemen were found to be inadequate. A number of the policemen did not possess protective body gear. The safety shields and lathis were also broken during the

agitation. The unclear visibility of the screen on the helmets was also cited as an issue by several policemen.

22. The water cannons were effectively used till the time there was continued supply of water. . It was observed that the impact of the water cannons were rather short-lived. The operational efficiency of the water cannons are also questionable in narrow by-lanes and it is also difficult maneuver the big Varun vehicle through the congested areas. .

23. After the crowd dispersed due to lathi charge, the force lacked the means to prevent them from regrouping in the chowk. Prevention of regrouping of the mob could have been checked if the force had the ability to use tear gas smoke and chilli irritants in the chowk area along with use of rubber pellets or plastic bullets (modified to lower charge configuration to ensure that they are non-lethal).

24. Police handheld bullhorns were found to be ineffective to communicate the message to a large section of the mob. Better quality bullhorns are required to address this issue.

25. Lack of female police force in adequate numbers has greatly hampered the ability to withhold highly aggressive women protestors.

26. Review of the mobile phone intercepts by the telecom/intelligence detachment of the IB revealed that regrouping of the mob after the lathi charge was a well organised activity where certain local pro-militant community leaders were involved. Use of short range mobile phone jammers could have severely impacted the ability of rioters to reorganise.

Manipur

Situation Description

27. Manipur has been a focus of study as this state has accounted for several riots through the years. Manipuris are traditionally known to be defenders of their land and they associate themselves strongly with their land. Being a matriarchal society, the protests are mostly led by women and the protests are usually directed against the state police forces and the CRPF and at times non-Manipuri belligerent forces. . Scenes of extreme violence like roadblocks, killings, arson of public property etc. are a common sight in this region.

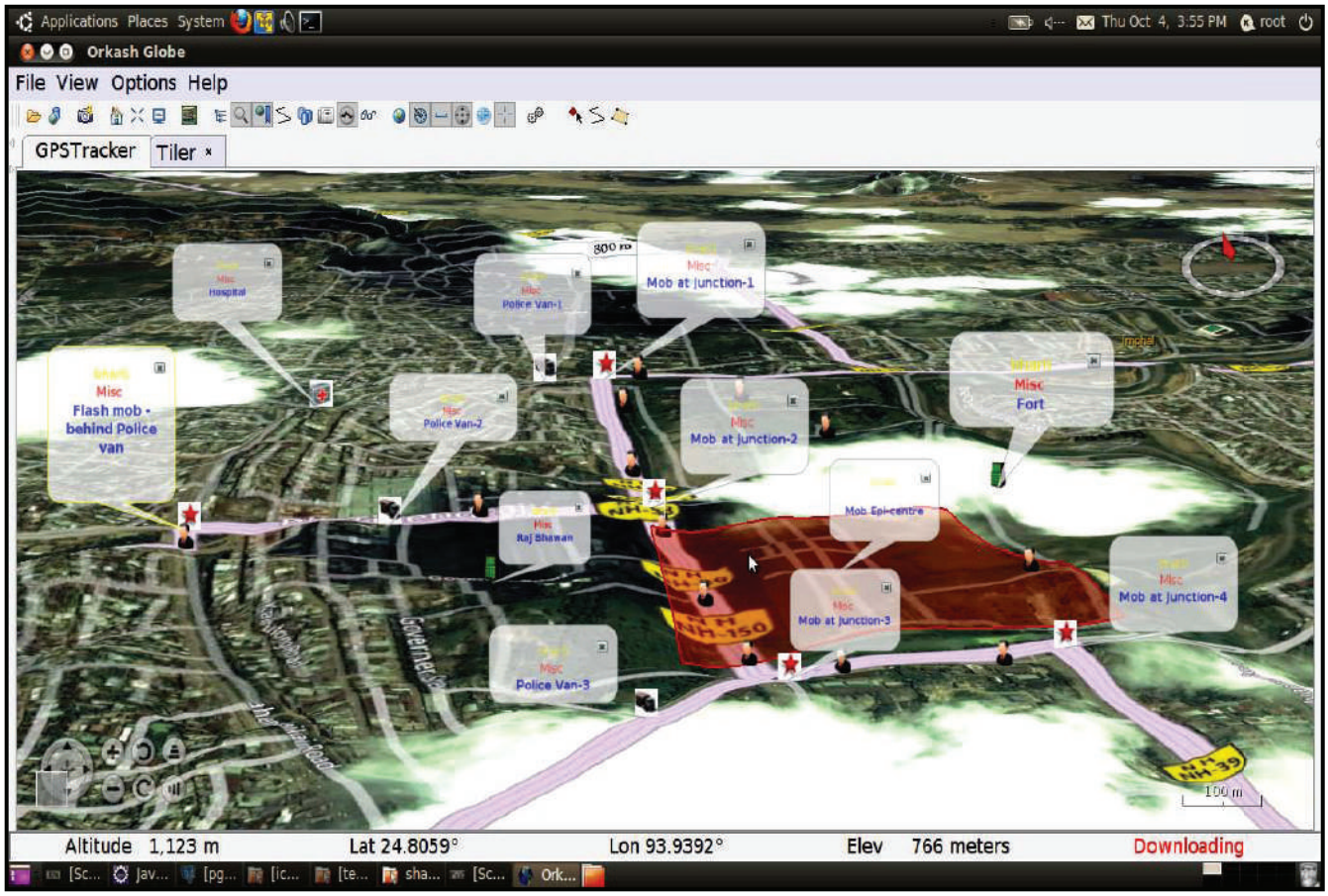
28. Crowd gatherings in Manipur are quite large and determined in nature.. The mobs in Manipur are significantly coordinated in their actions and consolidated in the motif behind the demonstration Distinctive feature of the Manipuri mobs are the participation of women force in the protests. Women usually form the frontline of these protests and at times attempt to blackmail the security forces by tearing of the clothes. . At times, the small mobs here can be armed as well while attacking police personnel with weapons smuggled from China/Myanmar. The rioting in this region usually occurs during daytime.

29. The violent and expansive nature of mob in Manipur leads the police forces to resort to stricter measures. . The forces use firearms against the mob agitations though the regular usage of tear gas, rubber bullets, water cannon and lathis.. Single shot (non-automatic) anti-riot guns are also used although it is as found to be ineffective to manage the crowds. The rioters in Manipur are acquainted with the use of tear smoke and are able to combat against its usage. .

30. The forces here are also well equipped with protective gears that include helmets, body armor, protective screens and protective pads. Despite the availability of such equipments, there is a serious concern about the applicability and the quality of these equipments.

Scenario

31. This scenario tries to capture the mob dynamics in Manipur. On Monday morning, it was observed that a large crowd was gathering around the Raj Bhavan and around the Kangla Fort area of central Imphal. This was reportedly a planned march against police atrocities and arrest of 4 minor girls on alleged charges of links with separatist rebels over the weekend. Largely the crowd consisted of women marchers supported by youth men. By 10 am, almost 2000 people had occupied the Kangla Fort and around 500 people were shouting slogans in front of Raj Bhavan. There were also small pockets of around 100-150 protestors blocking the traffic of 3 to 4 major junctions leading to Raj Bhavan. The local traffic police reported that the situation was fast aggravating as an increasing number of protesters were marching towards the epi-centre to voice their protests.



Observations

32. As reports of this situation reached the police control room, it was apparent that the protest was conducted in a well organized manner with protests and blockades at multiple entry points to magnify the intensity of the protests.

33. The police HQ deployed 3 detachments of 2 platoons each (comprising around 60 men in each attachment) along with 3-4 water cannons - Varun vehicles) to counter the agitation but the police vans had to be stopped at a distance from the Raj Bhavan. The blockages created at the major junctions didn't allow the vans to move further. It was also reported that the women protestors laid on the ground to stop any approaching vehicles.

34. At one junction, the forces tried to speak to the protestors but could not convince them to let the police van pass. This led the police to issue warnings to the protestors to uplift the blockades. . Post this, the police tried to disperse the crowd through the usage of tear gas. This had little effect as the protestors were well prepared to counter the usage of tear gas shells by wearing improvised protective masks to negate the effects of the tear gas. . They also smartly avoided close contact with the tear shells and threw water bottles at the shells to further subdue their effect. After almost 45 minutes of confrontation, the police unit eventually resorted to using water canon to disperse the crowd and make way for the police van to pass.

35. At another junction, the police immediately resorted to lathi charge which led to retaliation from the protestors. The protestors started using petrol bombs against the police personnel which also injured 2 force personnel. In response, the police used tear gas hand grenades to thwart the miscreants. At this junction, the forces had to face an unexpected situation when another group of rioters started stone pelting over them from behind. These rioters had suddenly arrived on the scene through the narrow by-lanes and encircled the police team. Unable to guard themselves because of the agitators the police had to break their formation. Since there were clear orders prohibiting the use using lethal force to suppress the rioters, many of the policemen had no option but to take shelter inside the police vans which had protection in the form of wire mesh and steel plating's.

36. At a third junction, the police team tried to disperse the mob using tear gas and stun shells but had not much effect as the rioters used re-enforcements from the mob epicentre. This forced the police forces to close in and come within 30-40 metres of the rioters to use some plastic bullets (through SLR rifle) and Water Canon etc. After the heavy confrontation the police went dry with the water cannon and rubber bullets also didn't deter the determined crowd. Police then resorted to lathi charge against an approximate crowd of

300 people. At this junction, a group of women rioters came to the forefront and tore off their clothes both to show their angst against police as well as to thwart any further movement of the forces. This action further stalled police movement.

37. At the epicenter, there were around 3000-4000 protestors and were continuously shouting slogans against the state. They also resorted to damaging public property, setting fire to 3-4 vehicles and also threatened to burn down the Raj Bhavan if their demands were not met. It was reported that a few protestors had smuggled firearms as well to the epicenter of the riot. The police teams that were able to close in to the epicenter of the protest witnessed incidents of arson and mild stone pelting. The police used tear gas, hand grenades and stun grenades on the crowd but this didn't dampen the morale of the rioters. Instead they further closed into the police personnel when police resorted to lathi charge as a defensive measure. Subsequently, the police forces were issued the order for the usage of lethal firearms to take control of the situation.

38. The overall situation was adequately covered by the media and various human rights campaigners who expressed their observations. Some revealed that there were at least 5 cases of civilian and human rights violations committed by the forces deployed during the protest.

Key Findings

39. The platoons which were deployed were bereft of synchronized communication with one another and hence were unaware of what was happening at different incident sites.

40. Even women police failed prevent women protestors resolve to resort to nudity. The use of chilli based skin irritants (high ratings-upwards of 20) would have been effective to bring in control such a situation. Use of dye-markers could have helped in subsequent arrests.

41. Malodorants could also have been an effective means of crowd control in such a situation since a large number of rioters had gathered in smaller areas.

42. Mini-UAVs could be extremely useful to the police forces in similar protest scenes to effectively plan and carry out a coordinated operation. Such UAVs help generate situational awareness and give real time inputs to the police control room. .

43. GPS tracking of police vans would enable control room/HQ to track the movement of police force and its redeployment.

44. Inadequate number of gas masks was also cited as a concern during the police debriefs. Also, usage of modern day weaponry like handheld MBLs/MSGLs could have been useful to prevent the rioters with kinetic ammunitions and gas shells. .

45. Inadequate training of the forces has also been cited as a major reason for the ineffectiveness of the non-lethal weaponry on the ground. The police personnel were uncomfortable with the usage of the available weaponry.

46. Also a serious concern area was the unavailability of adequate amounts of ammunitions and quality equipments. It seems that the police forces were carrying inadequate weaponry required to contain such huge crowds.

Delhi

Situation Description

47. Protests and demonstrations in the capital city of the country usually have strong political dictate, hence the crowds that gather for such kinds of agitations and protests are typically politically motivated with defined objectives (which are often targeted towards media coverage). The crowd gatherings are usually huge and can easily build up to 50,000 within a short time period. Since the crowd gatherings have a common and well defined agenda they also tend to be very methodical in their planning approach to rally against the police forces. . Despite the huge number of protesters, the mobs in Delhi are generally not aggressive in nature seldom involve usage of any kind of arms or ammunitions. .

48. Riots in Delhi also do not witness stone pelting, a common feature in other parts of the country. The crowds usually carry hoardings and shout slogans to display their protests. Typically, riots in the capital are event driven and involve people of various age groups and sects depending on the cause of the protest. . For example – recent protests led by Anna Hazare under his 'anti-corruption' wave brought in people of all age groups (mostly youth) and various ethnicities. Although, it was a peaceful protest the situation in the capital was acutely tense due to the crowd size.

49. The police in Delhi are reasonably well prepared to counter riots and such large crowd gatherings.

50. A unique aspect of the rioting in Delhi was that it was extensively covered by all forms of media and it built a country wide public opinion about the cause of the protests. Another key aspect of the Delhi riots was the obvious political sensitivities attached to them.

Scenario

51. Instigated by the recent arrest cases and unethical jailing incidents of the citizens across the country under the dubious amendment in the clause of 66A of the IT Act, a group of several leading NGOs supported by the lawyer community announced on Friday morning to stage a protest at the Jantar Mantar. A multi-media announcement campaign was made to release this information to the masses which stated the venue of assembly and the subsequent march towards the Parliament with timing details. The people were requested to protest in a peaceful manner and it was decided to stage a sensitization session at 11:00 hrs by the intelligentsia class to assess the merits and impact of the defamed section of the IT Act. It was realized that the entire march was heavily supported and led by the leading opposition parties at the centre.

52. Police had to make arrangements to control the public gathering at the Jantar Mantar and the march towards the Parliament. All the critical junctions were barricaded overnight to ensure the law and order situation.

53. Anticipating a huge crowd gathering from all parts of the national capital and also neighboring regions Delhi police had requested for reinforcements from the RAF battalions and around 4 RAF companies were deployed at the critical junctions.

Observations

54. There were large groups of gatherings observed early morning to march towards the Jantar Mantar. The groups carried with themselves boards and hoardings showing their resolute against the harsh clause. Some groups were also carrying effigies of key politicians and policy makers in general.

55. The wide roads leading to Jantar Mantar enabled easy access for a major section of the crowd but it was increasingly difficult to accommodate and contain the huge crowd at the venue. By around 09:00 hrs a gathering of 10,000 people at Jantar Mantar. .

56. People continued to gather at the venue in large numbers and the place was congested with 20,000 people. . The police barricades couldn't prevent the public gathering and were overpowered by the crowd. However, there was no major unrest as the crowd was passive in nature.

57. The situation became increasingly tensed as people approached the venue to be a part of the 11:00 hrs sensitization sessions. Around this time, the roads leading to Jantar Mantar faced heavy traffic due to overcapacity..

58. The sensitization session got delayed to 11:30 hrs and by this time the crowd accounted for 35,000 protesters. .

59. The session lasted an hour and the crowd size expanded to a number of 40,000 people opposing the draconian clause and demanding its withdrawal from the IT Act since it was against the fundamental laws of the country. .

60. This was immediately followed by a march towards the parliament by the crowd to show their solidarity on the issue and demand immediate withdrawal of section 66A from the IT Act. The march was led by leaders of various NGOs, leading lawyers of the country. Though, the protest was non-violent but the aggregation 50,000 protestors intensified the ground situation.

61. There were small clashes between police and the marching crowd since the crowd had overthrown the barricades posed at certain sections due to contain overcapacities. Although, this was controlled and the police held their ground to ensure that the planned route is followed throughout the march.

62. At the parliamentary gates, police had placed 2 fully equipped riot control platoons to counter any unforeseen circumstances. The huge crowds that had approached to show their protest against the section under IT act were growing increasingly violent probably due to instigating comments by the mob leaders. They started to vociferously press their demands and a certain aggressive youth section threatened to destroy parliamentary property and approached to attack the main entry gate. The police had to use the 2 water canon Varun vehicles to temporarily stop those aggressive groups of rioters.

63. This didn't have much effect as the mob leaders further fuelled the aggression amidst the rioters and police was finding it increasingly difficult to identify the mob leaders and incapacitate them individually. Although, the police was well prepared to hold the ground on their own and stop the

protestors from moving further. However, they found themselves seriously ill equipped to disperse the crowd.

64. After almost 2 hours of this tussle (stalemate situation) the rioters finally started to disperse in large numbers giving the police enough opportunity to negotiate with the remaining rioters to convince them to leave the riot scene. This was around 17:30 hours and most of the rioters were too tired to continue and further press for their demand aggressively. However, the overall objective of the march and protest was achieved as the incident had huge live media coverage which drew instant responses from all sections of society administration across the country forcing the political parties to call for a debate session with eminent lawyer and citizen community to try and find a resolution to the situation.

Key Takeaways

65. The estimated turnout of the crowd was much more than what the police administration had prepared for. This caught the police off-guard in terms of their preparation to control such large crowds.

66. Although the police was able to hold their ground but couldn't achieve the objective to disperse the crowd when it was required.

67. The police also found themselves to be ill equipped to accurately identify and target the individual mob leaders. This was a predominant reason why police couldn't disperse the aggressive crowds and bring down aggression levels.

68. Another area of concern cited by the police personnel in post incident review meetings was the casualties they suffered due to close contact with the rioters while they tried to destroy parliament property. Usage of electric shock and batons to tackle such situations could have had instant reaction and would have substantially enhanced the control over the situation.

69. Requirement of long range bullhorns was also reported by the platoon commanders as it would have helped them to communicate their warnings and also negotiation points to the rioters at larger distances.

70. Police also reported that mobile jammers could have helped them to stall communications amongst rioters who were reportedly using mobile phones mass sms messages feature to communicate their movements and plan of action.

Andhra Pradesh

Situation Description

71. Hyderabad, the capital city of Andhra Pradesh has witnessed several incidents of protests and violence since 1960s. These protests have been a part of the Telangana movement, demanding a separate State. Early months of 2011 saw a series of events after the Srikrishna committee (constituted to look into this issue) came out with its report and suggested various alternatives.

72. Protests and demonstrations in Andhra are typically pre-planned and are informed to the authorities well in advance by the protestors. Protesting mobs constitute of activists of various political parties, student communities, government employees, lawyers, teachers, journalists, doctors, writes and cultural artists etc. The primary objective behind these protests is the demand of a separate Telangana state and the protests take place in the by activities like boycotting of work, withdrawing the payment of taxes, blocking highways and roads and other measures.

73. The agitation is characterized by rallies, hunger strikes and protests by students, unions, organizations and individuals leading to the shutdown of the region. Buses are burnt down and police tents are set ablaze. The refusal of the police to allow organization of rallies leads to further protests and students indulge in stone pelting, forcing the security personnel to deploy tear gas shells to disperse them.

74. Petrol bombs are also used by the students to target police personnel. Iron rods and ropes from the barricades are used by the agitators to uproot the statues representing Telugu culture. Protestors here do not even spare the media persons, cameras, vans and attack them. Incidents of arson of public property are common in this region.

75. Police here is reasonably well prepared to counter the mob both in terms of planning and responding to situations. A differentiating characteristic of the protests here is that there are relatively fewer lethal injuries inflicted by the police and the rioting group. The police would allow protestors to conduct peaceful demonstrations and stage their protest (the demand of a separate Telangana state) as also the rioters would not inflict lethal injuries to the policemen. Usually the police would resort to usage of lethal force only in extreme crises.

Scenario

76. In this situation, the city administration and police were informed over the week about the upcoming gathering of regional groups on Saturday around Osmania University. These demonstrations as stated were to press forth the demand for the separate Telangana statehood and also the government's apathy and associated delays in decision making. The agenda was clearly highlighted to stage protests to springboard the issue again on a national scale through the day long demonstration.

77. Anticipating huge number of crowd on Saturday, large units of policemen were deployed at critical junctions to ensure law and order and also to take care of any incidents that could escalate the demonstrations.

Observations

78. The police had barricaded a number of key junctions around the roads leading to the main demonstration area. This was ensured to allow the demonstrators passage through designated routes to avoid stampede situations and gain control over the situation. This ensured the mob containment within the anticipated demonstration area.

79. Police reported that demonstrators started gathering around the main area as early as 6 am in the morning. The numbers grew increasingly larger within a short period of time and by 8 am the demonstrators found it difficult to reach to the main area.

80. This resulted in increased pressure situations within few sections of the demonstrators who were not able to reach the main area by 10 am. This was both due to an already high number of people who had crowded the main area and also due to the barricades placed by the police which prevented easy direct entry. . Around this hour, the demonstrator broke at certain places which led to over throwing the police barricades to reach to the main area.

81. The police issued continuous warnings to these demonstrators not to breach the barricades threatening the rioters with police action. . This had little effect on the demonstrators as they eventually broke through the barricades and started to march towards the main area through prohibited routes. At this junction, anticipating that the situation is getting out of control the police had no option but to use tear gas shells against such agitators.

82. The tear gas and stun shells had a momentary impact but could not create the desired effect to stop the agitators as it was very difficult to contain the crowd with gas guns to have a substantial impact on the crowd.

83. At another junction, the police were able to disperse the crowd through preliminary lathi charge. At this junction, the mob actually started to assemble at a nearby railway track and started heavy stone pelting on the police force. The police used tear gas smoke shells and stun shells in retaliation. This didn't have any effect due to a critical reason. There was a high wall that separated the agitators and the police so the police essentially fired the shells based on guesswork and had little accuracy. The forces eventually had to pull back due to heavy stone pelting and no proper protective gear with police personnel to defend themselves

84. At around 2 pm at another junction, the police forces had to face the incoming crowds from multiple directions while they were guarding entry to a particular lane. The agitated crowd got involved into a tussle with the force here and the forces had to open the water cannons. The police was able to control the situation here as the crowd didn't dare come close to the guard point again. This did not stop the crowd to continue to agitate, and thus they resorted to burning of buses and other public property in front of the police to vent off their frustration and show their protest. This incident was aptly covered by the local media personnel who also in turn were not spared by the agitators who attacked the media vehicles as well.

85. At around 4 pm, at the main area where there was a huge gathering of around 10-12 k people, they also got to know about the agitation at nearby places and started arson activities putting fire to a few vehicles typically to gain media attention. They shouted slogans for the demand of a separate Telangana state and threatened to stall all civil operations bringing down public administration in the region if their demands are not met. It was quite evident that the crowd which primarily consisted of young students had a certain mix of adults within them. Police also reported to seeing the flags of the banned CPI-M party being used inside the mob reflecting that the extremist elements had a prominent effect in influencing the demonstrations.

86. The police stood their ground against the heavy protests which eventually subsided by around 6 pm in the evening. The roads were eventually cleared of burnt vehicles, effigies and posters etc. for free commute before opening them for public at large. There were hardly any measurable serious injuries reported from either side and a few injured were transferred to a nearby hospital.

Key Findings

87. The barricades that were put in place were definitely not adequate to stop the kind of crowds that the police personnel faced. It was a combination of incorrect estimation of the situation as also the non-availability of enough barricades (type, quality and quantity).

88. The police only had gas guns with tear-gas and stun shells/grenades to counter the agitators at a longer distance and these ammunitions were not found to be effective. A prime reason was that police seldom was able to saturate the environment with these ammunitions to create a substantial deterrence for the rioters. Usage of handheld MSGLs could have substantially resolved this issue. Also the issue was reported of misfiring of the gas guns that were used in the operations.

89. The policemen were lacking the right equipment to counter the mobs when they were close within a distance of around 30-60 meters. Some of policemen resorted to throwing back the stones that the crowds were pelting. A proven non-lethal kinetic technology such as the use of AEP baton rounds could have acted as a greater counter measure to address this issue. The existing kinetic energy weaponry with the police comprising of rubber bullets, plastic pellets and the plastic bullets have been found to cause lethal damages. Hence, there is an acute requirement to supplement the existing equipments with better kinetic technology based weapons.

90. The police personnel didn't have requisite protective gear against incidents of heavy stone pelting. Also, the existing protective gears were found to be of poor quality as several protective shields were found broken (cracked at the metal rivet joints). Helmets used were also found to be overweight and badly fitting (and without neck and ear protection). Standardization of these

protective gears is a key requirement. Another requirement is centralized procurement of such gears.

91. Police could not attempt to negotiate or reason with the rioters. The loudspeakers/bull-horns with them were only partly effective.

92. Training of police personnel regarding the usage of all available weaponry comes across as a serious concern especially when faced with such frequent encounters with the public.

Part 8: Tactics, Concept of Operations and Standard Operating Procedures

1. **Overarching Principal:** The **'use of less lethal force option'** should minimize the risk to any person of serious injury and lethality at all ranges while at the same time resulting in dispersal of the rioters and rapid degrading of the violence causing capabilities. The option should at least temporarily neutralize the threat, rendering a subject incapable of carrying out an immediate threat of violence. The duration of such incapacitation must be sufficient to permit police personnel to safely approach a subject and restrain them if needed.

2. It is obvious that few, if any, options will meet the above requirements in all situations. They will, nevertheless, enable the production of a matrix to derive the 'best fit' available, probably involving a combination of options. An important consideration for the use of 'use of less lethal force option' and the tactical measures adopted is that these must meet the important considerations arising from Legal and Human Rights Implications - Would the adoption of the option violate legal authority or require specific legal authority (e.g. orders by a magistrate)? What are the tactical considerations in the light of Human Rights (e.g. proportionality, minimum force, etc)?

2.1.1. In this section, we have captured in detail the Concept of Operations and the Standard Operating Procedures that determine the kind of less lethal weapons and associated protective gear as well as supporting gadgetry that is required by the police for effective handling of riot situations. While formulating the concept of operations we have drawn inferences from various sources viz. –

a) our understanding of riot situations in India through field visits across the country
b) interviews with leading Subject Matter Experts (SMEs) from around the globe
c) literature review – through several white paper researches and relevant documents gathered from pioneering institutes in this field
d) Findings from the 'Srikrishna Committee Report' and the 'Justice P. Jaganmohan Reddy Commission Report'

2.1.2. Apart from the above sources, we have also developed insights and inferences by taking into consideration a multitude of factors that form the basis of formulating effective tactical response and approach. Broadly classifying them, the key factors are:

2.1.2.1. Mob Analysis

a) Size, demographic composition, behavior
b) Abilities
c) Ideology, if any
d) Tactics
e) Preparedness levels
f) Prior knowledge and experience (rioting and police tactics related) etc.

2.1.2.2. Force Dynamics

a) Equipments & body gear availability
b) Standard Operating Procedures
c) Planning and preparedness
d) Tactics
e) Response mechanisms
f) Training levels
g) Intelligence inputs and surveillance capabilities
h) Communication capabilities.

2.1.2.3. Geographical considerations

a) Terrain: open accessible terrains vs. enclosed or dense built up urban areas
b) Surroundings - wind direction, wind velocity humidity, temperature.
c) Other factors like season, time of the day.

2.1.3. The Guiding Principles for the Tactical Operations

2.1.3.1. Based on the inputs from various sources and the consideration of the above outlined factors, we have identified 4 overarching guidelines for the formulation of the tactical concept of operations. These guidelines are based on our in-depth understanding of the issue and takes into account the various scenarios across the country, available riot control equipments with the forces, tactics and the identified gaps for effectively dealing with riot control situations –

2.1.3.2. Principle 1: Distance of rioters from Police

2.1.3.2.1. The most critical consideration while developing the concept of operations is the distance that the police is able to maintain vis a vis the rioters while still being able to effectively control a violent crowd in an non –lethal way.

2.1.3.2.2. We have observed that the forces have found it difficult to engage and control large and aggressive crowds at a distance and hold them there effectively. This results in the mob coming in close to the police personnel endangering the forces or the assets being protected. A large and aggressive crowd should be best dealt at a distance greater than 50 meters or so. This essentially draws from the fact that violent behavior of the crowd becomes a threat to police when they are closer than 50 meters. These rioters can then throw stones, fire-bombs, kangries (and also the handheld tear gas grenades used by police back) on the police forces. Under such circumstances, an under-armed, under-protected police unit loses its strategic formation to deal with such a crowd and has no option but to lathi charge or resort to lethal force.

2.1.3.3. Principle 2: Ability to saturate the environment for adequate effect on the crowd (quantity and time)

2.1.3.3.1. A quintessential factor that goes into determining the effectiveness of a tear-gas based ammunition (RCAs) is the ability of the forces to saturate the environment with enough quantity of these RCAs within a reasonable time-frame that then quickly incapacitate a large section of the rioters to serve as a substantial deterrence.

2.1.3.3.2. The equipments that are being used currently are found to be gravely inadequate to create such saturated environments in a quick time when faced with large aggressive crowd. This acts as a serious impediment in crowd control situation.

2.1.3.4. Principle 3: Combination of equipment/technologies for optimum results:

2.1.3.4.1. Kinetic based technologies in combination with RCAs are found to be the most effective and efficient means of crowd control. Depending upon the commercial, historic and geographic constraints varied technology type can be deployed by the forces but a right balance of these two technologies equips the police to manage the crowds irrespective of distance, terrains, and climate and mob dynamics.. Usage of RCAs is the only and most effective way of controlling violent crowds at greater distances. Kinetic energy based equipments gain prominence as the rioters come closer to the police since the RCAs have usage constraints in such situations.

2.1.3.5. Principle 4: Adequate Protective Equipment for the Police Personal

2.1.3.5.1. The ability of police personal to face a violent crowd and take effective action is directly proportional to their continued well-being in the face of the threat and their motivation levels. High quality protective equipment in the form of helmets, riot shields, protective body suits, eye protection goggles, boots, (and gas marks and bullet-proof jackets in certain situations) are therefore essential requirements.

3. Based on the understanding of the above mentioned parameters and the key insights from various sources we have attempted to derive a clear approach to select less-lethal equipments and technologies to address the riot situations in the country. We articulate through our analysis all the force/weapons/equipment requirements in much detail and also develop a strong and clear rationale for the selection of particular technologies/equipments.

Mob Analysis

4. The mob analysis has been captured in much greater details in the previous sections. Typically we have observed that India witnesses huge crowd turnouts for communal issues, political issues or other socio-economic issues. A large section of the crowd in the country typically constitutes of aggressive youth who press their demands vociferously and even resort to lethal actions against the police if required. At times women and elderly also have formed parts of the crowd. A recent

phenomenon is that women and children have increasingly started to take the front lines of the mobs to deter the action by the police forces.

5. The rioters in major parts of the country are still fearful of basic tear gas and stun ammunitions since their exposure to such gadgetry is fairly low. This however can't be said of the rioters in J&K and Manipur where the crowds are not fearful of these ammunition and come reasonably well prepared to counter these police measures.

Mapping Technologies/Equipment to Desired Crowd Control Effect

6. To understand the police dynamics to determine the kind of technologies/equipments to be deployed, we first shed light on the various less-lethal technologies available across the globe to-date. Another key aspect to understand here is the desired impact that is planned to be achieved using these less-lethal technologies.

7. The table below encapsulates the various kinds of less-lethal technologies (and types) and the associated impact of each of them across various desirable outputs (Operational Parameters/Efficacy) during a riot control situation.

Non-Lethal Weapons : Technologies											
Technology	Types	Operational Parameters / Efficacy									India Usage / Availability
		Crowd Dispersal	Individual Incapacitation	Prevent Coordinated Crowd action (communication blockages)	Degrade violence causing actions/behaviours	Limit injuries and deaths (Legal, moral and HR aspects)	Utilize/create fear factor to influence mob psyche	Neutralize mob leaders	Protect own troops and motivation	Identification mechanisms	
Kinetic energy	Impact projectiles	N	Y	N	Y	N	Y	Y	N	Y	Yes
	Water cannon	Y	N	N	N	N	N	Y	N	Y	Yes
Barriers and entanglement	Nets, chains, spikes, Caltrops	N	N	N	Y	N	N	N	N	N	Yes
Electrical	Stun weapons	N	Y	N	N	N	Y	Y	N	N	Yes
Acoustic	Acoustic-optical	Y	N	N	N	Y	Y	N	N	N	Yes
	Acoustic generators	Y	N	Y	Y	N	Y	N	Y	N	No
	Vortex generators	Y	N	Y	N	N	Y	N	N	N	No
Directed Energy	High-power microwave and Radiofrequency (HPM/RF)	N	N	Y	N	N	N	N	N	N	No
	Millimeter wave	Y		Y	Y	Y	Y	N	Y	N	No
	Laser (low energy)	N	Y	N	N	Y	N	Y	N	N	No
	Laser (high energy)	N	N	Y	N	N	N	N	N	N	No
Chemical	Anti-Personnel (RCAs, Incapacitants, Maladorants)	Y	Y	N	Y	N	Y	N	Y	N	Yes
	Anti-Material (Anti-Material, Anti-tractions)	N	N	Y	N	N	N	N	N	N	No

8. The most widely used technologies in India are the Kinetic Energy and the Riot Control Agents (Anti-Personnel Chemical Energy) based technologies. Both of these technologies if properly deployed have the potential for individual incapacitation as also crowd dispersal. They also degrade violence causing behavior of the mob and create fear factor to influence mob psyche by acting as a strong deterrence.

9. Under the *Kinetic energy technologies*, India currently has the following sets:

   9.1. Plastic pellets fired through Anti-Riot Gun

   9.2. Rubber Bullets, Multi-Baton Cartridges (rubber batons) fired through Gas Guns

   9.3. Plastic Bullets fired through standard rifles (SLR)

   9.4. In some cases state police has procured paper cartridges (rubber pellets) fired through Pump Action Guns.

10. Though available, none of the above ammunitions/impact projectiles is being widely used due to reasons previously stated in detail. A summary of primary reasons are discussed below:

    10.1. Potential of these ammunitions to cause lethal damage- Plastic bullets (in their current charge loading state) are found to penetrate the human body at distances up to even 100 meters.

    10.2. Inadequate training to use these equipments in the right manner. For example considerations like distance and type of firing mechanism (ricochet) are sighted for anti-riot gun.

    10.3. Apprehension amongst police personnel to use these equipments.

11. Under the *Chemical based technologies*, India normally uses Tear Smoke Shells launched either through Gas Guns or the electric MBLs. Apart from this, usage of hand thrown Tear Smoke Grenades is also fairly common in the country., Our field surveys reveal that the police have not found these to be effective for controlling the kinds of aggressive and large crowds they face. Amongst the several reasons for this, the important few are highlighted below:

    11.1. Incapability to saturate the environment with irritant chemicals using these equipments.

    11.2. Equipment malfunction

    11.3. Training of police personnel to use these equipments. Ex: angle of fire, no sight calibration for different ranges on launchers / guns etc., operation of electric MBLs etc.

    11.4. Maneuvering capabilities of certain launchers – electric MBLs (Agnivarsha)

    11.5. Crowd resistance/precautionary measures against such ammunitions

    11.6. Environmental factors like climate and wind direction

12. Apart from the above two technology groups that most prominently used less-lethal technologies in India, equipments based on electrical and 'paint ball' gun type technologies are also available with certain sections of forces but have not been put to use. Also, the barriers and entanglement

gear being currently used in the country is largely ad-hoc, not found to be effective, and is easily overpowered.

13. The Concept of Operations and the Standard Operating Procedures (SoPs) has been devised in light of the above observations. Amongst the previously mentioned factors under the force dynamics, we have discussed a few key factors in the below paragraphs which emerged from the field surveys and primarily related to the tactics employed by the forces for crowd control. These key factors help formulate the salient features of the Concept of Operations and the Standard Operating Procedures,

13.1. *Engagement Distance*: For tactical response by police for crowd control/riot management, engagement distance is a key factor. Engagement distance is the distance at which the police plans the usage of force/tactics against a crowd. In case the crowd crosses the 'minimum threshold of engagement distance', it is able to indulge in violence and cause damage by throwing stones, fire bombs on its target. Whereas if the rioters can be engaged and stopped at a distance greater than the 'minimum threshold of engagement distance', the rioters ability to inflict damage is greatly limited.

13.2. *Saturation*: A critical factor is the importance of achieving saturation and the associated rate of fire for use of tear gas shells and other irritant chemical weaponry.

13.3. *Lathi-Charge Effect*: An important consideration is to replicate the effectiveness similar to that of 'lathi charge' at longer distances. To achieve similar effects of this action up to distances around 50 meters, the usage of effective less-lethal Kinetic energy weapons is a viable option.

13.4. *Targeted incapacitation*: While considering the range of less-lethal equipments/technologies, due consideration is needed to be paid on the technologies that can help achieve targeted incapacitation. This is usually an important requirement as police personnel are often required to neutralize the mob leaders and main miscreants.

13.5. *Additional Gadgets*: Apart from the less-lethal equipments and technologies that need to be incorporated into the system, there is a strong requirement to equip the riot control police with additional gadgetry for more efficient crowd control. These additional equipments ideally should serve one of the several purposes from amongst surveillance, intelligence creation and information gathering, communication establishment etc.

13.5.1. *Use of Mini UAVs*: Mini UAVs for example are a very effective means of surveillance mechanism that could assist in real-time information gathering and informed decision making during large scale public agitations. They also can help the forces to strategically plan their operations both prior to a riot and also during the actual situations. Appropriate deployment and positioning of units, crowd movement tracking can be more accurately achieved through the usage of mini-UAVs.

13.5.1.1. Mini UAVs are primarily used for surveillance and reconnaissance purposes. Role of UAVs for crowd control is seen as an emerging technology. Through live video feeds and pictures, UAV's facilitates capturing the exact situation and

facilitate quick decision making. Use of UAVs provides access to pro active intelligence and situational updates about crowd behavior and incidents as well as size of crowd.

13.5.1.2. In addition to capturing images, our desktop research revealed that in the countries like the Unites States tests have been carried out to check the possibility of releasing chemical irritants from UAVs.

13.5.1.3. India has witnessed usage of UAVs as a surveillance measure already but the usage remains largely limited. It has been used by civil police for crowd monitoring as well as tracking the movement of criminals. Further, it also been used in anti Naxal operations.

13.5.1.4. Netra UAVs were used by the Mumbai police for surveillance and crowd management at Azad Maidan in August 2012. These UAVs relayed real time images to a control room set up at the City Police Headquarters. Netra is a UAV designed by Idea Forge in co-operation with the DRDO. It has a range of 2 kms and can fly for 30 minutes at a stretch before requiring a battery recharge. Each Netra costs around INR 1.5 to 2 million, and is currently being used in anti-insurgency operations.

13.5.1.5. In April 2011, Chandigarh police became the first police force in India to acquire UAV to keep vigil on criminal movements and trouble mongers. The UAV named Golden Hawk is field trialed under DRDO. It weighs 3 kg and flies approximately 100 m from ground for about half an hour.

13.5.1.6. A compact UAV named T-MAV (Micro Air Vehicle) is a machine manufactured by Honeywell and weigh approximately 10 kg was successfully tested in Bastar region of Chhattisgarh in 2010. It provided thermal images of movements on the ground. It can reach a height of 10,000 feet, fly at speed of 70 km/hr and can provide 240 minutes of sensory image to the base station. As claimed, it works well in pitch dark situations of the night as well.

13.5.2. *Communication Jammers – mobile phones*: Another additional piece of apparatus that is required as enhanced support feature are mobile jammers. It is frequently observed that the rioters communicate through mass SMSs/calls amongst themselves through the usage of mobile phones. This ability to communicate within the main elements of the mob is a crucial factor that determines the mob tactical response and its intensity. Mobile jammers have been found to be very effective in such situations across the globe and their usage indirectly helps the police personnel by affecting the communication capabilities of the rioters through mobile phones.

13.5.3. *Acoustic Devices*: Another gadget that can seriously affect the direct communication capabilities of the rioters are acoustic devices such as LRAD (Loud Range Acoustic Device) or even high decibel loud speakers producing high-pitched high-decibel sound. Such devices act as supplementary force measures for the police and have the capability of hindering the voice communications between the rioters. Such devices also serve

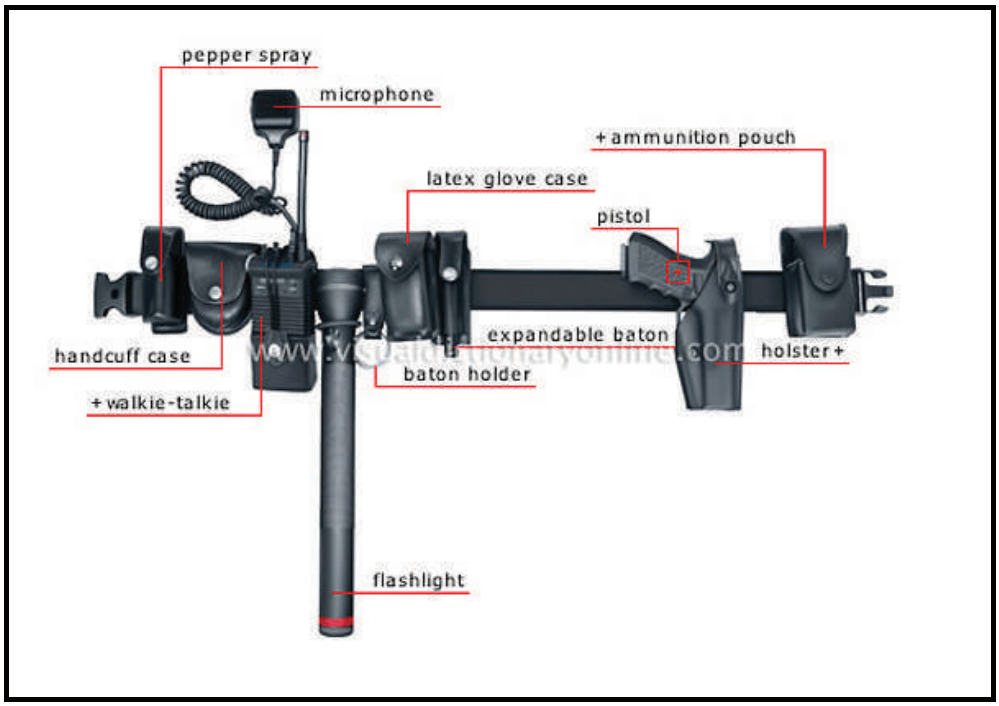
another purpose by acting as a strong warning signal to stop the aggression, failure of which could result in serious police action.

13.5.3.1. Usage of these acoustic devices also poses a threat on the capabilities of the riot control police. Hence, prior to the usage of these equipments it is ensured that the police personnel are well guarded against the adversities of these devices. For example, the riot control police needs to have proper ear protectors when using an LRAD.

13.5.3.2. The hand-held bullhorns presently in use are not found ineffective to communicate the warnings/communication messages to the large sections of the crowd. Forces need to be equipped with better quality bullhorns that have been adequately field tested to communicate the messages at longer distances of at least 250 meters and are loud enough to be heard over the sound of agitating crowds and protestors (who may be indulging in high volume slogan shouting etc).

13.5.4. *Tactical Mobility – Need for Light Armored Vehicles*: During the operational response to a mob disorder, resources must be mobilized and allocated proportionately based on initial inputs. Light armor protection vehicles equipped with multi barrel tear gas launchers, communications, floodlight, and other needed paraphernalia can act as force multipliers by actually venturing into the crowd and for rapid re-deployment of police teams while ensuring adequate protection during such movements. These vehicles can also be equipped with a public address system, distinctive audible sirens and blue flashing lights, first aid boxes and video cameras. Mumbai police has recently acquired eight 'riot intervention vehicles' based on a SUV platform but these lack the needed armor protection and also other operational issues viz. operation of generator for electric MBLs from outside the vehicle rather than from inside exposing the police personnel.

13.5.5. *Multi-Utility Belts*: These belts have tremendous utility and provide enhanced flexibility to a policeman faced with riot situations. Such utilities come very handy in case of tactical involvement of the police with the rioters and different riot situations. They become increasingly important especially for policemen with rifles (either SLR/MSGLs) when they are faced with crowds in close quarters. Amongst different equipments that they hold, most important ones are an expandable baton (with mirror and torchlight attachments), a handcuff case and pepper spray.



Sourced from visualdictionaryonline.com

13.5.6. *Protective Equipment*: The protective gear currently being used across the country is not adequate and has quality concerns. An overarching reason we have identified is that the procurement of such equipments is not always standardized and not being procured centrally. Hence, the localized products have quite often been found to be of inferior quality that gets reflected in their operational capabilities during field operations. This situation seriously dampens the forces' ability to respond appropriately to the riot and agitation situations.

13.5.6.1. A strong requirement that got resonated at multiple field locations from the police personnel with extensive experience of riot control operations was the requirement for standardization of this gear and also an institutional mechanism of constant improvement incorporation in these gears. For ex: the handling mechanism of the protective shields was found to be different in various lots of shield and lacked standardization.

13.5.6.2. A riot control unit is also found to be quite under-equipped in terms of the protective gear that they use. Situations like less number of protective shields, shin guards, body guards, need to be immediately addressed as these results in injuries. (For example – our field survey found that during one summer in 2008, more than 650 police personnel were severely injured due to stone pelting during anti-riot duties in the Baramulla-Sopore area alone).

Standard Operating Procedures, Tactical Parameters & Drill for Operations of Crowd Control and Anti Riot Operations & Use of Various Less Lethal Equipment & Weapons in Riot Situations

14. Based on the above features, the section below details out the usage of different technologies/equipments and operational techniques. This is modeled around the tactical response that is to be achieved by the forces at various engagement distances. For better understanding, we have divided the tactical response at various distances below,

15. Response beyond 50 meters : Primarily based on Riot Control Agents or Irritants

15.1. Based on our understanding and key insights from experts it has been realized that irritant chemical technologies (i.e. the Riot Control Agents or RCAs) are the most efficient means of crowd control at distances greater than 50 meters from the police units. A key requirement though is to achieve environment saturation with such irritant chemicals to have a substantial impact on the crowd/rioters. This level of saturation is typically not being achieved by the present weapon systems in use and their rate of fire also doesn't help the police personnel to deploy sufficient amount of ammunition over the crowd in a reasonable timeframe. For example, a well trained police personal can fire around two tear gas shells per minute using

the existing Gas Gun (time taken in loading, firing, and reloading). Each tear gas shell produces smoke for about 20 seconds. Hence by the time the second shell lands in the crowd the first one has already stopped producing smoke. This does not permit a desired level of saturation of tear gas to build-up at the target end. Hence, there is a strong requirement to incorporate modern weapon systems into these units that have the capability for rapid fire and thereby to deploy required amount of ammunitions on the ground within the stipulated time frames.

15.2. *Area Saturation - Use of Multi-shell Grenade Launchers*: Based on our research, the modern handheld Multi-shell Grenade Launchers (MSGLs – these work on similar principal as the existing Gas Gun, but have a multi-shell chamber similar to that in a revolver) are a very effective means to achieve the above objective of saturation and rapid rate of fire. These handheld MSGLs, which have the capability to launch 6 shells within a few seconds, are fairly easy to operate. Apart from this, these launchers have a high degree of maneuverability and mobility because they are lightweight (6.5 kg versus the 70 Kg Agnivarsha multi grenade launcher which must be mounted on a vehicle for mobility reasons). The loading of these MSGLs permit the policemen to have a mix of tear-smoke/Chili/stun/ or other kinetic ammunition based shells into the equipment and use them as per the situation demands. These launchers not only score very high on their range (up to 400 meters or more depending on the type of ammunition) and reach but also are highly accurate due to very sophisticated sighting and calibration mechanism being mounted on them.

15.3. *Area Saturation- Use of Under Barrel Grenade Launchers*: Another way of assisting in achieving the saturation and rapid rate of fire described above through the usage of Under Barrel Grenade Launchers (UBGLs – these are similar to the existing Gas Gun in their functioning) that can be mounted on the existing rifle systems. These UBGLs can then act as a reasonably accurate means of launching tear-smoke/Chili/stun/other kinetic ammunition on to the crowds, and when used along with the MSGLs can help achieve rapid fire-volleys and saturation of area needed for impact on a large crowd. This improvisation then enables a policeman with a standard rifle to engage with crowds at longer distances while being less-lethal and since there exists good number of policemen in a unit who carry these standard weapon systems, the impact achieved by the unit increases despite the equipment combination itself being single shot. A comparative study at the end of this section reflects on the impact achieved by a platoon carrying these weapon systems.

16. Response between 15 to 50 meters : Primarily Kinetic Energy Based

16.1. This is a critical range since at distances closer than 50 meters, the rioters become capable of throwing stones, hand grenades, fire-bombs back to the police personnel or at their target. Hence, an aggressive crowd at such distances can cause significant damage to property and injuries to personnel. This warrants appropriate preparation and response on behalf of the forces to deal with such situations. The traditionally used ammunitions in this range like the existing kinetic energy weapons and the tear-gas/chilli hand grenades have not been found to cause desired effect as the policemen can't saturate the environment with them because of their capacity to impact the forces themselves. On the other hand the kinetic weapons currently available have often been found to be lethal at this range and the usage of tear

smoke hand grenades are always associated with the concern of it being fired back or the tear-gas engulfing the police personnel itself (depending on wind direction) due to the short range. The usage of gas/smoke ammunitions at this range is also dependent on the climate and wind directions. Hence, there prevails a strong requirement to appropriately equip the police personnel to counter the aggressive crowds at such ranges and the present situations and constraints build a strong case for incorporating more effective less-lethal kinetic weaponry.

16.2. A clear approach that stands out as an effective measure to deal with crowds in this range is to replicate the 'lathi-charge' experience (quite effective) at such distances. An effective way of achieving this is to use the right set of kinetic weaponry that can create the large scale effect of lathi-charge. Usage of modified plastic bullets (lower charged) from the standard SLR rifle is believed to be an effective means of achieving the objective. The plastic bullets in their present state cause lethal damages to rioters but they can be appropriate if the gunpowder charge content is reduced to bring down the muzzle velocity to cause less-lethal damage to rioters at closer distances. This is critical as the policemen are very apprehensive about the usage of plastic bullets in their current form due to its lethality. (Trials of existing 7.62 mm plastic bullets carried out by Mumbai police showed that these bullets easily penetrate a plywood board of up to three-quarter inch thickness). Also, this serves the purpose of creating a lathi-charge effect on as a reasonably good number of police personnel within a platoon/unit carry the traditional SLR rifle. Based on field inputs, around 08 policemen in a unit of 30-36 men (a platoon in anti-riot role) carry this rifle and they are trained to use this rifle. Hence, usage of this existing small-arms weapon system with less-lethal ammunition by well trained police personnel definitely seems to have the potential to create a lathi-charge like response at this range. Further if these SLRs are equipped with UBGLs, the police personnel will also be able to fire kinetic energy shells such as the baton round on the crowd to increase the effect on the crowd as needed.

16.3. It is important to note that both MSGLs and UGBLs can fire the modern baton rounds, as well as a range of tear-gas, chilli, stun-grenade, rubber pellets based shells/grenades. This approach is supported again by the observations made in the weapon-wise analysis section that concludes this section.

16.4. Another alternative to achieve this effect is the usage of 'paintball' type weapon system (pneumatic types) and the related ammunitions. As per their specifications, these weapon systems are found to be less-lethal at such ranges and can carry various ammunition types that can be delivered at such ranges with enhanced accuracy. These systems can be loaded to deliver irritant chemicals, targeted projectiles, marker dyes etc. depending upon the situational requirements. The comparative weapon analysis model below estimates the potential impact capabilities of such weapon systems. The training and ease of handling aspects of these weapon systems is also fairly easy. Owing to their high precision and a very high rate of fire, these weapons systems definitely have the potential to create a lathi-charge effect at larger distances in this range. However, such pneumatic equipments due to their sophistication are quite difficult to maintain and manage.

17. Response in face-to-face situation

17.1. In situations when the rioters confront the police forces at much closer ranges (less than 15-20 meters), they pose serious threat to the safety of the police person themselves as also the overall crowd control tactics by the police. At such distances, the police do not have an option to use either the irritant weapons or the kinetic weaponry that was being used for control at larger distances.

17.2. At such distances, water canon is found to be an effective means but has its own constraints as it is primarily an area-denial equipment with a limited span and mobility (difficult to move them in lanes and by-lanes). Another constraint is the availability of sustained water supply at all terrains. Water cannons have been usually found to run dry after a few minutes of operation and their maneuvering capabilities is very limited.

17.3. The traditional approach to tackle such situations is to resort to lathi-charge which has been found to be very effective in close encounters with the rioters. But there are at times serious implications of the usage of lathis as well, since they have the potential to cause lethal damages when being forced upon critical body parts. Hence, there is a requirement of supplementing the equipments that the police personnel uses when faced with crowd at arm's length.

17.4. One such equipment that could cause less-lethal damage to aggressive crowds is the electric shock shields and the electric shock truncheons. These have the potential to cause instant reaction on the rioters who try and engage with the police personnel at such close ranges. However, these equipments all have their limitations because of their battery life. Lathis, if used properly still serve as the best less-lethal means of crowd control at such close ranges.

18. Neutralizing the Leader – Use of .22 Rifle

18.1. In many riot situations, neutralizing the leader who is instigating the crowd and directing violence can be a very effective means of reducing loss of life and damage. Neutralizing the mob's leaders results in rapid break-down of the command, control and communication links within the rioters. Also, this requirement warrants a very specialized or targeted attack on the mob leader when he/she has to be brought down by inflicting minimal injury. The 0.22 rifle is effective weaponry that serves this purpose due to its high precision and the less injury/damage inflicted on the individual (as compared to rifles like 303, SLR and INSAS). The wound ballistics of .22 rifle bullet causes much less damage than the standard 303, SLR or INSAS rifle and typically doesn't cause severe injuries to the subject and is yet able to bring it down. This weaponry although not readily available with all forces could serve the purpose of targeted attack/incapacitation of the mob leader.

19. Rubber/Plastic (AEP) Baton Rounds

19.1. The UBGLs and the handheld MBLs could also be used to launch the modern Rubber Baton Rounds (which is different from the existing baton round used in India that is fired from the 303 anti-riot guns). These baton rounds are made of polyurethane (owing to its temperature stability and the possibility of tightly controlling the material properties). It has a crumple

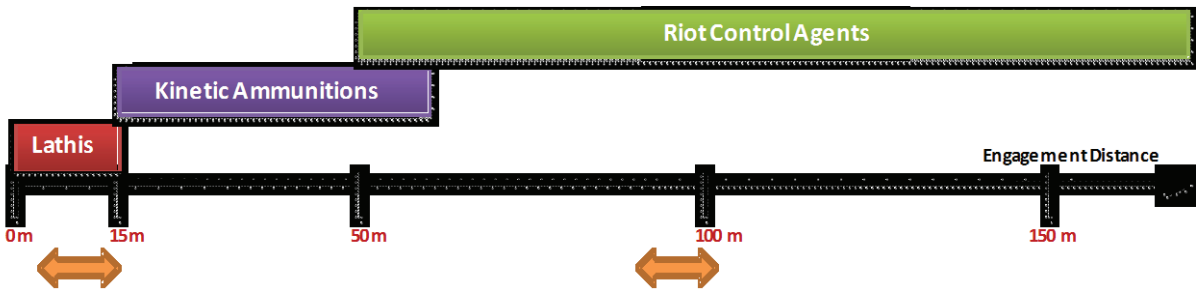
zone of polyurethane, with an air gap in the nose. One such round, the AEP round has dimensions similar (10×3.7 cm) to the traditional baton round and its weight (98g). The mean velocity is 72 m/s. It delivers a slightly higher kinetic energy on initial impact than its predecessor (in UK the L21A1). These rubber baton rounds are single baton rounds that can be aimed fired from the UBGL or an MSGL and is essentially an aim and fire type of ammunition. It is high precision ammunition and can be used to accurately target individual and bring them down. Such rubber batons are also found to be quite effective for neutralizing the mob leaders at closer ranges of 15 to 45 meters).

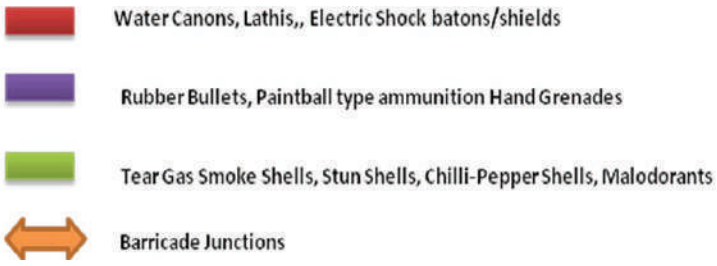
20. Video Recording

20.1. The London riots of 2011 have underlined the vital importance of CCTV/Video evidence in identifying and prosecuting rioters which enabled the police to bring hundreds of rioters to justice very quickly. The police in J&K too have found video cameras to be highly effective means of identifying rioters and also for handling allegations related to riot control. Additionally, every police PCR van/riot control vehicle must have an all weather video camera installed and every riot police platoon must have a hand-held video camera. With the technology advancements permitting us, an even better solution would be to have camera mounted helmets that help capture real time actual ground scenarios that help not only to understand the police psyche and plan quick response in such situations but also act as a great tool for post incidence analysis.

20.2. Further, live feeds from these cameras to commanders and the command & control room greatly enhance better management of the riot situation.

21. The below line diagram gives a schematic representation of the usage of various types of effective less-lethal equipments/technologies at appropriate distances –





22. Basic Anti-riot Platoon configuration and Riot Drill:

23. Based on the above features and analysis and the impact simulation described below, we have attempted to staff a police/paramilitary platoon specialized into riot control operations. The authorized strength of a typical riot control platoon with paramilitary forces is 36 and for the state police is 30. However it is seldom the case that the platoons are available at their full strength on the ground due to multiple reasons. The below configurations take into account the actual field strength of these platoons both for state police and paramilitary forces. The range considered for the actual field strength of these platoons is based on field inputs from various states. Also, we have considered 2 different scenarios to effectively allocate the police personnel with different NLWs. These scenarios take into account the various situations/trends as faced by the forces in dealing with riot control across the country. Some of these features are crowd types, size, and violence causing behavior, preparedness levels etc. as also the geographic considerations of the area where the riot is happening. Based on these considerations, we have described the 2 scenarios which are described below,

23.1. *Extremism/insurgency affected locations* where the forces witness higher levels of mob violence, at times accompanied by use of fire arms by militants/extremists firing from behind the crowds. This would typically relate to locations like the ones faced in the state of 'Jammu and Kashmir' and 'Manipur' etc.

23.2. *Non-extremist mobs* with relatively lower level of violence. Such types of incidents are witnessed in cities like Delhi etc. typically in the form of protest demonstrations.

24. Based on the above 2 scenarios and the actual ground level platoon strengths, we have planned the following 4 basic configurations for the riot control police/paramilitary forces,

Type of Equipment	Extremist/Insurgency locations		Non-extremist locations		Capabilities	Distance application / ammunition type		
	State Police	Paramilitary	State Police	Paramilitary		0-15 metres	15-50 metres	>50 metres
MSGL*	3	3	2	3	Non-Lethal	n/a	Kinetic Energy Ammunitions	RCA+Stun Shells
UBGL* with SLR	6	8	6	5	Non-Lethal + Lethal	Lethal ammunitions	Reduced charge Plastic Bullets	Plastic Bullets + RCA/Stun shells
Lathis and Shields	11-13	12-14	12-14	15-17	Non-Lethal	Typical maneuverability	n/a	n/a
Commander with Bullhorn+0.22 rifle & Assistant with Radio+ Video Camera	2	2	2	2	Non-Lethal + Lethal	0.22 rifle-lethal at this range	0.22 rifle's lethality is usage based	0.22 rifle's lethality is usage based
Total (actual platoon field strength)	22-24	25-27	22-24	25-27	Non-Lethal + Lethal	All		

Table – Describing 4 Basic Platoon Configurations of Riot Control Police

*The selected MSGL/UBGL must be able to fire ammunition upto 120 mm in length.

24.1. It is proposed that 50 percent of the men with shields to be replaced with Electric shock shields and 3 to 4 of them to have electric shock truncheons. This provides them with additional gadgetry support to release an instant non-lethal shock to tackle forceful crowds and repel them instantly.

24.2. It is also proposed that the personnel with UBGL mounted on SLR be equipped with a multi-utility baton. This increases their operational effectiveness as they can act as lathi reinforcements by using the expandable baton if required in situations of close contact with the rioters. However, it is assumed here that these men won't have protective shields with them so they would form the second line of defence behind the men with lathis and shields.

24.3. The above configurations do not account for the availability of personnel for the usage of additional mobile weapons like Vajra, Varun or other smaller gypsies. It is assumed that these vehicles will have their own well-trained and dedicated staff.

24.4. In case there is availability of Vajra or Varun vehicles with a platoon, it is assumed that they come with a well trained and dedicated driver and co-driver. These individuals are adept at handling and maneuvering these vehicles in most conditions. Apart from these, the vehicles need to have dedicated personnel to be stationed inside them both for targeted offensive as also vehicle defense in case of adversities. This aspect of vehicle protection is increasingly being realized by police forces using them for crowd control purposes.

24.5. In case of Vajra, it needs a dedicated team of around 4 to 5 men to be positioned inside the vehicle who are adept at handling of the Agnivarsha and can guard the vehicle from hostile crowds when required. These additional police personnel are assumed to come from the platoon itself at the cost of men carrying MSGL or riflemen with UBGLs. Although, this

shift of police personnel from MSGL/UBGL to Vajra is to be done tactfully and the platoon commander needs to assess the situation and create a balance between troop protection and enhanced firepower and maneuverability.

24.6. For Varun, a dedicated team of 3-4 people is required to be stationed alongside the vehicle. These additional men should come from the platoon by shifting men with lathis to Varun vehicle.

25. Anti-Riot Platoon Drill

25.1. A platoon is the building block for police response to any law and order situation. Hence, it is very essential to adequately staff the existing platoons with equipments, gadgets etc. to properly deal with any such situations since these platoons are the frontal units of the police.

25.2. While staffing the existing platoon sizes as is done above, we have ensured that under no circumstance the riflemen within a platoon are less than 8 people (MSGL + UBGL). This ensures enough firepower (lethal and non-lethal) with a platoon to engage with a crowd either in an offensive or defensive mode. Staffing men with adequate number of MSGLs draws from the principle of force escalation measure for our platoons which are reasonably understaffed when compared to their authorized strength.

25.3. This also ensures that there is enough strength of men with batons under each platoon with at least 12 such men under each configuration. This ensures formation of various tactical configurations when dealing with different riot situations. On top of this, there is a small team of the platoon commander and his assistant with essential communication gadgetry and tactical weaponry like 0.22 rifle.

25.4. The commander can either use the 0.22 rifle for targeted incapacitation or else carry the traditional SLR rifle and a UBGL with a launching capacity of AEP baton rounds. This helps the platoon commander by serving the dual purpose of lethal and non-lethal targeted engagement with mob leaders. This also ensures that either the 0.22 rifle or AEP baton rounds are handled by very well trained platoon commanders who are experienced in the proper usage of these weaponry.

26. Platoon Section Deployments

26.1. Here we have made an attempt to categorize the platoon section deployments for various law and order situations. Police forces are normally deployed in anticipation of a riot and control situations. Since sporadic incidents are rare wherein full platoons have to be deployed at a particular area, normally police forces are deployed at separate critical junctions in small formations or platoon sections as they are called.

26.2. A platoon typically consisting of arms and ammunitions as described above can be divided into the following sections for tactical deployment in case of riot situations. The first 2 sections cater to a platoon without the services of additional firepower of Varun/Vajra vehicle whereas the last 2 section deployments are either with a Varun/Vajra vehicle:

26.2.1. Section without Varun/Vajra - This section would comprise of men with Lathis and Shields. They would be carrying electric batons and shock shields if available. This is a strong cohesive unit that is best prepared for close encounter situations. Hence the availability of proper protective equipment to all members of this platoon section is quintessential.

26.2.2. Section without Varun/Vajra - This section consists of Rifle men (303/SLR/Insas/MSGL/UBGL etc.) capable of carrying both lethal as well as non-lethal fire-arms. They form the first line of attack due to their ability launch an offensive at greater distances. This section becomes increasingly weak as the crowds approach closer. At least some members of this section must have protective gas masks. The personnel of this section can be staffed with multi-utility belts to increase their operational and tactical capabilities especially during close encounters.

26.2.3. Section with Varun vehicle - This section would comprise of the vehicle with its police personnel as also men with MSGL and riflemen with UBGL. In terms of its capabilities, the unit is well poised to engage with crowds at virtually all distances.

26.2.4. Section with Vajra vehicle - This section would comprise of the vehicle with its police personnel as also men with lathis and other riflemen with UBGL.

26.3. In case the platoon is to be deployed in its full strength (with or without the Varun/Vajra), there is a strong case for the formation of 2 sections of the platoon for engaging with the crowd. These 2 sections are as follows,

26.4. *Riflemen Section*: This sections comprising of MSGLs and UBGLs would be in the front line of attack when engaging with crowds at larger distances. Due to their ability to engage with crowds at distances as close as 20+ metres with RCAs and Kinetic Energy ammunitions, they need to be well guarded by the lathi men with their shields. If required, the platoon commander can order these riflemen to be in 2 separate units of equal proportions for bi-directional attack or for coordinated simultaneous engagement depending upon the situational requirements.

26.5. *Lathi Section*: This section comprising of at least 12 men with lathis, shield and proper body protectors should act as a cohesive unit and should be formidable enough to engage with violent rioters at close quarters. The formation of these men again is situation dependent. It can be in the form of single layer long line of defense while engaging with crowds in open spaces while guarding a particular building or a unit, while in other cases it can be in the form of 2 layers with each layer comprising of at least 6-7 men. This provides additional strength to the unit and they can hold strong their position especially from rioters who have a unidirectional line of attack. Depending upon the situation, the platoon commander can order the lathi men to split in 2 groups of 6-7 men each and position themselves at a distance to provide tactical benefits and operational capability enhancement measures as the circumstances may demand. In such situations, the riflemen should also be guarded behind the lathi men and perform tactical engagement from behind depending upon additional gadgetry provided to them. Under no circumstance, the lathi men should be deployed less than a unit of 6 fully equipped and well protected men. It is recommended that atleast a few

lathi men should also have gas masks which enhances their ability to venture into the crowds which have been subjected to RCAs

26.6. In case, the platoon is staffed with additional firepower provided by Varun/Vajra vehicles, these vehicles also need to be protected from the violent crowds and necessitate at least 1 smaller unit of lathi men to be positioned close to the vehicle.

27. ***Graded Use of Weapons***

27.1. In this section, we have tried to objectively qualify each of the less lethal technologies/ammunitions based on various categories of state police departments. The categories considered here are the thana level police platoons, district armed reserves and the state armed reserves. The overall table that details the usage of each of the less lethal technologies is as follows,

S. No.	Equipment (Ammunition)	Category		
		Thana Level	District Armed Reserve	State Armed Reserve Bn.
1	Lathis (Bamboo/Polycarbonate Batons)	Y	Y	Y
2	Gas Guns (Tear Gas Shells / Stun Shells/Rubber Bullet/ Multi Baton Cartridges)	Y (till they phase out)	Y (till they phase out)	Y (till they phase out)
3	Anti-Riot Gun (Plastic Pellets)	Y (till they phase out)	Y (till they phase out)	Y (till they phase out)
4	Traditional weaponry SLR (Plastic Bullets)	Y (with reduced charge bullets)	Y (with reduced charge bullets)	Y (with reduced charge bullets)
5	Hand Grenades (Tear Gas, Stun, Pepper, Dye)	Y	Y	Y
7	Pump Action Gun (paper cartridges)	N	Y	Y
8	Electric Multi Barrel Launcher (Tear Gas Shells / Stun Shells)	N	Y	Y
9	Water Canon (Primarily Area Denial)	N	Y	Y
10	Handheld MSGLs (Tear Gas Shells/ Stun Shells/Rubber Balls/Batons/ Malodorants/Dye-pepper, Dye, Pepper balls)	N	Y (not all districts)	Y
13	Traditional Weaponry with UBGLs (Tear Gas Shells/ Stun Shells/Rubber Balls/Batons/ Malodorants/Dye-pepper, Dye, Pepper balls)	Y (alongside Gas Guns and as their replacement)	Y	Y
16	Electrical shields	N	Y	Y
17	Electrical Batons	N	Y	Y
18	Mobile Jammers	N	Y	Y
19	UAVs	N	N	Y
20	Cameras	Y	Y	Y
21	Bullhorns	Y	Y	Y
22	High decible Audio devices	Y	Y	Y
23	Gas Masks	Y	Y	Y
24	Portable fire extinguishers	Y	Y	Y
25	Multi-Utility Belts	Y	Y	Y

27.2. In the above, we have marked the gas guns as yes at all levels since there is a reasonable stock of this 37-38" weapon system. Although, there is a strong need to replace this existing system with a worldwide standard of 40" weapon system. Hence, the existing gas guns can be incorporated at all levels for use till they eventually phase out and get replaced by much better 40" system. The usage of 40" systems obviates the compatibility issues of the gun system with the ammunitions available worldwide. Having said that the Indian ammunitions manufacturing facilities also need to increasingly focus on the production of 40" ammunitions.

27.3. Similarly, the usage of anti riot gun is found to cause lethal injuries more often than not. A major factor is the inadequate training levels of the officers with regards to the usage of this less lethal weapon.

27.4. As for the proposed MSGLs, they are required only at district and state level armed reserve forces for major law and order situations. However, we propose the availability of UBGLs at all levels since they provide enhanced engagement capabilities to the policemen.

27.5. Electric shields and shock batons are not a necessary piece of equipment to be kept at the thana level but at least a few platoons at the district level onwards should have these equipments during specific encounters and situations.

Operational Scenario Based Simulation of various Technologies and Equipment

28. Simulation based comparative analysis has been carried out for various less-lethal weapons/ munition. The simulation methodology as well as the findings is elucidated in this section.

29. Research shows that there are 5 identified criteria for selection of Non-Lethal Weapons. They are availability, quantity, performance in the field, time required to train individuals with no previous experience in their employment, and the need to deliver the munitions using various weapon systems. Here we illustrate each of them one by one,

    29.1. Availability - Field personnel need non-lethal systems immediately. Most peace-operation deployments are reactions to a crisis. Non-lethal systems need to be readily available with short lead times in requisition and delivery.

    29.2. Quantity - Companies that manufacture non-lethal systems normally do not keep large inventories of these systems on hand. The market for non-lethal systems does not justify maintaining large inventories. Therefore, when selecting non-lethal systems, planners must consider the quantity required for the entire force to support a peace operation to ensure that manufacturers can meet the requirements.

    29.3. Performance in the field - Planners should consider the environment in which the peace operation is expected to occur. Some non-lethal systems work better in some environments than others. For example, an anti-traction lubricant may work extremely well on an asphalt road but poorly on a dirty road. Planners should determine the best overall non-lethal system that will support the types of operations that troops are expected to perform.

    29.4. Time required to provide training to individuals who has no previous experience in the use of non-lethal weapons. Most peace operations require quick responses by deploying forces. Often, there is insufficient time available to train personnel on nonlethal systems that are extremely complex to use. It would be inappropriate to place a policeman in front of a large, hostile crowd with a weapon system in which he is not properly trained.

    29.5. Time required to deliver non-lethal weapons using organic weapon systems. Riot situations in peace operations can quickly turn from a non-lethal situation to a lethal one. Soldiers need to be able to quickly transit from non-lethal to lethal on the demand of the occasion.

30. We have tried to do a comparative analysis of the various NLW weapons and ammunitions considering few of the above criteria. This comparative analysis (based on approximations) of various NLWs operational across the country is tabulated below,

Table 1.1 : Comparative Operational Impact Analysis of various NLW equipments/ammunitions.

S. No.	Equipment (Ammunition)	Impact achieved by 1 policeman in 1 min.						Impact achieved by a Platoon (consisting of approx. 30 policemen) over single platoon level engagement							
		Rioters effected per shot (r)	Shots per minute (s)	Training / Ease of Adaptability of the equipment ('p' Range: 1-4)	Accuracy correction factor (f-0-1)	Impact achieved =fn(r,s,p,f)	Average Impact (I)	ammunition carrying capacity (c: not used for calculations here)	no. of policemen using the equipment (n)	Single platoon level engagement time in mins (t)	Impact achieved under normal open terains =Impact Achieved*n*t	Average Impact achieved (I')	Deployability coefficient - difficult enclosed terains ('c' Range: 1-4)	Impact achieved under difficult enclosed terains =fn(Impact achieved under normal terains,c)	Average Impact achieved (I'')
1	Lathis (Bamboo/Polycarbonate Batons)	0.45	2.15	4	0.98	0.96	3.06	30	14	4.69	62.86	215.15	4	62.86	215.15
2	Gas Guns (Tear Gas Shells / Stun Shells/Rubber Bullet/ Multi Baton Cartridges)	8.84	2.09	3	0.91	13.84	8.08	60	2	2.57	71.13	48.46	3	53.35	36.34
3	Anti-Riot Gun (Plastic Pellets)	2.70	1.88	1	0.63	1.59	1.80	60	2	3.55	11.29	10.82	3	8.47	8.11
4	Traditional weaponry SLR (Plastic Bullets)	0.96	2.90	2	0.90	1.68	1.33	150	8	1.54	20.71	15.96	4	20.71	15.96
5	Hand Grenades (Tear Gas, Stun, Pepper)	7.97	2.59	4	0.91	18.77	13.04	60	4	2.33	175.09	130.27	4	175.09	130.27
6	Hand Grenades (Dye - does n't incapacitate)	9.25	2.03	4	0.89	16.77	13.09	60	4	2.47	165.87	130.77	4	165.87	130.77
7	Pump Action Gun (paper cartridges)	2.45	2.73	2	0.94	4.23	3.48	60	3	2.50	31.74	26.12	3	23.80	19.59
8	Electric Multi Barrel Launcher (Tear Gas Shells / Stun Shells)	7.92	4.27	2	0.69	15.74	13.06	60	1	2.49	39.18	32.67	2	19.59	16.34
9	Water Canon (Primarily Area Denial)	4.65	14.41	4	0.93	61.99	50.51	1	1	7.73	479.31	378.36	1	119.83	94.59
10	Handheld MSGLs (Tear Gas Shells/ Stun Shells)	7.84	3.37	3	0.96	21.04	24.16	60	3	3.80	239.60	217.06	4	239.60	217.06
11	Handheld MSGLs (Rubber Balls/Batons/ Malodorants)	7.03	4.69	3	0.95	25.88	30.46	60	3	3.29	255.80	274.10	4	255.80	274.10
12	Handheld MSGLs (Dye-pepper, Dye, Pepper balls)	8.32	4.00	3	0.95	26.15	30.47	60	3	2.42	189.58	274.17	4	189.58	274.17
13	Traditional Weaponry with UBGLs (Tear Gas Shells/ Stun Shells)	5.87	0.91	3	0.91	4.00	4.30	60	8	3.16	100.97	108.52	4	100.97	108.52
14	Traditional Weaponry with UBGLs (Rubber Balls/Batons/ Malodorants)	7.71	0.89	3	0.91	5.21	5.43	60	8	3.69	153.84	129.98	4	153.84	129.98
15	Traditional Weaponry with UBGLs (Dye-pepper, Dye, Pepper balls)	7.81	0.71	3	0.92	4.25	5.43	60	8	2.76	93.90	130.92	4	93.90	130.92
16	Electrical shields	1.42	4.23	3	0.82	4.07	2.29	10	7	3.79	107.95	79.89	4	107.95	79.89
17	Electrical Batons	0.79	1.99	3	0.98	1.28	2.26	10	7	5.54	49.61	79.49	4	49.61	79.49
18	Mobile Jammers	Support Gadgetry													
19	UAVs														
20	Cameras														
21	Bullhorns														
22	High decible Audio devices														
23	Gas Masks														
24	Portable fire extinguishers														
25	Multi-Utility Belts														

	Readily available
	Not-readily available; Category-1
	Not-readily available; Category-2
	Proposed ammunitions/equipments
	Additional proposed gadgetry

Training / Ease of Adaptability of the equipment ('p' Range: 1-4)	
Range	Value
1	0.5
2	0.67
3	0.83
4	1

Table 1.2: Training/ Ease of adaptability

Deployability coefficient - difficult enclosed terrains ('c' Range: 1-4)	
Range	Value
1	0.25
2	0.5
3	0.75
4	1

Table 1.3: Deployability coefficient

30.1. In the above analysis, we have compared all available NLW ammunitions/equipments based on various parameters that determine the operational efficacy. For the purpose of clarity in the model, we have broadly made 2 categories to assess the impact of each of the weapons/ammunitions being described. The 2 categories are namely,

30.2. *Impact achieved by 1 policeman in 1 minute using particular equipment*: To calculate this, we have considered 4 key operational parameters to determine the impact,

30.2.1. Rioters effected per shot of the equipment (r) – for each equipment a lower bound, an upper bound and a most likely value for the number of rioters effected was determined and an appropriate statistical probability distribution curve (triangular distribution) was fit over the values.

30.2.2. Shots per minute (s) – for each equipment a lower bound, an upper bound and a most likely value for the number of shots that can be fired from the equipment in a minute was determined and again an appropriate statistical probability distribution curve (triangular distribution) was fit over the values.

30.2.3. Training/Ease of Adaptability of the equipment (p) – this corresponds to the ease with which police personnel can be trained to use a particular equipment as also its adaptability by the personnel. It has been divided into 4 separate ranges 1 to 4 with each range corresponding to a value between 0 and 1. The values are reflected in Table 1.2.

30.2.4. Accuracy Correction Factor (f) – this factor accounts for the inaccuracies with regards to the usage of various equipments/ammunitions. It takes into account the inaccuracies resulting out of factors other than training aspects. The value is between the range of 0 to 1 and a normal skew distribution is fitted over the range with skewness towards the perceived accuracy of each equipment/ammunition.

30.3. The Impact achieved is a function of the above 4 parameters and is calculated as a simple multiplication of the parameters. This impact is then run over the Monte-Carlo Simulation over 1000 iterations to generate the output curve for the impact achieved. The next column in the above table gives the Average Impact (I) by simply taking the mean of the impact values obtained over 1000 iterations.

30.4. *Impact achieved by a police platoon (assuming 30 policemen) over 1 engagement period:* Here an engagement period is defined as the small duration of engagement with the public during which a particular equipment is being used by the platoon. This impact is being calculated over 2 terrain conditions; normal open terrains and difficult enclosed terrains (broad classification of terrains). The parameters that go into assessing this impact are presented below,

30.4.1. *Ammunition carrying capacity*: This parameter is just an illustrative parameter (not being used in any calculations) that helps one builds an estimate around the number of ammunitions of particular type a platoon of around 30 policemen would typically carry.

The idea here is to gauge the availability of the particular ammunition. This is a fixed number as described in the table.

30.4.2. *Number of policemen using the equipment (n)*: This reflects the number of police personnel who would actually use the particular equipment. This number is usually very small for a large set of ammunitions as the equipments available within a single platoon to operate such equipments is very limited. This is a fixed number as described in the table.

30.4.3. *Single platoon level engagement time (t)*: This time as previously described is the small duration during which a particular platoon engages with the crowd while using that particular equipment. In particular, this time is not constant across the equipments. For a particular equipment, this time is being fitted as a triangular distribution with the values of minimum engagement time, maximum engagement time and a most likely engagement time.

30.5. Thus, the Impact achieved under normal open terrains is calculated as a product of Average Impact (I: obtained in previous section), number of policemen using the equipment (n) and the single platoon level engagement time (t). This impact is then run over the Monte-Carlo Simulation over 1000 iterations to generate the output curve for the impact achieved. The next column in the above table gives the Average Impact under normal open terrains (I') by simply taking the mean of the impact values obtained over 1000 iterations.

30.6. Deployability coefficient- difficult enclosed terrains (c) – This co-efficient essentially takes into account the ease of usage (deployability) of a particular equipment/ammunition in difficult terrains which typically have enclosed spaces, small by-lanes where certain set of equipments are hard to carry/maneuver. This coefficient is based on a range from 1 to 4 where each value corresponds to a value between 0 and 1. These values are reflected in table 1.3.

30.6.1. Hence, the Impact achieved under difficult enclosed terrains is calculated as a function of Average impact achieved (I') calculated above and the deployability coefficient (c) by simply taking a product of the two parameters. This impact is then run over the Monte-Carlo Simulation over 1000 iterations to generate the output curve for the impact achieved. The last column in the Table 1.1 gives the Average Impact under difficult enclosed terrains (I'') by simply taking the mean of the impact values obtained over 1000 iterations.

Equipment-wise Analysis of the Monte Carlo Simulation Results

31. Lathis (Bamboo/Polycarbonate Batons)

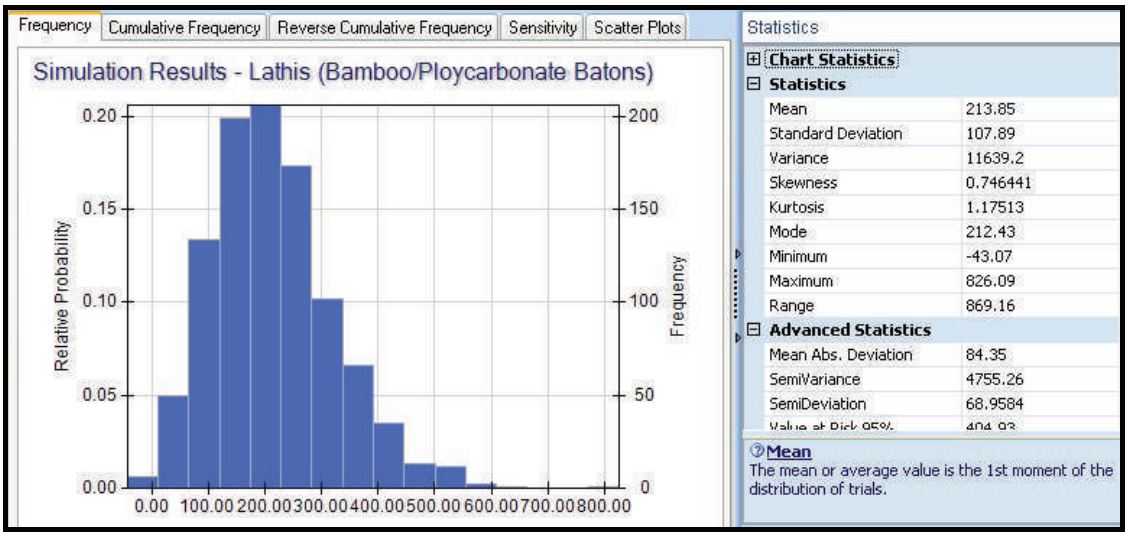
31.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 0-1-2. The shots per minute are a triangular distribution with a min-likely-max range of 2-3-5. Training/ease of adaptability for lathis is 4 (highest).

31.2. Accuracy correction factor for lathis is a skew-normal distribution (0-1) with skewness towards 0.9 reflecting high accuracy of lathis. The Average Impact achieved is 3.05 rioters per policemen per minute.

31.3. Assuming around 14 policemen are available to use a lathi in case of an issued order, also a single platoon level engagement time for lathis is assumed to be a triangular distribution with a min-likely-max range of 3-5-7 minutes. This gives an Average Impact achieved by a platoon equal to 212 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

31.4. The deployability coefficient of lathis is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time remains the same at 212 rioters.

Simulation graph



32. Gas Gun (Tear Gas Shells / Stun Shells/ Rubber Bullet/ Multi Baton Cartridges)

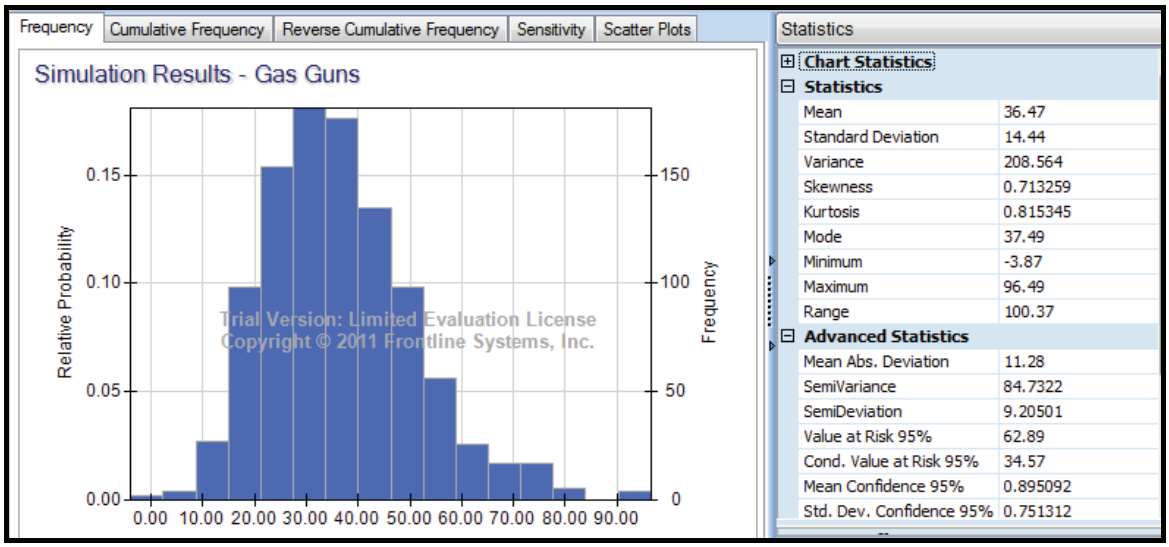
32.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 3-6-10. The shots-per-minute is a triangular distribution with a min-likely-max range of 1-2-3. Training/ease of adaptability for gas guns is 3 (relatively less).

32.2. Accuracy correction factor for gas guns is a skew normal distribution (0-1) with skewness towards 0.6 reflecting low accuracy of gas guns. The Average Impact achieved is 8.08 rioters per policemen per minute.

32.3. Assuming only 2 policemen in a platoon are available to use a gas gun in case of an issued order, also a single platoon level engagement time for gas guns is assumed to be a triangular distribution with a min-likely-max range of 2-3-4 minutes. This gives an Average Impact achieved by a platoon equal to 48.40 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

32.4. The deployability coefficient of gas guns is assumed to be 3 (relatively less) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 36.30 rioters.

Simulation graph



33. Anti-Riot Gun (Plastic Pellets)

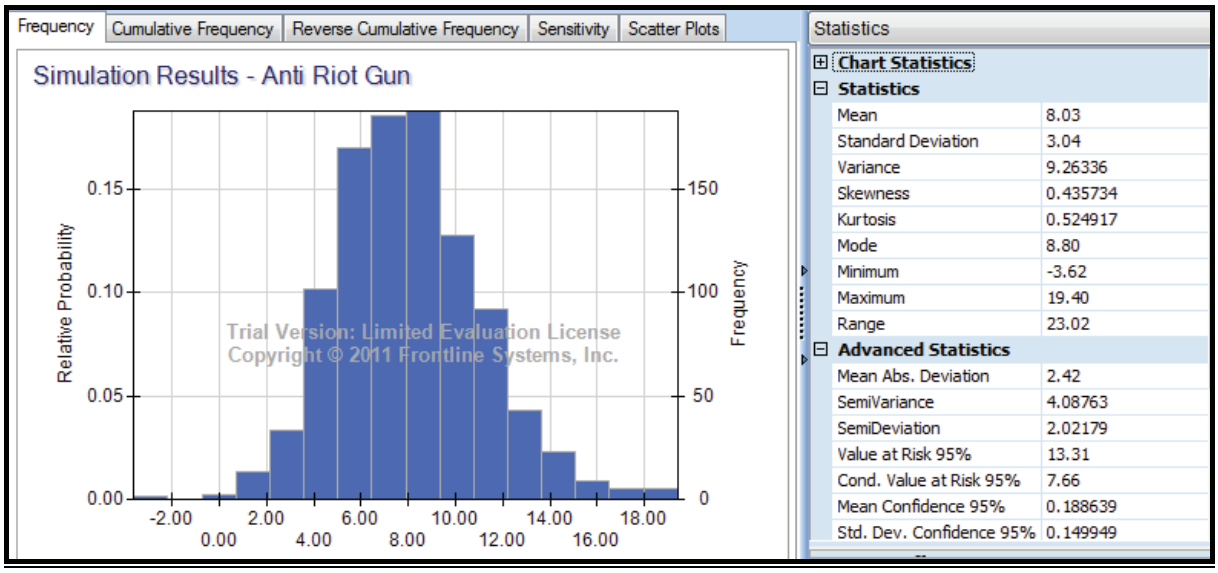
33.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 2-2.5-4. The shots-per-minute is a triangular distribution with a min-likely-max range of 1-2-3. Training/ease of adaptability for anti-riot guns is 1 (very low).

33.2. Accuracy correction factor for anti-riot guns is a skew normal distribution (0-1) with skewness towards 0.3 reflecting very low accuracy of anti-riot guns. The Average Impact achieved is 1.79 rioters per policemen per minute.

33.3. Assuming only 2 policemen in a platoon are available to use an anti-riot gun in case of an issued order, also a single platoon level engagement time for anti riot guns is assumed to be a triangular distribution with a min-likely-max range of 2-3-4 minutes. This gives an Average Impact achieved by a platoon equal to 10.71 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

33.4. The deployability coefficient of anti-riot guns is assumed to be 3 (relatively less) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to around 9 rioters.

Simulation Graph



34. Traditional weaponry 303, SLR, INSAS (Plastic Bullets)

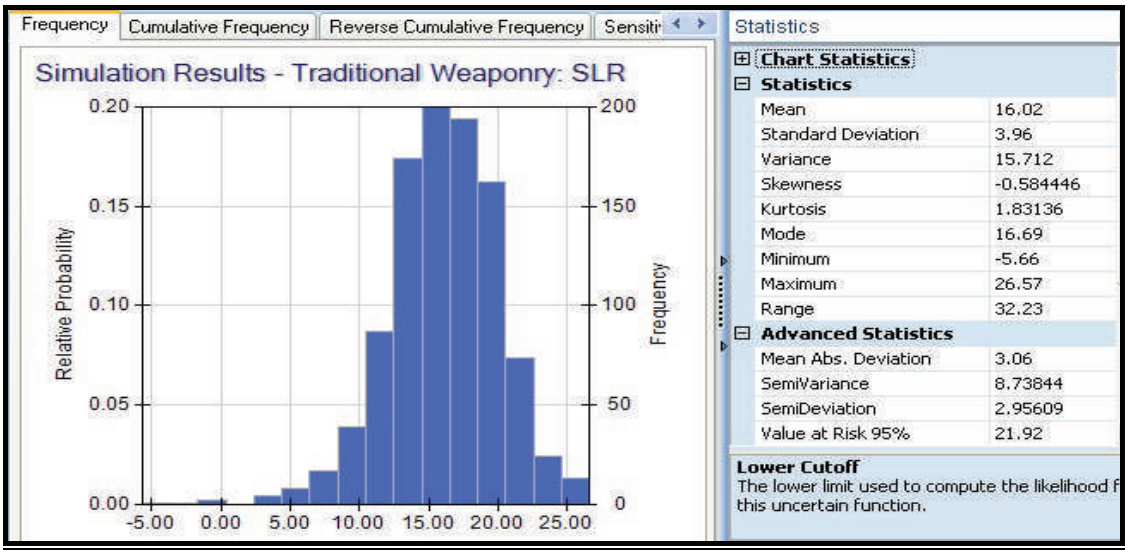
34.1. The rioters affected per shot are a skew normal distribution (0-1) with skewness towards 0.95. The shots-per-minute is a triangular distribution with a min-likely-max range of 2-2.5-3. Training/ease of adaptability for this weaponry for plastic bullets is 2 (quite low).

34.2. Accuracy correction factor for traditional weaponry is a skew normal distribution (0-1) with skewness towards 0.75 reflecting reasonable accuracy of traditional weaponry. The Average Impact achieved is 1.33 rioters per policemen per minute.

34.3. Assuming around 08 policemen in a platoon are available to use the traditional weaponry in case of an issued order, also a single platoon level engagement time for plastic bullets is assumed to be a triangular distribution with a min-likely-max range of 1-1.5-2 minutes. This gives an Average Impact achieved by a platoon equal to 16 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

34.4. The deployability coefficient of traditional weaponry is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 16 rioters.

Simulation Graph



35. Hand Grenade (Tear Gas, Stun, Pepper)

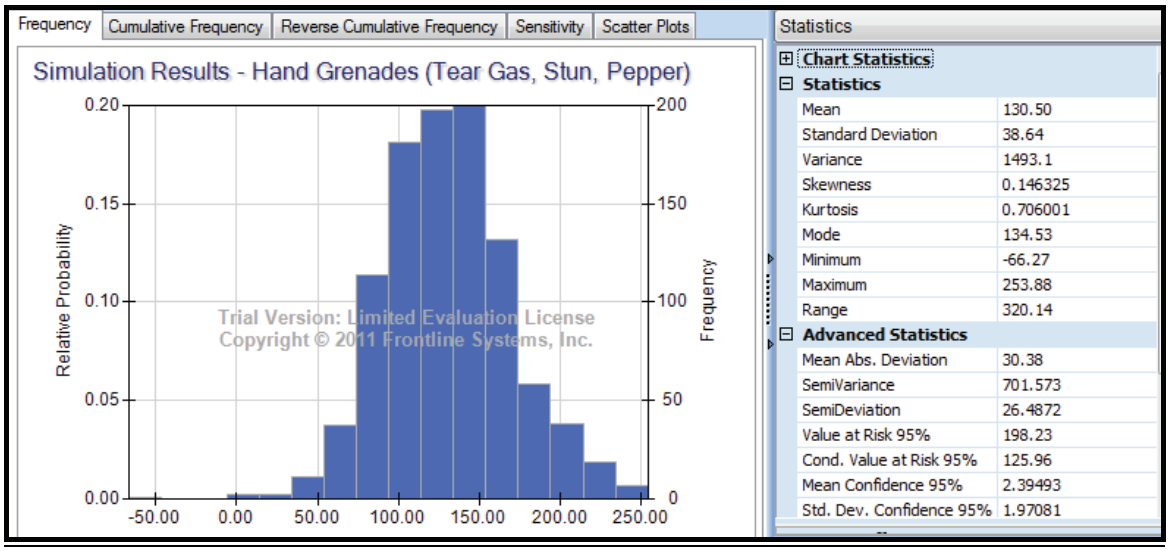
35.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 6-8-10. The shots-per-minute is a triangular distribution with a min-likely-max range of 1-2-3. Training/ease of adaptability for hand grenades is 4 (quite high).

35.2. Accuracy correction factor for hand grenades is a skew normal distribution (0-1) with skewness towards 0.7 reflecting reasonable accuracy of hand grenades. The Average Impact achieved is 13.05 rioters per policemen per minute.

35.3. Assuming only 4 policemen in a platoon are available to use a hand grenade in case of an issued order, also a single platoon level engagement time for hand grenades is assumed to be a triangular distribution with a min-likely-max range of 2-2.5-3 minutes. This gives an Average Impact achieved by a platoon equal to 130.50 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

35.4. The deployability coefficient of hand grenades is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 130.50 rioters.

Simulation Graph



36. Hand Grenades (Dye - doesn't incapacitate)

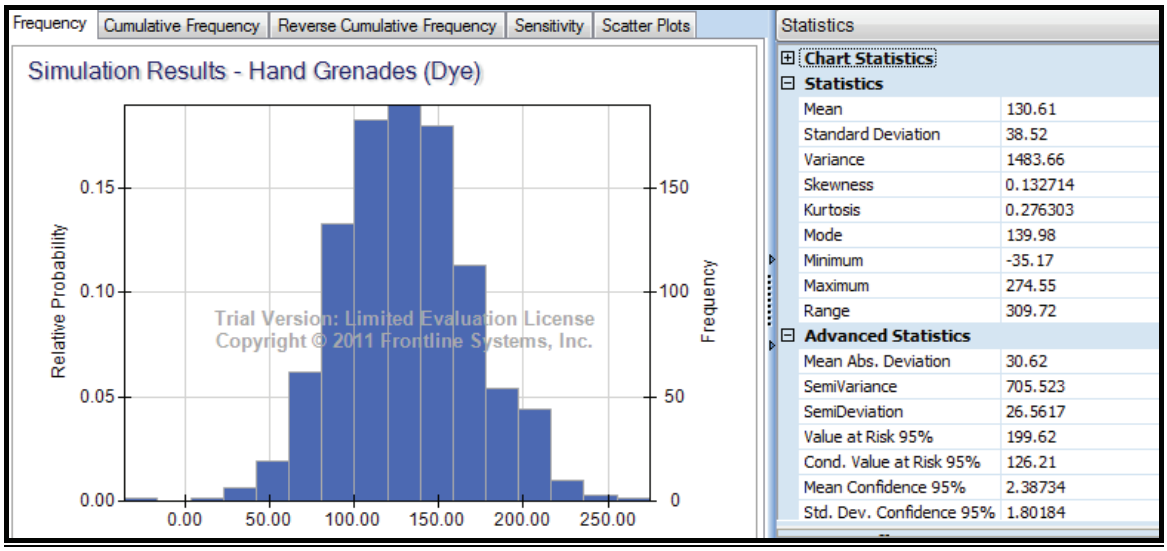
36.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 6-8-10. The shots-per-minute is a triangular distribution with a min-likely-max range of 1-2-3. Training/ease of adaptability for hand grenades is 4 (quite high).

36.2. Accuracy correction factor for hand grenades is a skew normal distribution (0-1) with skewness towards 0.7 reflecting reasonable accuracy of hand grenades. The Average Impact achieved is 13.05 rioters per policemen per minute.

36.3. Assuming only 4 policemen in a platoon are available to use a hand grenade in case of an issued order, also a single platoon level engagement time for hand grenades is assumed to be a triangular distribution with a min-likely-max range of 2-2.5-3 mins. This gives an Average Impact achieved by a platoon equal to 130.50 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

36.4. The deployability coefficient of hand grenades is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 130.50 rioters.

Simulation Graph



37. Pump Action Gun (paper cartridges)

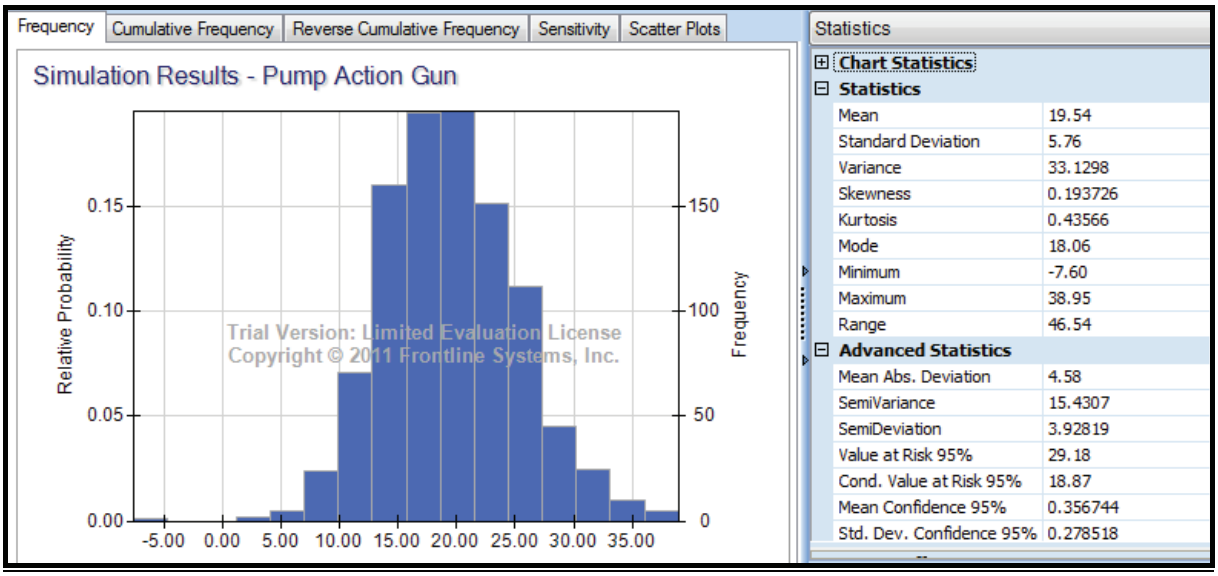
37.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 1-2-3. The shots-per-minute is a triangular distribution with a min-likely-max range of 2-3-4. Training/ease of adaptability for pump action guns is 2 (quite low).

37.2. Accuracy correction factor for pump action guns is a skew normal distribution (0-1) with skewness towards 0.8 reflecting reasonably high accuracy of pump action guns. The Average Impact achieved is 3.48 rioters per policemen per minute.

37.3. Assuming only 3 policemen in a platoon are available to use an anti riot gun in case of an issued order, also a single platoon level engagement time for anti riot guns is assumed to be a triangular distribution with a min-likely-max range of 2-2.5-3 mins. This gives an Average Impact achieved by a platoon equal to 26.06 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

37.4. The deployability coefficient of anti riot guns is assumed to be 3 (relatively less) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 19.54 rioters.

Simulation Graph



38. Electric Multi Barrel Launcher (Tear Gas Shells / Stun Shells)

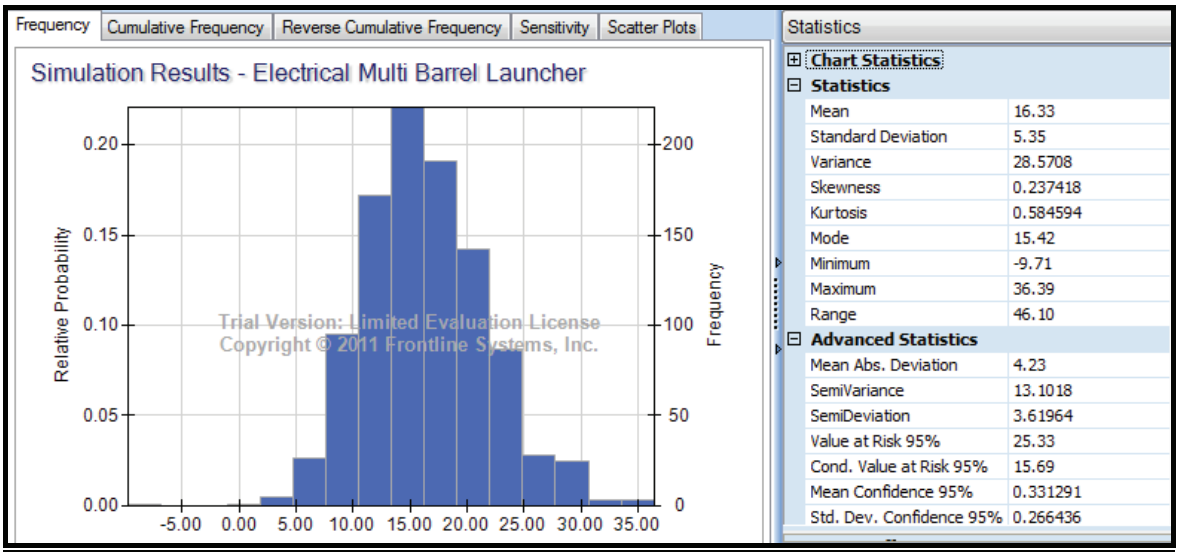
38.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 3-6-10. The shots per minute are a triangular distribution with a min-likely-max range of 3-4-5. Training/ease of adaptability for electric multi barrel launchers is 2 (quite low).

38.2. Accuracy correction factor for electric multi barrel launchers is a skew normal distribution (0-1) with skewness towards 0.6 reflecting low accuracy of electric multi barrel launchers. The Average Impact achieved is 13.07 rioters per policemen per minute.

38.3. Assuming only 1 policeman/ electric multi barrel launchers in a platoon is available for use in case of an issued order, also a single platoon level engagement time for electric multi barrel launchers is assumed to be a triangular distribution with a min-likely-max range of 2-2.5-3 mins. This gives an Average Impact achieved by a platoon equal to 32.66 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

38.4. The deployability coefficient of electric MBLs is assumed to be 2 (quite low) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 16.33 rioters.

Simulation Graph



39. Water Canon (Primarily Area Denial)

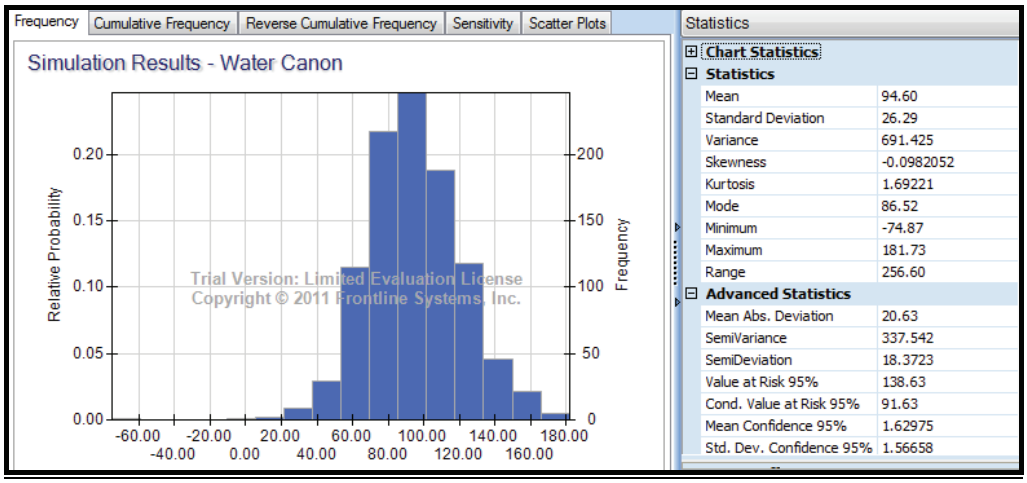
39.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 3-4-5. The shots-per-minute is a triangular distribution with a min-likely-max range of 10-15-20. Training/ease of adaptability for water cannons is 4 (very high).

39.2. Accuracy correction factor for water cannons is a skew normal distribution (0 to 1) with skewness towards 0.75 reflecting reasonably high accuracy of water cannons. The Average Impact achieved is 50.43 rioters per policemen per minute.

39.3. Assuming only 1 policeman in a platoon are available to use a water cannons in case of an issued order, also a single platoon level engagement time for water cannons is assumed to be a triangular distribution with a min-likely-max range of 5-7.5-10 minutes. This gives an Average Impact achieved by a platoon equal to 378.40 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

39.4. The deployability coefficient of water cannons is assumed to be 1 (very low) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 94.60 rioters.

Simulation Graph



40. Handheld MSGLs (Multi Shell Grenade Launchers - Tear Gas Shells/ Stun Shells)

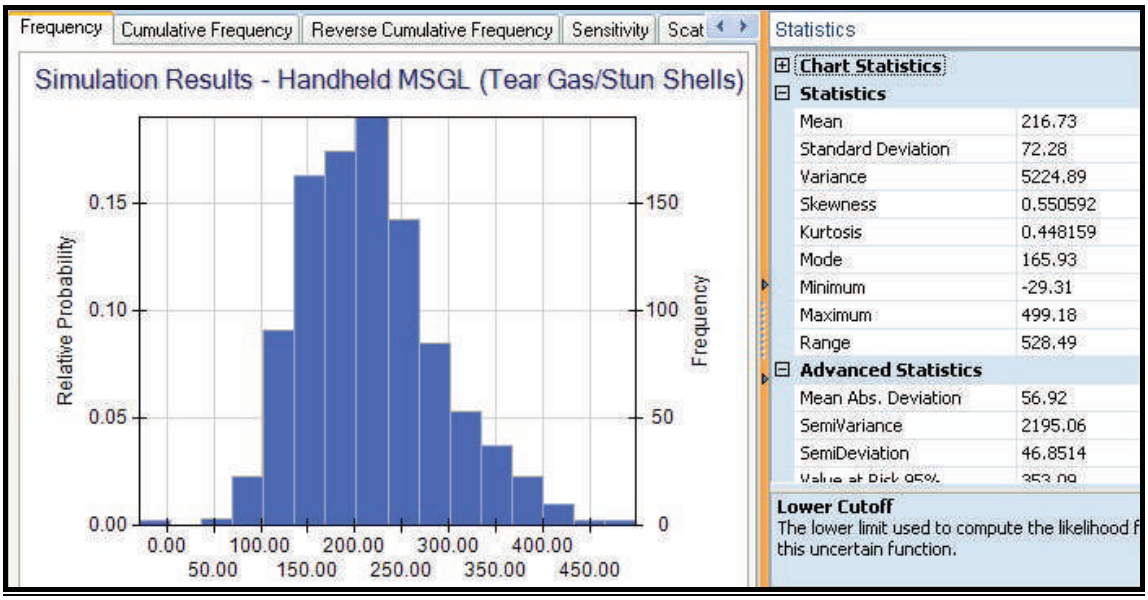
40.1. The rioters affected per shot are a triangular probability distribution with a min-likely-max range of 3-6-10. The shots-per-minute is a triangular distribution with a min-likely-max range of 3-5-7. Training/ease of adaptability for handheld MSGLs is 3 (relatively less).

40.2. Accuracy correction factor for handheld MSGLs is a skew normal distribution (0-1) with skewness towards 0.9 reflecting high accuracy of handheld MBLs. The Average Impact achieved is 24.13 rioters per policemen per minute.

40.3. Assuming 3 policemen in a platoon are available to use a handheld MSGL in case of an issued order, also a single platoon level engagement time for handheld MSGL is assumed to be a triangular distribution with a min-likely-max range of 2-3-4 minutes. This gives an Average Impact achieved by a platoon equal to 216 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

40.4. The deployability coefficient of handheld MSGLs is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 216 rioters.

Simulation Graph



41. Handheld MSGLs (Rubber Balls/Batons/Malodorants)

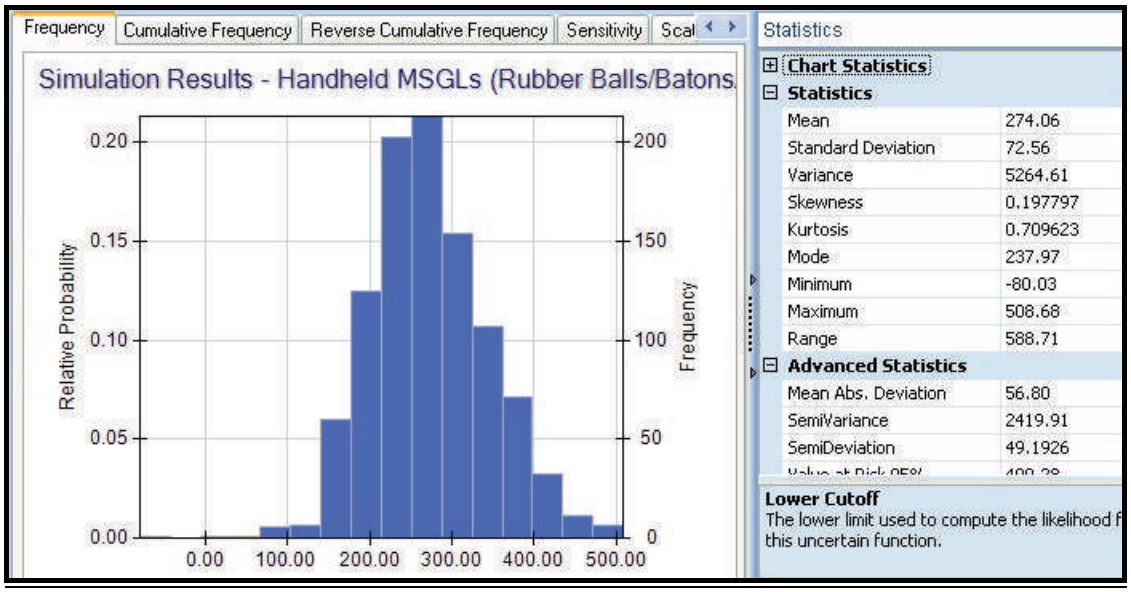
41.1. The rioters affected per shot are a triangular probability distribution with a min-likely-max range of 6-8-10. The shots-per-minute is a triangular distribution with a min-likely-max range of 3-5-7. Training/ease of adaptability for handheld MSGLs is 3 (relatively less).

41.2. Accuracy correction factor for handheld MSGLs is a skew normal distribution (0-1) with skewness towards 0.9 reflecting high accuracy of handheld MSGLs. The Average Impact achieved is 30.45 rioters per policemen per minute.

41.3. Assuming 3 policemen in a platoon are available to use a handheld MSGL in case of an issued order, also a single platoon level engagement time for handheld MSGLs is assumed to be a triangular distribution with a min-likely-max range of 2-3-4 minutes. This gives an Average Impact achieved by a platoon equal to 274 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

41.4. The deployability coefficient of handheld MSGLs is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 274 rioters.

Simulation Graph



42. Handheld MSGLs (Dye-pepper, Dye, Pepper balls)

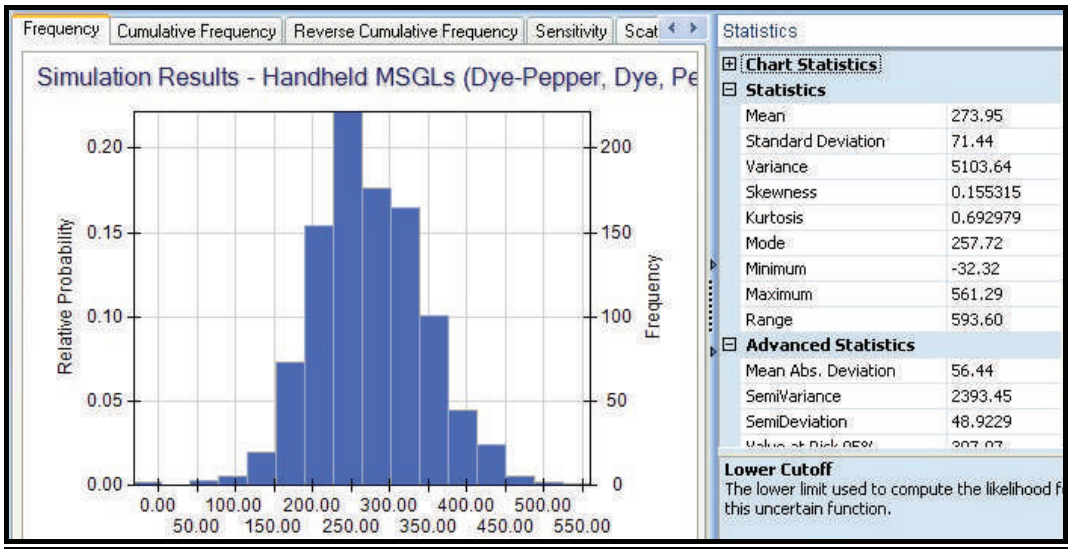
42.1. The rioters affected per shot are a triangular probability distribution with a min-likely-max range of 6-8-10. The shots-per-minute is a triangular distribution with a min-likely-max range of 3-5-7. Training/ease of adaptability for handheld MSGLs is 3 (relatively less).

42.2. Accuracy correction factor for handheld MSGLs is a skew normal distribution (0-1) with skewness towards 0.9 reflecting high accuracy of handheld MSGLs. The Average Impact achieved is 30.44 rioters per policemen per minute.

42.3. Assuming 3 policemen in a platoon are available to use a handheld MSGL in case of an issued order, also a single platoon level engagement time for handheld MSGLs is assumed to be a triangular distribution with a min-likely-max range of 2-3-4 minutes. This gives an Average Impact achieved by a platoon equal to 274 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

42.4. The deployability coefficient of handheld MSGLs is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 274 rioters.

Simulation Graph



43. Traditional Weaponry with UBGLs (Tear Gas Shells/ Stun Shells)

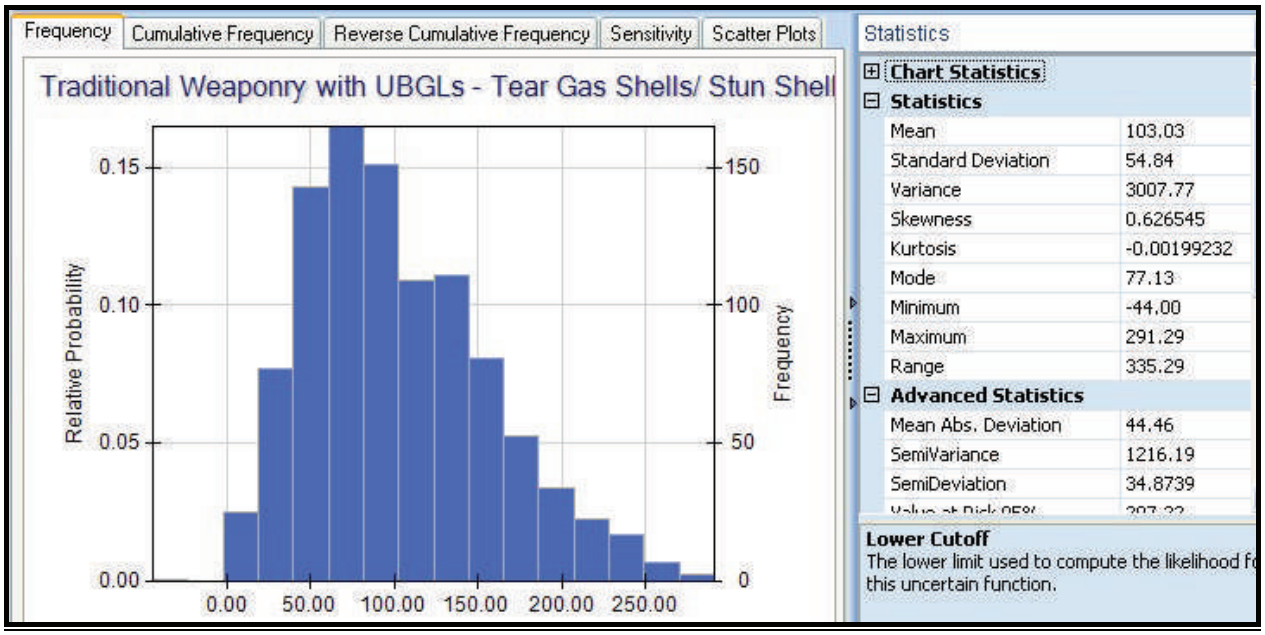
43.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 3-6-10. The shots-per-minute is a triangular distribution with a min-likely-max range of 0-1-2. Training/ease of adaptability of this weaponry for Under Barrel Grenade Launchers is 3 (reasonably good).

43.2. Accuracy correction factor for traditional weaponry is a skew normal distribution (0-1) with skewness towards 0.70 reflecting reasonable accuracy of traditional weaponry. The Average Impact achieved is 4.28 rioters per policemen per minute.

43.3. Assuming around 08 policemen in a platoon are available to use the traditional weaponry in case of an issued order, also a single platoon level engagement time for traditional weaponry is assumed to be a triangular distribution with a min-likely-max range of 2-3-4 minutes. This gives an Average Impact achieved by a platoon equal to 103 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

43.4. The deployability coefficient of traditional weaponry is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 103 rioters.

Simulation Graph



44. Traditional Weaponry with UBGLs (Rubber Balls/Batons/ Malodorants)

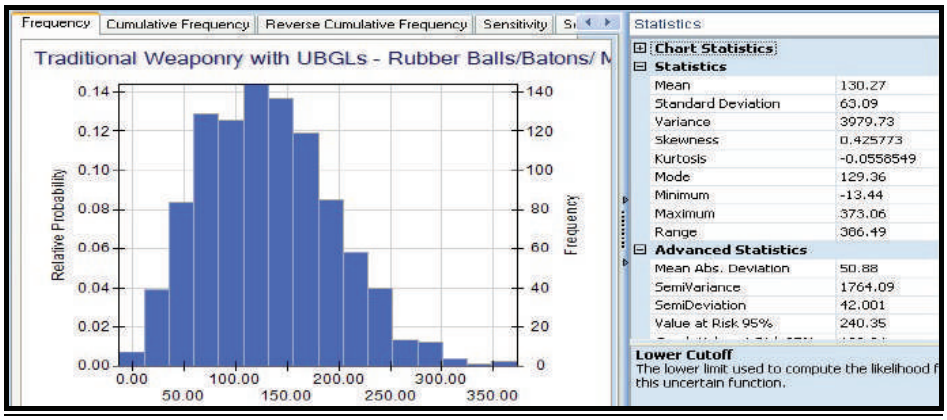
44.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 6-8-10. The shots-per-minute is a triangular distribution with a min-likely-max range of 0-1-2. Training/ease of adaptability of this weaponry for Under Barrel Grenade Launchers is 3 (reasonably good).

44.2. Accuracy correction factor for traditional weaponry is a skew normal distribution (0-1) with skewness towards 0.70 reflecting reasonable accuracy of traditional weaponry. The Average Impact achieved is 5.44 rioters per policemen per minute.

44.3. Assuming around 08 policemen in a platoon are available to use the traditional weaponry in case of an issued order, also a single platoon level engagement time for traditional weaponry is assumed to be a triangular distribution with a min-likely-max range of 2-3-4 minutes. This gives an Average Impact achieved by a platoon equal to 130 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

44.4. The deployability coefficient of traditional weaponry is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 130 rioters.

Simulation Graph



45. Traditional Weaponry with UBGLs (Dye-pepper, Dye, Pepper balls)

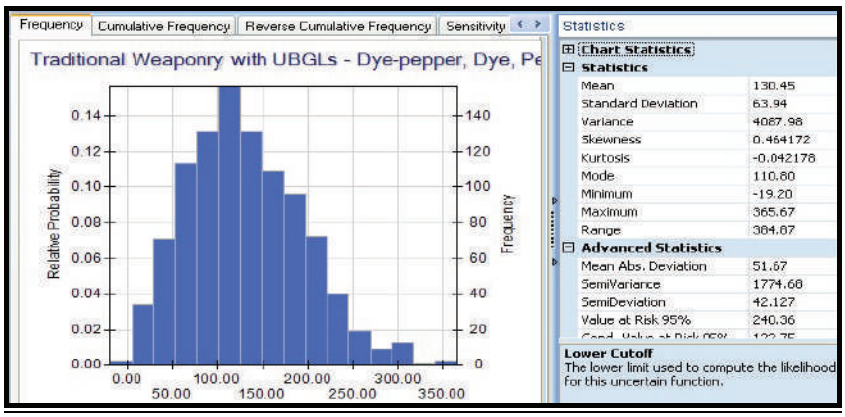
45.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 6-8-10. The shots-per-minute is a triangular distribution with a min-likely-max range of 0-1-2. Training/ease of adaptability of this weaponry for Under Barrel Grenade Launchers is 3 (reasonably good).

45.2. Accuracy correction factor for traditional weaponry is a skew normal distribution (0-1) with skewness towards 0.70 reflecting reasonable accuracy of traditional weaponry. The Average Impact achieved is 5.45 rioters per policemen per minute.

45.3. Assuming around 08 policemen in a platoon are available to use the traditional weaponry in case of an issued order, also a single platoon level engagement time for traditional weaponry is assumed to be a triangular distribution with a min-likely-max range of 2-3-4 minutes. This gives an Average Impact achieved by a platoon equal to 130 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

45.4. The deployability coefficient of traditional weaponry is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 130 rioters.

Simulation Graph



46. Electrical shields

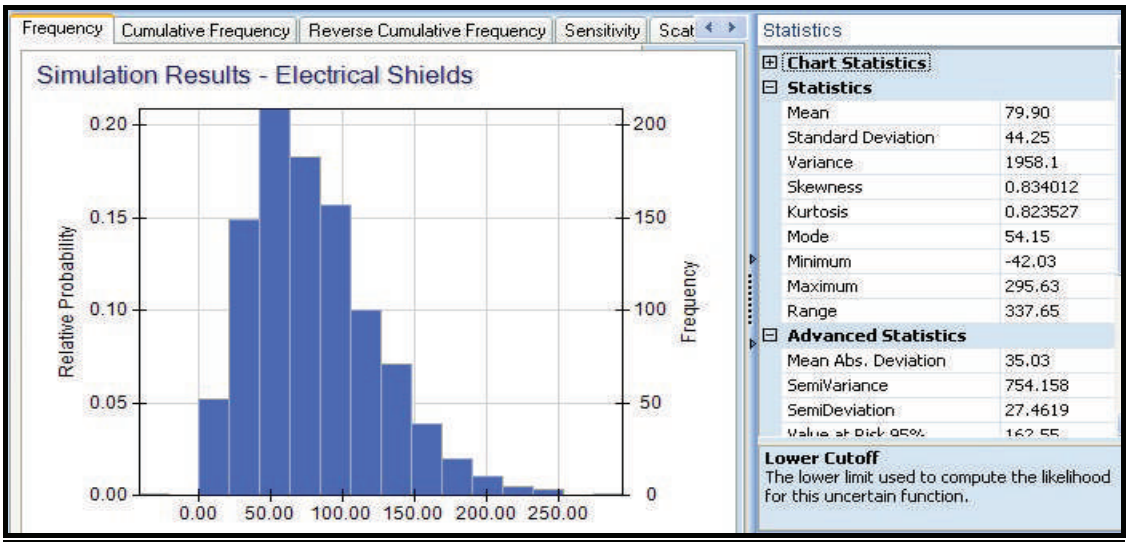
46.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 0-1-2. The shots-per-minute is a triangular distribution with a min-likely-max range of 1-3-5. Training/ease of adaptability for electric shields is 3 (relatively less).

46.2. Accuracy correction factor for electric shields is a skew normal distribution (0-1) with skewness towards 0.9 reflecting high accuracy of electric shields. The Average Impact achieved is 2.29 rioters per policemen per minute.

46.3. Assuming 07 policemen in a platoon are available to use electric shields in case of an issued order, also a single platoon level engagement time for electric shields is assumed to be a triangular distribution with a min-likely-max range of 3-5-7 minutes. This gives an Average Impact achieved by a platoon equal to 80 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

46.4. The deployability coefficient of electric shields is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 80 rioters.

Simulation Graph



47. Electrical Batons

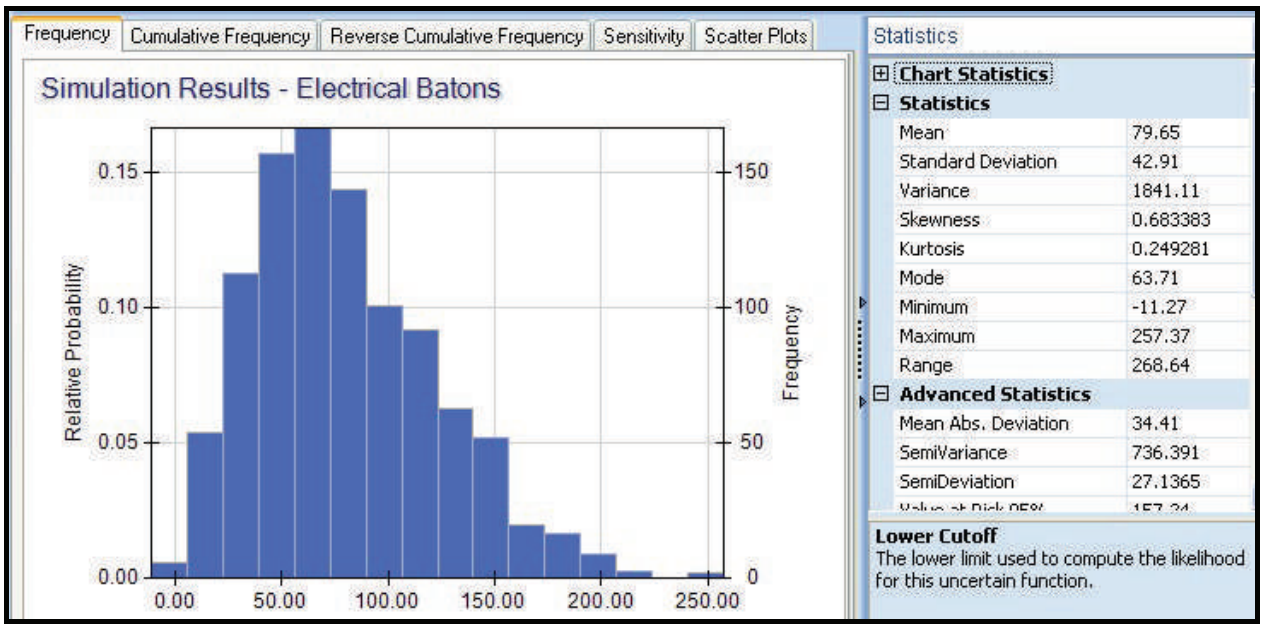
47.1. The rioters affected per shot are a triangular distribution with a min-likely-max range of 0-1-2. The shots-per-minute is a triangular distribution with a min-likely-max range of 1-3-5. Training/ease of adaptability for electric batons is 3 (relatively less).

47.2. Accuracy correction factor for electric batons is a skew normal distribution (0-1) with skewness towards 0.9 reflecting high accuracy of electric shields. The Average Impact achieved is 2.29 rioters per policemen per minute.

47.3. Assuming 07 policemen in a platoon are available to use electric batons in case of an issued order, also a single platoon level engagement time for electric batons is assumed to be a triangular distribution with a min-likely-max range of 3-5-7 minutes. This gives an Average Impact achieved by a platoon equal to 80 rioters over a single platoon level engagement time. This Impact is considering normal open terrain conditions.

47.4. The deployability coefficient of electric batons is assumed to be 4 (very high) and subsequently the Average Impact achieved by a platoon in difficult enclosed terrains over a single platoon level engagement time comes to 80 rioters.

Simulation Graph



Part 9: Training

Training

1. Like every other technology/ weapon system, it is the man who operates the system that makes the difference. Therefore, proper training and development of crowd behavior based tactical drills, concept of operations and rules of engagement take greater significance in successfully handling crowds and riot situations. These would be generally based upon the scenarios which vary from one location to the other. Kashmir, for instance, may be posed with an anti-state militant led violence in the backdrop of civilian riots. Gujarat may face a case of communal violence with political underpinnings in the backdrop of sensitive religious sentiments. Andhra Pradesh faces, on a daily basis, politically fuelled separate state (Telangana) agitations by student-led unions. Manipur, on the other hand, showcases a setting where it is predominantly women led agitations, often leaving the law enforcement agencies with few choices.

Specialized teams for Riot-Control Operations

2. Specialized riot management training needs to be imparted to the riot control teams. Various State Police and CAPFs have evolved some best practices in this area. Training modules are to be built on these and imparted at various levels of the forces. In addition, S.W.A.T teams (Special Weapons and Tactics) who specialize in riot-control and handling of less lethal weapons need to be created through extensive training. Officers of S.W.A.T teams play a specialized role, especially in crisis situation. SWAT teams would comprise officers with an excellent service record, physical fitness, psychological mindset that ensures their suitability for service in a high-stakes environment. Emotional stability, physical courage and the ability to make quick decisions under stress form other key characteristics. Because SWAT units operate as a close-knit team, strong communication and interpersonal skills are essential. Many states have SWAT teams operating for certain vital functions in India under various names. For eg: SWAT teams of Punjab, Hyderabad, Quick Reaction Teams (QRTs) of Tamil Nadu, SWAT team of Agra (for terrorist and emergency attack situations). SWAT teams for riot management will have to be trained in a wide variety of tactics, specialized less-lethal weapons, close-knit small team operations, emotional tolerance, emergency procedures including administering first aid and other medical requirements.

Training Modules for Riot Control

3. Training should include, but not limit to, the following key areas.

   3.1.Physical fitness and Mental Alertness

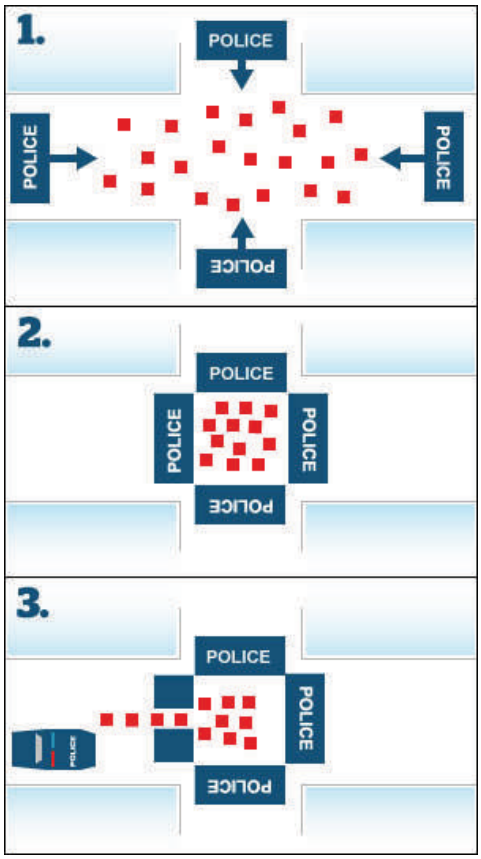
3.2. *Operational tactics*: Operational tactics and mental framework required to counter these scenarios effectively would encompass a structured way of breaking the mental barriers and sensitising the constabulary and the leadership at all levels about the implications and governance hurdles. Buy-in at all levels is a game-changer in all success stories. In short, training at all levels not only on the operational and technical aspects of a weapon, but also on the aspects of psychology, strategic aspirations, human rights, gender sensitivities and legal aspects is a must. As reinforced by the subject matter specialists during the interviews, training on various formations is essential.

3.3. *Five basic riot control field formations* (Line, Wedge, Echelon, Diamond and Circle) – Field research validates the fact that Control force formations, when properly employed and executed against a crowd, are some of the most practical methods of crowd control. However, it is to be noted that formations are more effective in urban areas than in open areas such as fields or parks.

3.4. Usage of Vehicle and Field formations in tandem

3.5. *Specific tactics like Kettling*: Based on the prior riot control experience and crowd psychology, police forces of various countries have come up with operational tactics that are effective. Subject Matter Specialists from Europe and US have revealed that operational tactics like kettling often serve the purpose with usage of minimal force. Kettling is Kettling is a police tactic to control crowds where officers surround a group of people on all sides. Over the past 15 years, especially in Europe, the Police forces have found this to be an effective way to "take the steam out of a potentially violent situation"38. In some instances, police direct protesters toward a predetermined location. As the crowd grows, the police presence tightens around them. Police control access to the location and decide how to allow people to leave, often through a predetermined spot. The diagram below shows the kettling tactic at work.

[38] http://www.cbc.ca/m/touch/news/canada/story/2012/05/24/f-kettling.html



Stage 1: As the Police observe the transformation of crowd into violent crowd, they start surrounding the crowd from all the directions.

Stage 2: As the situation continues to get tense, they start tightening the presence around the crowd from all the directions.

Stage 3: Police control access to the location and decide how to allow people to leave - through a predetermined spot. They have a better control and surveillance on the crowd that is leaving.

3.5.1. However, there are controversies in using this tactic as time kettling can last long which may lead to lack of access to water, food and toilets. However, in March 2012, the European Court of Human Rights ruled that the 2001 kettling in London was "least intrusive and most effective" tactic available to officers.

3.6. Technical training on usage of weapon: this shall include operating the weapon, technical considerations like Firing angle versus range considerations, weapon handling and maintenance, concentration/ intensity of weapon/ munition to be used. For eg: amount of tear gas per 500 sq yards of area or amount of Oleoresin based Chilli grenades for a crowd of 5000 people.

3.7. *Class room training on*:

3.7.1. Training on essential laws and conventions - Awareness about Legal and human Rights issues

3.7.1.1. Dealing with sensitive mobs – women and children, communal riots, emotionally charged mobs

3.7.2. Dealing with well prepared mobs and mobs with past history of rioting

3.7.3. Soft skills – negotiation skills, community policing aspects, persuasion techniques through sense of humour etc.

3.7.4.Motivational aspects.

3.7.5.Specialised Stress Management modules

Development of a training plan

4. Planning and preparation is essential for training. The training plan should take into consideration the nature and intensity of riots that occur in the country, the behavior and sentiments of the crowd, preparedness and resolve of the crowd, anti-riot gear that are used to handle these situations, understanding the crowd and their means of rioting (women and children in the fore-front or throwing burning kangries at the armed personnel etc).The objective of usage of the less lethal weapons should be laid down at the very first itself. A plan that ensures that training focuses on all the necessary elements of riot control should be worked out. This shall include focus on aspects like:

    - Instructors
    - Mock drills – both Individual and group drills
    - Leaders
    - Equipment
    - Weapons
    - Munition
    - Live-fire range exercises
    - Qualification and familiarization
    - High Speed Field Training exercises (these would simulate real life high stress scenarios)
    - Scenario modeling

Crowd-control training modules

5. Crowd control involves not only the management of riot when it happens, but also preparation and planning prior to the occurrence. Thus, crowd control training involves various levels of officers. While more emphasis would be on operational tactics and technical training for the constabulary, as we go up the hierarchy, class room training finds importance increasingly. A key element of class room training should cater to planning of riot control operations and strategizing the moves with a holistic picture. This requires mental simulations of these scenarios and brainstorming in a classroom setting. Aspects of coordination of joint operations (Riot control teams/ Reserve Police and L&O), interface with the local civil authorities etc will form part of this process. This would also involve detailed analysis of what data, equipment and operational training is required, how to conduct survey of areas and routes, preparation of plans for probable areas of disturbance etc.

Stand-off distances

6. Training the riot-control teams to engage at increased distances effectively will not only reduce the vulnerability of the Police man to the casualties, but also increase the morale and confidence levels. With advances in less-lethal weapons, it is possible to increase the effective standoff distances to 15 to 100 meters between the crowd and the control force formation and minimize direct contact with the crowd. 39However the riot control teams (State IR/ AR battalions, RAF and other units who would perform riot control operations) need to be trained to effectively use the less-lethal weapons to achieve this.

Mock drills

7. Inputs from senior officers of various states suggest that mock drills are the most effective way to prepare the troops that face the mob. J&K Police for instance, have the mock drills as part of their routine activity where the freshly inducted battalions undergo mock drills that simulate the real environment in J&K when a riot happens. The drill involves handling emotionally charged rioters with almost zero stand-off distances, heavy stone pelting, working jointly with the CRPF units etc. Field interactions at Baramullah range of Jammu and Kashmir reveal that joint exercises with CRPF units form a regular exercise for the troops.

Need for Refresher courses

8. The need for refresher courses has been acknowledged at all levels of Police forces including the Central Police forces CRPF, SSB and BSF. This is essential as the organization at large undergoes a shift in policy or means to achieve the goal. For eg: In Kashmir L&O is superimposed with terrorism. More often, the L&O situation is separatist/ militant driven with armed militants or anti-state actors hidden behind the violent mobs. Preparing and responding to such crowds is challenging and driven by uncertain repercussions. The J&K Police (and CRPF) face hostile crowds (that include women and children) who indulge not only in skillful stone pelting but also in attempts to provoking the police through abuses, throwing burning kangries, hurting national sentiments etc. during agitations. The J&K police has transformed in the 1970s from a lathi wielding role (a typical L&O role) to a military/ counter-terrorist and counter extremist operations (lathi to AK 47 as a practice) due to the then prevailing conditions in the state.

9. Today J&K police is in the pursuit of reverting to the L&O mindset to maintain peace and stability with harmony and good relations with the people. This shift towards the old system is in the wake of changed political scenario, policy changes, government initiatives and many other interlinked variables. In this entire process, the mindset of an organization has to undergo significant transformation. This required focused training and systemic mind set changes that had

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39 https://rdl.train.army.mil/catalog/view/100.ATSC/C52D923F-D529-43C8-B2FE-EE4FA86552C3-1274309810835/3-19.15/Chapter6.htm

to be gradually built in the men. Changing the mental framework of the personnel on ground from anti-militant operations to typical law enforcement role posed many challenges. Today, new battalions are being trained for L&O; the old battalions which need to re-orient themselves undergo refresher courses including new weapon handling, multi tasking, human relations/L&O which are aimed at re-instating core and basic policing in them.

Training the Trainers – Partnership model as a force multiplier:

10. Currently, Tear Smoke Unit of BSF, Tekanpur undertakes training courses for the trainers who in turn are required to train the riot control units on the products of TSU. However, these training programs, which limit to a batch size of 60, are oversubscribed and the demand is not being met. There is a need for augmenting the capacity of training infrastructure. One of the practical and cost-effective ways of doing this is through a Public-Private Partnership.

11. In the western countries, training institutes run by private professionals (who often are retired law enforcement officers) offer courses on various policing aspects including crowd control. By developing an ecosystem of this kind of industry around every Police Training School (PTC) and every Police Academy, training could be delivered much effectively with minimized cost, effort and coordination issues. Former Police officials and retired professionals from every state could be made part of the initiative with industry (the manufacturers of less-lethal weapons like Tear Smoke Unit, Ordnance factories, other private companies) also as one of the stakeholders. The State Police Welfare associations, retired police welfare associations could play an active role in this initiative. Technical training obligations could be built into the weapon/ ammunition contracts itself. Ability to not only manufacture and supply good quality and effective equipment, but also to train the forces/ user agencies, should form one of the key criteria in awarding a contract to a less-lethal weapon/ munition manufacturer.

12. In summary, training needs to be augmented through awareness programs, confidence building measures, workshops that deal with the technicalities of the weapon and to sensitise the forces to the policy of the government, importance of using the less-lethal weapons, while also being taught the operational tactics of crowd control during the worst situations.

Annexure

Excerpts from Justice P. Jaganmohan Reddy Commission Report on Inquiry into Ahmedabad Riots of 1969

The commission did not feel satisfied with the handling of the disturbances by the police. "The failure of the police in these riots to give effective protection to the citizens in the entire area was due to their inability to anticipate the serious reactions of the Jagannath temple incident over a fairly large area. The Commission listed the following lapses on the part of the police:

1. Failure to round up and arrest miscreants, trouble makers and other political workers and communal minded persons who were creating trouble and spreading rumours;
2. The ineffective manner of counter-acting rumours;
3. Ineffective patrolling and lack of timely information of mobs poised to create riots;
4. The breakdown of the Special Branch to get information;
5. The hesitancy and delay in imposing curfew, and the ineffective implementation of it after it was imposed;
6. The reluctance and hesitation to use effective force and firepower on the crowds who were indulging in riots;
7. Failure to appreciate the need for calling the army earlier and the reluctance to call it at the initial stage when it became evident that sufficient force was not available to control the spread of riots.

The Commission observed: "That police, in our opinion were caught napping and became confused and had misappreciated and misjudged the seriousness of the situation. The police lost the initiative in the early stages and once the situation got out of control at the very commencement of the riots, the police were overwhelmed by the situation that confronted them. "The efficiency and determination of law enforcing agencies can only minimize the loss where society is afflicted with communal frenzy. But for that they have to strike fear in the people who resort to riots which means that drastic and firm action alone can arrest the mass hysteria which was absent".

The Commission was critical of the functioning of the City Special Branch. Though the Commission accepted that the Special Branch was not properly equipped with staff and machinery to be able to give an up-to-date appreciation of political and communal activities, yet they observed that in respect of rumours, pamphlets and the writings of what were termed black-boards, the Special Branch miserably failed to function effectively to ascertain the source and to arrest the offenders. The Special Branch failed to give any information about anti-social elements or to have them rounded up.

The Commission noted that in these riots, mobs of one locality were visiting other localities and when resistance was offered they adopted special tactics. They divided themselves into groups and attacked from different directions simultaneously. Sometimes one group kept the local inhabitants engaged while others came from a different place and attacked.

Suggestions by the Commission to deal with communal disharmony,

1. Creating the post in each State of a Riot Commissioner of sufficiently high calibre, without in any way derogating from the prestige or authority of the Inspector General of Police or the Commissioner of the Police of the city, who should coordinate the efforts of law enforcing agencies during the disturbances. He would be able to give effective direction and view things from a more detached and objective angle.
2. An effective and efficient Special Branch.
3. Increasing the number of Police Chowkies and Police Stations and connecting them with telephones. Hot lines to be created between Police Stations. Control room to be reorganized to make its functioning meaningful.
4. Increase in the police force after re-examining the yard stick.
5. Increasing the fire power and mobility of Police Station staff.
6. S.R.P should not be used for normal duties like ordinary police but only as armed police like B.S.F., C.R.P. and the army. The question of its operational control during such duties should also be re-examined.
7. Police should not be wasted during the riots on miscellaneous duties such as cleaning debris, removing corpses, escorting persons, standing guard to protect personal properties. These dissipate their energies which should be utilized for quelling disturbances. For duties of this nature services of Home Guards and N.C.C. should be availed of.

Excerpts from Sri Krishna Committee Report on the Bombay (now Mumbai) riots of 1991-92

i. Practically every police officer examined before the Commission made the grievance that the weapons available in the police station were hopelessly inadequate, both in quality and quantity, to meet the contingencies which arose during December 1992 and January 1993.

ii. The fire–arms that are presently available with the police stations to handle riot situations are the .303 rifles and the .410 muskets. Even these are not available in sufficient numbers so that each policeman can be armed in times of emergency. The .410 muskets appeared to be outdated and their deterrent effect on the rioters appeared to be nil.

iii. .303 rifle is an adequate weapon to deal with a riot as it is sufficiently deterrent and has sufficiently long range. Its accuracy of fire is also quite high. It is not necessary to go in for sophisticated fire–arms with automatic firing capacity like AK–47 as it might have the potential of producing large casualties if wielded by wrong hands.

iv. Apart from improving the quality of fire-arms, sufficient quantities must be held by the police station so that there is at least one fire–arm for each police constable in the field. The experience in the recent riots has shown that the policemen have become easy targets of attack by mobs, in open confrontation as well as in isolated pickets. Consequently, policemen are afraid of picket duty in isolated areas for fear of attacks against them. Possession of an efficient fire–arm would give them the confidence and boost their morale even if they are in isolated pickets.

v. *Lathis*: Apart from firearms, the policemen today carry cumbersome and unwieldy lathis which keep one hand engaged even when the lathi is not required to be used. It is suggested that truncheons of suitable material (as carried by the policeman in U.K. or U.S.A.), which could be hooked on to a buckle in the belt be carried by them so that both their hands are free for better purpose when the truncheon is not in use. The efficacy of a truncheon in hand–to–hand combat is much more than a lathi which is easily snatched away.

vi. The Commission recommended that, apart from sufficient supplies of better quality fire–arms, the policemen and officers must be put through rigorous training in handling them without which the investment in fire–arms would be useless.

vii. *Helmet*: The standard riot equipment issued to the police personnel to combat riots is a heavy metal helmet and a hand–held shield to deflect stones and other articles thrown at them. The metal helmets are heavy and cumbersome, particularly taking into consideration the hot weather in Bombay. It is recommended that helmets and shields of suitable lighter material, strong enough to withstand the impact of stones and sharp objects thrown at them, should be issued.

viii. While dealing with mobs which are suspected to indulging in private firing, there should be sufficient number of bullet–proof vests made available to the police personnel.

ix. *Riot control weapons in western countries*: The Commission feels that there is an imperative necessity to consider riot control weapons in western countries. For example, race riots have been effectively handled in U.K., in U.S.A. and by the Japanese police. The standard equipment issued to policemen in those countries needs to be studied in greater depth and, to the extent possible, implemented here. Things like rubber bullets or electric shot guns and water cannons are freely resorted to in advanced countries to avoid loss of life when carrying out riot control. Their efficacy needs to be studied carefully.

x. The study of riot controlling techniques in advanced countries should not serve merely as an excuse for a foreign junket, but for absorption of useful knowledge to be translated into local conditions for effective implementation here.

xi. *Reserves*: The situation during December 1992 and January 1993 showed up the flaw in the system in not having uncommitted reserves. At any given time at least five battalions of committed reserves should be maintained in barracks and any drop of the reserves below this figure should automatically set off an alarm in the minds of top officials who should then strive to maintain the figure of uncommitted reserves.

Technical Details and Specifications of Less Lethal weapons and Ammunition

1. Anti-Riot Helmet

Technical details and Specifications:

1. Name: Anti - Riot Helmet with Visor and Wire Mesh/Grill.
2. Model: RH-N12B.
3. Shape: Round shape shell duly hugging the ears and back of the head.
4. Surface: Smooth.
5. Weight: 1850 gms $\pm$ 25 gms
6. Thickness of PC Visor: 3mm $\pm$ 0.25mm
7. Thickness of Helmet: 4mm $\pm$ 0.25mm
8. Material: High impact resistant ABS plastic, Visor- high impact resistant polycarbonate plastic
9. Colour : Black
10. Visor should have iron wire mesh/jhali in front with a front free window of 17cmx7cmfor better viewing.
11. Visor should be adjustable – 3 positions. Visor holding plate must be riveted (5 numbers) and must be 2.5cm wide.
12. Window on either side (near ears) must be provided for ventilation.
13. It should have an adjustable point chinstrap system (with single point buckle and chin strap thickness – 2cm) for a stable, comfortable and perfect fit. Two chin flaps for protecting the chin must be provided.
14. A comfortable heavy duty interior with padding for shock absorption as also to ensure snug fit is needed. It must have cushion padding around the ears of minimum 3mm thickness. Inner most padding should be of heavy duty thermocol of minimum 17mm thickness.
15. It provides full head, neck, and face protection against non-ballistic threats such as rocks, bottles, sticks and against projectiles encountered during an adverse mob control situations etc.

16. Protection of neck: A semi circular soft pad to provide cover protection to sides of the neck and back portion of cervical from stones and projectile attacks. It must be attached to the helmet with at least 5 inch buttons.
17. It should be compatible with the adaption of respirator gas mask.

2. Full Body Protector

This is the latest Full Body Protector on offer. It has the high quality of protection with double shell which is made of high impact resistant engineering plastics (Polypropylene) in dull finish and the inner material (EVA and Poly foam) is soft to resist injury. It is comfortable for the person and easy to wear.

Technical Specifications

1. Ergonomically designed. It should be designed according to the body's joint, for ease of movement.
2. It should be made of strong shell and inner soft material for maximum user's comfort and safety.
3. Color: Black.
4. Weight: 5.940Kg ± 200gms.
5. Fit Body Height: 180 -190 cm
6. Total Protection Proportion. >1.5㎡
7. Material: High - protection engineering plastics (Polypropylene) + high molecular weight polyester non-fibre cloth + EVA and Poly Foam.
8. Certification: The body protector should be tested from NABL accredited Government laboratory/agency (no private laboratory). Copy of test report duly incorporating the given specification must be provided. Original copy of the Test Report will also be shown at the time of the Opening of the Technical Bid/Demonstration of the Product.
9. It should consist of the following,

a) **<u>Chest Protector, Groin & Shoulder Pad</u>**.

i. Modular front & back panels (in matt finish) are steel riveted/Velcro fixed.

ii. High-protection engineering plastics - Polypropylene (outer shell front and back panels) feature a unique flexible design for optimum movement, fit and comfort.

iii. Double layer with high-protection engineering plastics - Polypropylene and shock absorbing EVA foam covering the chest and back.

iv. High-protection engineering plastics: Polypropylene with shock absorbing EVA foam covers the shoulder and upper arm.

v. Chest Protector

- To provide adequate protection the front Shell is made of high-protection engineering plastics. Polypropylene must be of thickness 4.5mm ± 0.10mm.
- High-protection engineering plastics - Polypropylene plate at the back.
- To ensure balance between protection and comfort the combined thickness of EVA and Poly foam must be 8mm ± 0.10mm.
- Inner lining should be made of mesh fabric with sweat absorbing lining.
- There should be provision for removable (Velcro based) label system at the back.

vi. Shoulder Protector.

- To provide adequate protection the Shoulder Shell, made of high-protection engineering plastics, Polypropylene must be of thickness 2.5mm + 0.10mm.
- To ensure balance between protection and comfort the combined thickness of EVA and Poly foam must be 6.9mm + 0.10mm.
- Inner lining made of mesh fabric with sweat absorbing lining.
- It should be attached to Chest pad (front & back) with Velcro system to assist in emergency removal of the system from an injured officer.

vii. Upper Arm Protector.

- Shell should be of high-protection engineering plastics - Polypropylene.
- To ensure balance between protection and comfort the combined thickness of EVA and Poly foam must be 7.8mm + 0.10mm.
- Inner lining made of mesh fabric with sweat absorbing lining.
- It should be attached to Shoulder pad with buckle system to assist in emergency removal of the system from an injured officer.

viii. Groin Section has an outer shock absorbing high-protection engineering plastics – Polypropylene along with inner combined EVA and Poly foam. Inner lining made of mesh fabric with sweat absorbing lining. Groin pad should have a provision of detaching when required.

ix. Velcro adjustable system at the shoulder and sides to adjust for different sizes as also assist in emergency removal of the system from an injured officer.

x. There is a 2 inch belt on the sides to adjust for different sizes.

xi. Molle system strap at the back for additional fitments/equipment is also there.

b) <u>Forearm & Elbow Pad.</u>

i. There is a two piece system to provide flexibility required for forearm and elbow.

ii. It is attached to Upper Arm pad with Velcro as well as adjustable elastic (polyester) straps based system to provide sturdy fastening and also to assist in emergency removal of the system from an injured officer.

iii. Two Velcro and adjustable elastic (polyester) straps plus two hooks and adjustable elastic (polyester) straps based system are there to provide sturdy fastening.

iv. The inner lining is made of mesh fabric with sweat absorbing lining which offers comfort and breathability.

v. To provide adequate protection, the inner shell of forearm, made of high-protection engineering plastics, Polypropylene must be of thickness 2.5mm + 0.10mm. The outer shell of forearm, made of high-protection engineering plastics, Polypropylene must be of thickness 2.5mm + 0.10.

vi. To ensure balance between protection and comfort the combined thickness of EVA and Poly foam of Forearm pad must be 7mm + 0.10mm and Elbow pad must be 6.8mm + 0.10mm.

vii. It must provide double layered/shell protection (air cushion) at the elbow as well arms.

c) **<u>Thigh Guard</u>**

i. Thigh guard must be supported by Kamarband to avoid slippage on running / movement.

ii. Adjustable twin straps fastening with buckle in the Kamarband should be present.

iii. There is one Velcro and adjustable elastic (polyester) strap based system to provide sturdy fastening at the thigh.

iv. The inner lining is made of mesh fabric with sweat absorbing lining which offers comfort and breathability.

v. To provide adequate protection, the shell, made of high-protection engineering plastics, Polypropylene must be of thickness 2.6mm + 0.10mm.

vi. To ensure balance between protection and comfort the combined thickness of EVA and Poly foam of must be 6.85m + 0.10mm.

d) **Knee & Shin Guard**

i. This consists of a one piece system to provide full proof protection and comfort.

ii. Three Velcro and adjustable elastic (polyester) straps plus two hooks and adjustable elastic (polyester) straps based system to provide sturdy fastening.

iii. The inner lining is made of mesh fabric with sweat absorbing lining which offers comfort and breathability.

iv. To provide adequate protection - the inner shell of Shin guard - made of high-protection engineering plastics - Polypropylene must be of thickness 3mm + 0.10mm. The outer shell of Shin guard - made of high-protection engineering plastics - Polypropylene must be of thickness 2mm + 0.10mm

v. To provide adequate protection - the inner shell of Knee guard - made of high-protection engineering plastics - Polypropylene must be of thickness 3.4mm + 0.10mm.

vi. To ensure balance between protection and comfort the combined thickness of EVA and Poly foam of (knee as well shin guard) must be 6.85m + 0.10mm

vii. There should be foot protection from side and top.

viii. It must provide double layered/shell protection (air cushion) at the knee as well shin area.

3) Anti-Riot Gas Mask

Technical Specifications

1. This is made of super-soft Hycar facepiece which is up to 40% lighter than conventional full-face respirators.

2. Molded of black Hycar - a specially formulated combination of natural rubber and synthetic materials –the Gas Mask must resists chemical attack and temperature extremes, withstand rugged daily use and still give a snug, comfortable fit.
3. Complying to NIOSH approval TC - 14G - 0235 for protection against chlorobenzyhidene (CS) & Chloroacetphenone (CN) Tear Gas, P100 particulate efficiency level and particulates.
4. The canister should be also effective against Oleoresin Capsicum (OC).
5. The canister should provide protection against tear gases - chlorobenzyhidene (CS), Chloroacetphenone (CN) and Oleoresin Capsicum (OC) up to 8 hrs.
6. A flexible, one-piece polyurethane lens to be bonded to the face-piece and not rigid lens (or lens rings) to eliminate uncomfortable pressure points.
7. One-piece polyurethane lens should be there to provide wide, unobstructed field of vision and extended wearing comfort (Wrap-around lens design that provides excellent peripheral vision). Lens design should be such that it permits easy integration with police visor helmet.
8. Low profile design minimizes dead-air space and permits easy integration with most visored police helmets.
9. Mask should have dual canister mount (canister inlet ports on either side of the face-piece) to ease weapon sighting using with either eye. The canister position (bayonet mount) can be switched to enable the user to sight a weapon from either shoulder. Canister must be low-profile canister fit.
10. The fully elastic, 6-point head harness that promotes easy on-off (dons & doffs) and adjusts easily, with no hair pulling.
11. The face-piece should also feature a nose-cup to reduce lens fogging in low temperatures or high humidity conditions.
12. There should be a provision in face mask to allow corrective or prescription lens to be inserted inside.
13. There should be a provision to snap on face mask lens tinted outserts.
14. The face mask to be provided with speaking diaphragm for clear, short-range communications.
15. Face mask should have provision to attach a one piece, self-contained, electronic speech projection device (optional – not included) that allows wearers to speak normally, yet be heard loud and clear.
16. Weight without Canister – 400 gms ± 40 gms.

4) Impact Resistant Shield

Technical Specifications

1. Height- 1000 mm. + 5mm, Width- 570 mm + 10mm., Weight- 4.4 kilograms + 25 gms., Thickness-3mm + 0.2mm.
2. The shield must be made of high-quality, extremely resistant polycarbonate with thickness 3 mm+ 0.2mm.
3. Inner ergonomically shaped reinforcing plate should dampen efficiently impacts and vibrations on holding hand.
4. The holders should be such that it permits use by right or left hand and also supported by the other free hand as needed. Near V-shaped front face of the shield should conduct blows efficiently aside.
5. It must be doUBGLe layered (centre) with pocket of air to absorb shock and trauma.
6. Handle support must be clip- open type to prevent injury to hand in case shield is pulled out from user.
7. Anti-slip handle with indented surface should be provided. Slots for Baton must be provided on either side of the shield for left/right hand user (3 each side).
8. There should not be any rivet or bolt in the front face of the shield (rivets or bolts should be on the sides) – to prevent weakening of the PC shield.

5) Expandable Baton

Technical Specifications (with Plastic Swivelling Holder)

1. Length (closed): 10.2 inches + 0.5inch
2. Length (opened): 26.6 inches+ 0.5inch
3. Weight: 540 grams + 15gms
4. Surface finish-Black hard metal/black Ni/Chrome (with good resistance to abrasion).

- ✓ A three-part steel friction lock baton with a special rubber grip, with a high-quality holster as part of the delivery.
- ✓ The batons are highly resistant to a flexion if the baton is exposed to a hard stroke.
- ✓ Anti-slip handle with indented surface should be provided.
- ✓ Grip: Rubber specially designed for a fast hold. Outside diameter of the grip: 25 to 28mm± 5mm.The rubber is certified safe for contact with the skin without health risks.
- ✓ Material: Cold drawn seamless tube pipes, Class CSN 12 060.

6) Chilly/ Oleo-Resin (OR) Grenade

Technical details and Specifications

1. Tear Gas Grenades based on Oleo-Resin (OR), which is the concentrate extracted from the red chilies
2. OR fumes are not soluble in water. In other words, use of wet clothes will not make the fumes inactive

3. The body of the shell made of HDPE so that it starts melting on activation and the rioters cannot pick up and throw the grenade

4. OR based Tear Gas Grenade has much higher irritation to the eyes, nose and throat and therefore very effective in mob/riot control

Application

The OR laden smoke causes irritation to eyes, nose and throat of the persons who inhale it. It will make the person to quickly retreat from the site. The OR vapour are not soluble in water. The wet cloth or water cannot be used as a defence by the mob. The irritation caused by OR laden smoke, however, like the effect of hot chilies is temporary and goes away.

Technical Specifications

1. Height: 130 mm
2. Weight: 400 grams (+/- 5 grams)
3. Coverage Area: 2500 Sqm
4. Initial delay time: 1 to 2 Seconds
5. Smoke Duration: 60 to 80 Seconds
6. Made with HDPE shell.
7. Exposure to oleoresin produces unpleasant responses in human beings like tears, irritation, suffocation, nausea etc., effects wear off within 30 to 45 minutes.
8. No physiological damage to the human body.

7) 12 Gauge Non-lethal Ammunition

<u>12 Bore Gun Less Lethal Ammunition</u>

1. *Single Rubber Projectile:* This is used in situation of serious disturbances and combat against criminal activity with the objective of deterring or dispersing lawbreakers, as an alternative to the use of conventional ammunition.

Projectile	Single cylindrical of soft elastomer in black colour
Projectile weight Projectile diameter Projectile length	12 gms = 0.30 18mm = 0.10 38mm = 0.45
Range	20 to 50 m
Length	64mm +/- 1mm
Weight	22 gm+/- 2gms
Muzzle Velocity	130 m/s
Ammunition Casing	White Plastic
Base	Metal

2. *Three Spherical Rubber Projectile* : This is used in situations of serious disturbances and combat against criminal activity with the objective of deterring or dispersing lawbreakers, as an alternative to the use of conventional ammunition.

Projectile	Three Spherical of soft elastomer in black colour.
Projectile weight Projectile diameter	4.5gms = 0.10 19mm = 0/10
Range	20 to 50 m
Length	67mm +/- 1mm.
Weight	23 gm+/- 2gms.
Muzzle Velocity	150 m/s.
Ammunition Casing	White Plastic.
Base	Metal.
Spread	50cm +/- 5cm.

3. *Three Cylindrical Rubber Projectile* : This is also used in situations of serious disturbances and combat against criminal activity with the objective of deterring or dispersing lawbreakers, as an alternative to the use of conventional ammunition.

Projectile	Three Cylindrical of soft elastomer in black colour
Each Projectile weight Each Projectile length Each Projectile diameter	4.5gms = 0.10 12.6 mm = 0.15 17.90 mm = 0/10
Range	20 to 50 m
Length	64mm +/- 1mm.
Weight	22gm+/- 2gms.
Muzzle Velocity	130 m/s.
Ammunition Casing	White Plastic.
Base	Metal.
Spread	50cm +/- 5cm.

4. *12 Spherical Rubber Projectile* : This is also used in situations of serious disturbances and combat against criminal activity with the objective of deterring or dispersing lawbreakers, as an alternative to the use of conventional ammunition.

Projectile	12 Spherical of soft elastomer in black colour
Projectile weight Projectile diameter	0.56gms± 0.05 9.5mm± 0.15
Range	20 to 50 m
Length	60 mm +/- 1mm.
Weight	16 gm+/- 2gms.
Muzzle Velocity	132 m/s.
Ammunition Casing	White Plastic.
Base	Metal.
Spread	100 cm +/- 5cm.

5. *Precision Rubber Projectile* : It consists of one soft rubber precision projectile that can be fired with great accuracy with the intent of stopping or dispersing rioters, as an alternative to conventional ammunition.

Projectile Projectile weight Projectile diameter	Soft Elastomer Projectile in yellow colour. 9gms ± 0.20 43mm ± 0.45
Range	20 to 50 m
Length	64 mm +/- 1mm
Weight	20 gm+/- 2gms
Muzzle Velocity	150 m/s
Ammunition Casing	White Plastic
Base	Metal
Accuracy	At 20 m- 100 % in a target of radius of 10 cm.

8. Pepper ball Less Lethal Weapon System

Automatic/Semiautomatic launchers

<u>TAC-700 Automatic (pneumatic)</u>

1. This is a compact, tactical, fully automatic launcher with 200-round hopper, high pressure air bottle, and maintenance kit. Trigger can be set for full automatic, three round burst, or semi-automatic to conform to your company's policy while giving officers the right capabilities to achieve their goals. It averages 700 rounds per minute in full automatic mode. Range of fire on individual target - upto20mts/60 ft and for saturating an area – upto

50mts/200 ft. This works with the optional Patriot 450 Riot Vest for expanded capacity of up to 450 rounds.

2. TAC-700 launcher allows officers to quickly employ rounds and create substantial pepper clouds. This helps them to gain compliance in crowd control, breaking up fights, dispersing gangs, subduing violent suspects, etc. Tactical and compact.

3. Other technical specifications are given in the table below,

i)	Length of launcher	48.5 cm +/- 2 cm
ii)	Length of barrel	20 cm +/- 2 cm
iii)	Weight with hopper but without HPA Bottle	1.600 Kg +/- 0.5 Kg
iv)	Weight without hopper and HPA Bottle	1.450 Kg +/- 0.5 Kg
v)	Mode of power	Compressed air at 3000 psi
vi)	Kinetic Impact of Rounds	8-10 ft / lbs
vii)	Colour	Black
viii)	Velocity	100 meter/second.
ix)	High Pressure Air Bottle (HPA)	HPA Bottle with regulator at 800 psi

Custom Carbine SX **Custom Carbine TX**

Custom Carbine

1. This is a semi-automatic carbine, 160 shot high pressure air launcher system. Range of fire on individual target - upto20mts/60 ft and for saturating an area – upto 50mts/200 ft. Offset hopper for wider field of view and easy breech round loading. The launcher has Picatinny rail mount for addition of optional tactical lights, scope sights, laser sights, cameras, etc. It includes rechargeable HPA bottle.
2. The Custom Carbine Pepper Ball launcher has been optimized for demanding deployments and ruggedized for enduring service. Its barrel, internal and external parts, hopper placement, and manufacture quality have been optimized to exacting standards for less-lethal scenarios.
3. You can breach load single glass break rounds and immediately follow with Pepper rounds for vehicle or other suspect extraction applications. 160 round hopper capacity .Works with the optional Patriot 450 Riot Vest for expanded capacity of up to 450 rounds. An optional stainless steel hardware upgrade kit is available for extra endurance and/or use in harsh or marine environments.

4. Other technical specifications are given in the table below,

i)	Length of launcher	49.5 cm +/- 2 cm
ii)	Length of barrel	20 cm +/- 2 cm
iii)	Weight with hopper but without HPA Bottle	1.500 Kg +/- 0.5 Kg
iv)	Weight without hopper and HPA Bottle	1.350 Kg +/- 0.5 Kg
v)	Mode of power	Compressed air at 3000 psi
vi)	Kinetic Impact of Rounds	8-10 ft / lbs
vii)	Colour	Black
viii)	Velocity	100 meter/second.
ix)	High Pressure Air Bottle (HPA)	HPA Bottle with regulator at 800 psi

30x Nylon Marking Trg-Powder Trg – Water

Projectile

Projectiles are of 0.68 caliber - hard, plastic frangible (breakable) sphere designed for firing from certified Pepper ball launchers and break on impact forming a fine cloud. These weigh about 3 gms each, have a velocity envelope of 300 to 350 fps (feet per second), kinetic impact of 10 to 12 ft./lbs. of energy and can work in operational temperature range of minus 30° to plus 150° degrees Fahrenheit. Various options available are as follows:-

a) *Pepper Projectile (30X Hot Pava Powder)*: Filled with 15% PAVA (Capsaicin II) by weight it is used in live applications. It delivers painful impact, hot pepper powder agent, or both as desired.

b) *Solid Nylon Projectile*: Solid nylon projectile designed to break window/glass upon impact. Create an opening for follow-up with pepper agent rounds. It assists in barricade situations for suspect extraction from car, etc. This comes in quantities of 10 or 100.

c) *Marking Projectile*: Designed for marking individual suspects for post identification and round up. This comes in quantities of 10 or 100.

d) *Training Projectile*: Designed for simulation training and as a non-chemical agent impact round. This comes in quantities of 375.

i. Purple - Filled with inert scented powder - see and smell dispersal to assist training.

ii. Water Filled.This is filled with water – for training and kinetic energy impact to assist training.

9) Shock Baton

Technical Specifications

S No	Description	Technical Specifications
1	Output (Maximum Peak Value of Voltage)	1.5 Kilo Volts approx.
2	Maximum Duration of Impulse	Not greater than 1 Mili-seconds (ms)
3	Maximum Quantity of Electricity per Impulse	Less than 1 Mili-Coulomb (mC)
4	Maximum Discharged Energy per Impulse	Not greater than 1 Joules (J)
5	Dimension	Length - 550 mm to 575mm Diameter -33mm to 37 mm Weight -410 gms to 470gms
6	Activation of Shock	By self-return trigger switch
7	Low Battery Indicator	Test spark weak or slow.
8	Battery	Fully rechargeable comprising 9.6 V (8 cell) NickelCadmium rechargeable battery with built-in charging facility (plug-in AC/DC Charger of input of 220/110 V AC). Once fully charged must last for minimum of 7,000 quarter second burst.
9	Material	Strong and durable lightweight material
10	Accessories	Must have wrist straps & belt holder
11	Safety features	Non-lethal & safe Shock should be along length of Baton(excluding handle) No firing of dangerous projectiles Should not leave any permanent damage or burn marks on the victim or aggressor
12	Warranty	12 months
13	Certification	Test Certification from a reputed lab duly incorporating specification at serial 1 to 4 above must be provided

10) Shock Belt

Anti' Scape Stun Belt

Technical Specifications

Application: The Force Anti'Scape Stun-Belt will be used to transport prisoners / aggressors to prevent escape and to ensure protection of personnel or innocent bystanders from attacks and it is able to deter or immobilize a prisoner / aggressor in the process of restoring order with minimum force.

Its Features include the following,

- ✓ Long range remote control activation, 50-100 metres.
- ✓ 110-dB Ear-piercing Siren that serves as a warning to attract audible attention.
- ✓ High voltage, non-lethal, safe yet effective shock all round the belt from one point to another, in other words the total belt does not have to make contact on one specific place.
- ✓ Pre-set adjustable timer for duration of warning siren and shock.
- ✓ Cables throughout the belt prevent it from being cut with a knife.
- ✓ Wrist and arm restraints as well as handcuff d-ring attachments.
- ✓ Fully rechargeable complete with nickel-cadmium rechargeable battery and charger.
- ✓ Unlike with firearms or batons, no permanent damage or use of unnecessary force.
- ✓ Tested by South African authorities.

11) Shock Shield

Technical Specifications

S No	Description	Technical Specifications
1	Shield features	i) 4 mm thick see through clear polycarbonate shields ii) Foam padding in the centre (user side) of thickness 18 mm to 20 mm
2	Output (Maximum Peak Value of Voltage)	2.0 Kilo Volts approx.
3	Maximum Duration of Impulse	Not greater than 1 Mili-seconds (ms)
4	Maximum Quantity of Electricity per Impulse	Less than 1 Mili-Coulomb (mC)
5	Maximum Discharged Energy per Impulse	Not greater than 1 Joules (J)
6	Activation of Shock	Heavy duty Activation by Self Return Trigger Switch thumb operated momentary switch situated in the molded had grip. Suitably located on/off switch with LED indicator.
7	Low Battery Indicator	Test spark weak or slow.
8	Conductors	Light weight aluminium strips of 12.50-12.75 mm (6 Vertical and 2 Horizontal plates/strips)
9	Battery	i) Nickel Cadmium rechargeable battery(12 volt-650 mA) with built-in charging facility (plug-in AC/DC Charger of input of 220/110 V AC). ii) Once fully charged must last for minimum of 7,000 quarter second burst.
10	Dimensions	Height - 890 – 910 mm Width - 590 mm -610mm Thickness – 3.8 to 4.2 mm.
11	Weight	3.6kg to 4.4 kg.

12	Safety features	Non-lethal & safe
13	Accessories	Built in identification stickers with words 'Police' etched on it boldly
14	Warranty	12 months
15	Certification	Test Certification from a reputed lab duly incorporating specification at serial 2 to 5 above must be provided

12) Anti-Riot Group Shield

Technical Details and Specifications

1. Based on the principal of the Roman Wall used in the olden time – the Group Shield has been devised/ developed. In normal course these can be used as individual shield by personnel's. However when required these can be quickly combined (convenient & quick locking unlocking mechanism) to form a Group Shield. Size of the Group Shield or the Wall can be increased as per requirement from two pairs to 8/10 pairs or as many required.

2. Group Shield, besides providing protection from stones/brick bats from front & top, also enables large body of troop to take cover (behind less number of shield) and close in with the rioters/arsonists. In the same vein in case of rioters closing in Group Shield enables providing protection to larger body of troops (vis-à-vis individual shields).

3. With a convenient and quick locking-unlocking mechanism (chimbs), these shields can converted from single/ individual shield to group shield within seconds as also can be converted on the move. Given Group shield can provided adequate protection to the group while moving forward as also during tactical retreat.

4. Each pair of the Group Shield consists of front longer (length - 160 cm) shield which acts as the main protector and upper smaller (length - 120 cm) shield which provides protection from top.

5. Specifications,

    - *Model*: (with one handle, one arm handle and extra reinforced stab between the shield and padding.
    - *Material*: PC material, with high-impact strength and durability
    - *Color*: Transparent
    - *Size*: Front – 160cmx55cmx3.5mm., Top – 120cmx55cmx3.5cm.
    - *Weight*: Front – 5.5 Kgs and Top – 4.6Kgs
    - *Package*: 2pcs/ctn
    - *Light Transmittance*: • 80%

13) 37/38 Gas Gun & 40 mm Launcher - Less Lethal Ammunitions

1. *Three Rubber Projectile* – Use in the control of serious disturbances and combat against criminal activity with the objective of deterring or dispersing lawbreakers, as an alternative to the use of conventional ammunition.

S No	Parameter	As per available Technologies
a	Range	20-50m
b	Number of Projectile	3
c	Length of Projectile	124mm ± 3mm
d	Weight	150 gm± 10gms

e	Muzzle Velocity (m/s)	92 m/s
f	Material of Projectile	Soft Elastomer
	(i) Projectile weight	28 gms± 1 gm
	(ii) Projectile diameter	38.5 mm± 0.2 mm
g	Dispersion of Projectile at Target end	50 cm± 5cm
h	Ammunition Casing	Aluminum
I	Shelf Life	5 years
J	Operating Temperature	- 10 °C to + 50 °C
k	Storage Temperature	- 10 °C to + 40 °C
L	Quality Certification	ISO 9001 and ISO 14001

2. *12 Cylindrical Rubber Projectile* –This is used in situations of serious disturbances and combat against criminal activity with the objective of deterring or dispersing lawbreakers, as an alternative to the use of conventional ammunition.

S No	**Parameter**	**As per available Technologies**
a	Range	20-50m
b	Number of Projectile	12
c	Length of Projectile	115mm ± 1mm
d	Weight	130gm± 10gms
e	Muzzle Velocity (m/s)	216 m/s
f	Material of Projectile	Soft Elastomer
	(i) Projectile weight	4.5 gms± 1 gm
	(ii) Projectile diameter	19 mm± 0.5 mm
g	Dispersion of Projectile at Target end	100 cm± 10cm
h	Ammunition Casing	Aluminum
i	Shelf Life	5 years
j	Operating Temperature	- 10 °C to + 50 °C
k	Storage Temperature	- 10 °C to + 40 °C
l	Quality Certification	ISO 9001 and ISO 14001
h	Ammunition Casing	White Plastic

3. *Expandable Punch Projectile* –This is used in situations of serious disturbances and combat against criminal activity with the objective of deterring or dispersing lawbreakers, as an alternative to the use of conventional ammunition.

S No	**Parameter**	**As per available Technologies**
a	Range	5-30m
b	Number of Projectile	1
c	Length of Projectile	100mm ± 2mm
d	Weight	161 gm± 10gms
e	Muzzle Velocity (m/s)	70 m/s
f	Material of Projectile	Expandable Projectile
	(i) Projectile weight	80 gms ± 5 gm
h	Ammunition Casing	Aluminum
i	Shelf Life	5 years
j	Operating Temperature	- 10 °C to + 50 °C
k	Storage Temperature	- 10 °C to + 40 °C
l	Quality Certification	ISO 9001 and ISO 14001

4. *Tear Gas Direct Flush*- This is used in riot control and operations against criminal activity. It should be launched at short distances, with the objective of dispersing groups of lawbreakers and avoiding physical contact with the aggressor.

S No	Parameter	As per available Technologies
a	Range	Minimum Shooting Rg-3m Maximum Shooting Rg-5m
b	Material of Projectile	Tear Gas Charge (Tear Gas Agent-CS)
c	Length of Projectile	140mm ± 1mm
d	Weight	147 gm± 10gms
e	CS Content Weight	20 gms
h	Ammunition Casing	Aluminum
I	Shelf Life	5 years
J	Operating Temperature	- 10 °C to + 50 °C
k	Storage Temperature	- 10 °C to + 40 °C
L	Quality Certification	ISO 9001 and ISO 14001

5. *Pepper Direct Flush*- This is used in riot control and operations against criminal activity. It should be launched at short distances, with the objective of dispersing groups of lawbreakers and avoiding physical contact with the aggressor.

S No	Parameter	As per available Technologies
a	Range	Minimum Shooting Rg-3m Maximum Shooting Rg-5m
b	Material of Projectile	Pepper Charge (Pepper Agent-OC)
c	Length of Projectile	140mm ± 1mm
d	Weight	147 gm± 10gms.
e	OC Content Weight	0.33gms
h	Ammunition Casing	Aluminum
I	Shelf Life	5 years
J	Operating Temperature	- 10 °C to + 50 °C
k	Storage Temperature	- 10 °C to + 40 °C
L	Quality Certification	ISO 9001 and ISO 14001

6. *Medium Range Tear Gas Projectile* –This is used in riot control and operations against criminal activity. The projectile can be launched with the objective of dislodging, dispersing or breaking up groups of lawbreakers.

S No	Parameter	As per available Technologies
a	Range	70-110m (Average -90m)
b	Material of Projectile	Tear Gas Explosive (Tear Gas Agent-CS)
c	Length of Projectile	122mm ± 2mm
d	Weight	136.5gm± 10gms
f	Delay Time	2 sec± 0.5 sec
f	Emission Time	25sec± 10sec
g	Cloud Diameter at Target End	16m± 1mm
h	Ammunition Casing	Aluminum
i	Shelf Life	5 years
j	Operating Temperature	- 10 °C to + 50 °C
k	Storage Temperature	- 10 °C to + 40 °C
l	Quality Certification	ISO 9001 and ISO 14001

7. *Long Range Tear Gas Projectile* –This is used in riot control and operations against criminal activity. The projectile can be launched with the objective of dislodging, dispersing or breaking up groups of lawbreakers.

S No	Parameter	As per available Technologies
a	Range	120-160m (Average -140m)
b	Material of Projectile	Tear Gas Explosive (Tear Gas Agent-CS)
c	Length of Projectile	122mm ± 2mm
d	Weight	136.5gm± 10gms
f	Delay Time	2 sec± 0.5 sec
f	Emission Time	25sec± 10sec
g	Cloud Diameter at Target End	16m± 1mm
h	Ammunition Casing	Aluminum
i	Shelf Life	5 years
j	Operating Temperature	- 10 °C to + 50 °C
k	Storage Temperature	- 10 °C to + 40 °C

8. *Multiple Tear Gas Charge* –This is used in riot control and operations against criminal activity. The projectile can be launched with the objective of dislodging, dispersing or breaking up groups of lawbreakers.

S No	Parameter	As per available Technologies
a	Range	70 - 90m (Average -80m)
b	Material of Projectile	Tear Gas Explosive (Tear Gas Agent-CS)
c	Number of Projectile	Five pastilles of Tear Gas Mix
c	Length of Projectile	140mm ± 10mm
d	Weight	235 gm± 10gms
f	Emission Time	25sec± 10sec
g	Cloud Diameter at Target End	16m± 1mm
h	Ammunition Casing	Aluminum
i	Shelf Life	5 years
j	Operating Temperature	- 10 °C to + 50 °C
k	Storage Temperature	- 10 °C to + 40 °C

9. *Multiple Tear Gas Charge* –This is used in riot control and operations against criminal activity. The projectile can be launched with the objective of dislodging, dispersing or breaking up groups of lawbreakers

S No	Parameter	As per available Technologies
a	Range	70 - 90m
b	Material of Projectile	Tear Gas Explosive (Tear Gas Agent-CS)
c	Number of Projectile	Three pastilles of Tear Gas Mix
c	Length of Projectile	115mm ± 1mm
d	Weight	196 gm± 10gms
f	Emission Time	25sec± 10sec
g	Cloud Diameter at Target End	16m± 1mm
h	Ammunition Casing	Aluminum
I	Shelf Life	5 years
J	Operating Temperature	- 10 °C to + 50 °C
k	Storage Temperature	- 10 °C to + 40 °C

10. *Triple Tear Gas Grenade Hyper* - It works by saturating the environment with a cloud of smoke containing the tear gas agent (CS). It operates through the generation of an intense volume of smoke containing tear gas agent emitted by 3 pastilles that are distributed on the ground, making it difficult to throw back at the troops.

S No	Parameter	As per available Technologies
a	Projectile.	Three pastilles with Tear Gas Mix (Tear Gas Agent-CS).
b	Range	90 to 150m
c	Length.	156mm ± 2mm
d	Weight	445 gm± 20gms
e	Diameter	58mm± 1mm
f	Delay Time	2.5sec± 1 sec
g	Emission Time	25sec± 10 sec
h	Dispersion	8m+/- 1m
i	Initiation System	Time Delay Fuze (Optional Add On feature - I-Ref -enables the traceability of the grenade even after the functioning/ detonation)
j	Ammunition Casing/Body Material	Aluminum
k	Shelf Life	5 years
l	Operating Temperature	- 10 °C to + 50 °C
m	Storage Temperature	- 10 °C to + 40 °C
n	Quality Certification	ISO 9001 and ISO 14001
o	Effect	Approx 20 minutes

11. *High Emission Tear Gas Grenade* –It operates by saturating the space through the generation of an intense cloud of smoke containing tear gas agent (CS).

S No	Parameter	As per available Technologies
a	Projectile.	Tear Gas Charge (Tear Gas Agent-CS)
b	Range	60 to 100m
c	Length.	136mm ± 2mm
d	Weight	223gm± 10gms.
e	Diameter	57mm± 1mm
f	Delay Time	2.5sec± 1 sec.
g	Emission Time	45sec± 10 sec
h	Dispersion	8m+/- 1m
i	Initiation System	Time Delay Fuze (Optional Add On feature - I-Ref -enables the traceability of the grenade even after the functioning/detonation)
j	Ammunition Casing/Body Material	Aluminum
k	Shelf Life	5 years
l	Operating Temperature	- 10 °C to + 50 °C
m	Storage Temperature	- 10 °C to + 40 °C
n	Quality Certification	ISO 9001 and ISO 14001
o	Effect	Approx 20 minutes

12. *Tear Gas Grenade* –It operates through the saturation of the environment, by means of the generation of an intense cloud of tear gas.

S No	Parameter	As per available Technologies
a	Projectile.	Tear Gas Charge (Tear Gas Agent-CS)
b	Range	90 to 150m
c	Length.	121mm ± 2m
d	Weight	284gm± 10gms.
e	Diameter	80mm± 2mm
f	Delay Time	1.5sec± 1 sec.
g	Emission Time	25sec± 10 sec
h	Dispersion	8m+/- 1m
i	Initiation System	Time Delay Fuze (Optional Add On feature - I-Ref -enables the traceability of the grenade even after the functioning/detonation)
j	Ammunition Casing/Body Material	Gray Rubber
k	Shelf Life	5 years
l	Operating Temperature	- 10 °C to + 50 °C
m	Storage Temperature	- 10 °C to + 40 °C
n	Quality Certification	ISO 9001 and ISO 14001
o	Effect	Approx 20 minutes

13. *Triple Tear Gas Grenade Hyper*

S No	Parameter	As per available Technologies
a	Projectile.	Three pastilles with Tear Gas Mix (Tear Gas Agent-CS). It works by saturating the environment with a cloud of smoke containing the tear gas agent (CS) It operates through the generation of an intense volume of smoke containing tear gas agent emitted by 3 pastilles that are distributed on the ground, making it difficult to throw back at the troops.
b	Length.	156mm ± 2mm
c	Weight	445 gm± 20gms
d	Diameter	58mm± 1mm
e	Delay Time	2.5sec± 1 sec
f	Emission Time	25sec± 10 sec
g	Dispersion	8m+/- 1m
h	Initiation System	Time Delay Fuze (Optional Add On feature - I-Ref -enables the traceability of the grenade even after the functioning/detonation)
i	Ammunition Casing/Body Material	Aluminum
j	Shelf Life	5 years
k	Operating Temperature	- 10 °C to + 50 °C
l	Storage Temperature	- 10 °C to + 40 °C
m	Quality Certification	ISO 9001 and ISO 14001
n	Effect	Approx 20 minutes

14. *Triple Tear Gas Grenade*

S No	Parameter	As per available Technologies
a	Projectile.	Three pastilles with Tear Gas Mix (Tear Gas Agent-CS). It works by saturating the environment with a cloud of smoke containing the tear gas agent (CS) It operates through the generation of an intense volume of smoke containing tear gas agent emitted by 3 pastilles that are distributed on the ground, making it difficult to throw back at the troops.
b	Length.	151mm ± 2mm
c	Weight	223 gm± 10gms.
d	Diameter	38mm± 1mm
e	Delay Time	2.5sec± 1 sec.
f	Emission Time	20sec± 5 sec
g	Dispersion	8m+/- 1m
h	Initiation System	Time Delay Fuze
i	Ammunition Casing/Body Material	Aluminum
j	Shelf Life	5 years
k	Operating Temperature	- 10 °C to + 50 °C
l	Storage Temperature	- 10 °C to + 40 °C
m	Effect	Approx 20 minutes

15. *Medium Emission Tear Gas Grenade*

S No	Parameter	As per available Technologies
a	Projectile	Single pastilles with Tear Gas Mix (Tear Gas Agent-CS). It operates via the saturation of the environment through the intense generation of a cloud of smoke containing tear gas agent.
b	Length	131mm ± 2mm
c	Weight	150gm± 10gms.
d	Diameter	49mm± 1mm
e	Delay Time	2.5sec± 1 sec.
f	Emission Time	35sec± 10 sec
g	Dispersion	8m+/- 1m
h	Initiation System	Time Delay Fuze
i	Ammunition Casing/Body Material	Aluminum
j	Shelf Life	5 years
k	Operating Temperature	- 10 °C to + 50 °C
l	Storage Temperature	- 10 °C to + 40 °C
m	Quality Certification	ISO 9001 and ISO 14001
N	Effect	Approx 20 minutes

16. *High Emission Tear Gas Grenade*

S No	Parameter	As per available Technologies
a	Projectile	Tear Gas Charge (Tear Gas Agent-CS). It operates by saturating the space through the generation of an intense cloud of smoke containing tear gas agent (CS).
b	Length	136mm ± 2mm
c	Weight	223gm± 10gms.
d	Diameter	57mm± 1mm

e	Delay Time	2.5sec± 1 sec.
f	Emission Time	45sec± 10 sec
g	Dispersion	8m+/- 1m
h	Initiation System	Time Delay Fuze (Optional Add On feature - I-Ref -enables the traceability of the grenade even after the functioning/detonation)
I	Ammunition Casing/Body Material	Aluminum
J	Shelf Life	5 years
k	Operating Temperature	- 10 °C to + 50 °C
L	Storage Temperature	- 10 °C to + 40 °C
m	Quality Certification	ISO 9001 and ISO 14001
N	Effect	Approx 20 minutes

17. *Tear Gas Grenade*

S No	Parameter	As per available Technologies
a	Detonation Effect	On detonation- strong stunning effect provoked by the detonation of the explosive charge along with associated effect from a cloud of crystals containing the tear gas agent CS.
b	Length of Projectile/Grenade	132mm ± 2mm
c	Diameter	56mm± 2mm
d	Weight	235 gm± 10gms
e	Delay Time	3 sec± 1sec
f	Initiation System	TDF with two-stage (The two-stage system allows that the rigid part of the fuze to be ejected prior to the explosion of the grenade)
g	Ammunition Casing/Body Material	Red Rubber
h	Shelf Life	5 years
I	Operating Temperature	- 10 °C to + 50 °C
J	Storage Temperature	- 10 °C to + 40 °C
k	Quality Certification	ISO 9001 and ISO 14001
L	Peak Sound Pressure	175db at 2mtrs from the explosion

18. *Flash and Bang Grenade*

S No	Parameter	As per available Technologies
a	Detonation Effect	On detonation- strong stunning effect provoked by the detonation of the explosive charge and intense luminosity which obscures the vision of the aggressors for a few seconds, allowing for efficient police action.
b	Length of Projectile/Grenade	132mm ± 2mm
c	Diameter	56 mm± 2mm
d	Weight	200 gm± 10gms
e	Delay Time	3 sec± 1sec.
f	Initiation System	TDF with two-stage (The two-stage system allows that the rigid part of the fuze to be ejected prior to the explosion of the grenade)
g	Ammunition Casing/Body Material	Black Rubber
h	Shelf Life	5 years
i	Operating Temperature	- 10 °C to + 50 °C
j	Storage Temperature	- 10 °C to + 40 °C
k	Quality Certification	ISO 9001 and ISO 14001
l	Peak Sound Pressure	175db at 2mtrs from the explosion

19. *Pepper Grenade*

S No	Parameter	As per available Technologies
a	Detonation Effect	On detonation- strong stunning effect provoked by the detonation of the explosive charge along with associated effect from a cloud of smoke containing pepper agent/particulates (OC).
b	Length of Projectile/Grenade	132mm ± 2mm
c	Diameter	56 mm± 2mm
d	Weight	200 gm± 10gms
e	Delay Time	3 sec± 1sec
f	Initiation System	TDF with two-stage (The two-stage system allows that the rigid part of the fuze to be ejected prior to the explosion of the grenade)
g	Ammunition Casing/Body Material	Green Rubber
h	Shelf Life	5 years
i	Operating Temperature	- 10 °C to + 50 °C
j	Storage Temperature	- 10 °C to + 40 °C
k	Quality Certification	ISO 9001 and ISO 14001
l	Peak Sound Pressure	175db at 2mtrs from the explosion

20. *Tear Gas Grenade*

S No	Parameter	As per available Technologies
a	Projectile.	Tear Gas Charge (Tear Gas Agent-CS). It operates through the saturation of the environment, by means of the generation of an intense cloud of Tear gas.
b	Length.	121mm ± 2m
c	Weight	284gm± 10gms.
d	Diameter	80mm± 2mm
e	Delay Time	1.5sec± 1 sec.
f	Emission Time	25sec± 10 sec
g	Initiation System	Time Delay Fuze (Optional Add On feature - I-Ref -enables the traceability of the grenade even after the functioning/detonation)
h	Ammunition Casing/Body Material	Gray Rubber
i	Shelf Life	5 years
j	Operating Temperature	- 10 °C to + 50 °C
k	Storage Temperature	- 10 °C to + 40 °C
l	Quality Certification	ISO 9001 and ISO 14001
m	Effect	Approx 20 minutes

21. *Ballarina*

S No	Parameter	As per available Technologies
a	Detonation Effect	It operates through the saturation of the environment, by means of the generation of an intense cloud of tear gas CS. During the tear gas emission, the grenade makes random movements over the ground, enlarging the gaseous area and avoiding the devolution of the grenade against the troop.
b	Length of Projectile/Grenade	142mm ± 2mm
c	Diameter	60mm± 2mm

d	Weight	328 gm± 10gms
e	Delay Time	2.5 sec±0.5sec.
f	Emission Time	15sec± 10 sec
g	Initiation System	Time Delay Fuze
h	Ammunition Casing/Body Material	ABS
i	Shelf Life	5 years
j	Operating Temperature	- 10 °C to + 40 °C
k	Storage Temperature	- 10 °C to + 50 °C
l	Quality Certification	ISO 9001 and ISO 14001
m	Effect	Approx 20 minutes

22. Seven Bang Grenade

S No	Parameter	As per available Technologies
a	Detonation Effect	On detonation- strong stunning effect caused by detonation of the seven explosive charges allowing an efficient police action.
b	Length of Projectile/Grenade	113mm ± 2mm
c	Diameter	60mm± 5mm
d	Weight	206 gm± 10gms
e	Delay Time	3 sec±0.5sec.
f	Initiation System	Time Delay Fuze
g	Ammunition Casing/Body Material	Plastic on Black
h	Shelf Life	5 years
I	Operating Temperature	- 10 °C to + 40 °C
J	Storage Temperature	- 10 °C to + 50 °C
K	Quality Certification	ISO 9001 and ISO 14001

23. Multi-Impact Grenade

S No	Parameter	As per available Technologies
a	Projectile	It causes a strong stunning effect provoked by the detonation of the explosive charge, associated with the impact of the multiple rubber projectiles.
b	Length	121mm ± 2m
c	Weight	282gm± 10gms.
d	Diameter	80mm± 2mm
e	Delay Time	3sec± 1 sec.
f	Initiation System	TDF with two-stage (The two-stage system allows that the rigid part of the fuze to be ejected prior to the explosion of the grenade)
g	Ammunition Casing/Body Material	Black Rubber
h	Shelf Life	5 years
i	Operating Temperature	- 10 °C to + 50 °C
j	Storage Temperature	- 10 °C to + 40 °C
k	Quality Certification	ISO 9001 and ISO 14001
l	Peak Sound Pressure	175db at 2mtrs from the explosion

24. Multi-Impact Tear gas Grenade

S No	Parameter	As per available Technologies
a	Projectile.	It causes a strong stunning effect provoked by the detonation of the explosive charge, associated with the effect of the tear gas and multiple rubber projectiles.
b	Length.	121mm ± 2m
c	Weight	270gm± 10gms.
d	Diameter	80mm± 2mm
e	Delay Time	3sec± 1 sec.
f	Initiation System	TDF with two-stage (The two-stage system allows that the rigid part of the fuze to be ejected prior to the explosion of the grenade)
g	Ammunition Casing/Body Material	Black Rubber
h	Shelf Life	5 years
i	Operating Temperature	- 10 °C to + 50 °C
j	Storage Temperature	- 10 °C to + 40 °C
k	Quality Certification	ISO 9001 and ISO 14001
l	Peak Sound Pressure	175db at 2mtrs from the explosion

25. Multi-Impact Pepper Grenade

S No	Parameter	As per available Technologies
a	Projectile	It causes a strong stunning effect that is provoked by the detonation of the explosive charge, associated with the effect of the pepper agent and impact of the multiple rubber projectiles.
b	Length	121mm ± 2m
c	Weight	295gm± 10gms.
d	Diameter	80mm± 2mm
e	Delay Time	3sec± 1 sec.
f	Initiation System	TDF with two-stage (The two-stage system allows that the rigid part of the fuze to be ejected prior to the explosion of the grenade)
g	Ammunition Casing/Body Material	Black Rubber
h	Shelf Life	5 years
i	Operating Temperature	- 10 °C to + 50 °C
j	Storage Temperature	- 10 °C to + 40 °C
k	Quality Certification	ISO 9001 and ISO 14001
l	Peak Sound Pressure	175db at 2mtrs from the explosion

26. Multi-Impact Pepper Grenade

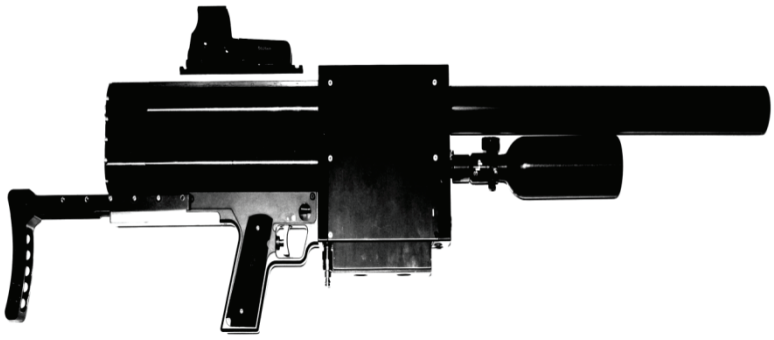
S No	Parameter	As per available Technologies
a	Projectile.	It causes a strong stunning effect that is provoked by the detonation of the explosive charge, associated with the effect of the pepper agent and impact of the multiple rubber projectiles.
b	Length.	121mm ± 2m
c	Weight	295gm± 10gms.
d	Diameter	80mm± 2mm
e	Delay Time	3sec± 1 sec.
f	Initiation System	TDF with two-stage (The two-stage system allows that the rigid part of the fuze to be ejected prior to the explosion of the grenade)
g	Ammunition Casing/Body	Black Rubber

	Material	
h	Shelf Life	5 years
I	Operating Temperature	- 10 °C to + 50 °C
J	Storage Temperature	- 10 °C to + 40 °C
k	Quality Certification	ISO 9001 and ISO 14001
L	Peak Sound Pressure	175db at 2mtrs from the explosion

27. Training Grenade

S No	Parameter	As per available Technologies
a	Detonation Effect	On detonation- emits a potent bang, which mimics the functioning of an authentic grenade. Such effects do not produce fragments, since the explosive sound charge functions outside of the artifact, thus making training safe.
b	Length of Projectile/Grenade	101mm ± 2mm
c	Diameter	61mm± 1mm
d	Weight	192 gm± 5gms
e	Delay Time	5.5 sec±0.5sec.
f	Initiation System	TDF
g	Ammunition Casing/Body Material	Rubber
h	Shelf Life	5 years
i	Operating Temperature	- 10 °C to + 40 °C
j	Storage Temperature	- 10 °C to + 50 °C
k	Quality Certification	ISO 9001 and ISO 14001
l	Peak Sound Pressure	170 db at 2mtrs from explosion

14) 40 mm Pneumatic Launcher (Multi Shell)



Revolver Version,

1. Inline break forward breech
2. No winding required / Gas piston operation
3. Polycarbonate bore sight
4. Quick release air supply
5. Option to accommodate ammunition cylinders up to 12” in 38 or 40mm

Magazine Fed Version:

1. Detachable 40mm magazine well
2. Blow forward bolt
3. Quick release air supply
4. Unified air option for magazine
5. Narrow profile 2.25”

Belt Fed Version:

1. 30 round ammunition box
2. 40mm Linked shell carrier belt
3. Interchangeable ballast chambers
4. Polycarbonate bore sight
5. Remote electronic operation option

Common Technical Features:

1. Variable velocity - 100-600fps
2. Non-Pyrotechnic and no muzzle flash
3. Low acoustic signature
4. Semiautomatic action
5. 120 Rounds per minute cycle rate
6. Operating pressure 150-1200psi
7. Interchangeable Barrels - 400 meter Range / 20 foot radius or 40 meter Range / 1 foot radius
8. The low power setting allows for operating distance of under 1 meter
9. Source of air can be SCUBA or Paintball type tanks of 3000 to 4500psi.
10. Approx. 1 shot per cubic inch from 3000psi source tank at 200psi operating pressure
11. Stationary or portable/mobile compressors with reservoirs may also be used.
12. Ammunition includes:
    a. Time delayed aerosol canisters CS/Oleoresin Capsicum/Inert
    b. 40mm Impact deformation slugs
    c. 40mm Rubber Ball / Frangible Ball / Fin Stabilized
    d. Future rounds will be adopted from existing 40mm ordnance

Multi Shell Grenade Launcher (MSGL)

(in Use with US Marines and an earlier model in use with the Indian Army)

- COMPACT IN ALL DIMENSIONS
- DESIGNED FOR DESERT-, JUNGLE- AND URBAN WARFARE
- PINPOINT ACCURACY 150M – EFFECTIVE RANGE 375M WITH STANDARD LOW VELOCITY (LV) GRENADES.

CURRENTLY BEING QUALIFIED WITH THE NEW MEDIUM VELOCITY (MV) GRENADES 40 X 51MM WITH PINPOINT ACCURACY OF 250 M AND EFFECTIVE RANGE OF 800M

LOW LIFE-CYCLE CO

- **Life-Cycle**
  - Barrel life time - 15,000 rounds
- **Limited replacement of major components:**
  - Barrel
  - Receiver
  - Cylinder
  - Rear housing
  - Sight

- **Low noise** when firing
- Increased **pinpoint accuracy** with a high first hit probability
- High rate of **sustained fire**
- Extreme **flexibility** in mission application
- Individual soldier can carry an **increased first line of ammunition** compared to the patrol mortar
- Same weapon can **deliver direct and indirect** fire as opposed to other support weapons
- **Easy to operate** from confined spaces
- Tested and fit for use in **all environmental** conditions

- end -