



Defence Research and  
Development Canada

Recherche et développement  
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# Statement of Operational Requirements (SOR)

*Guidance for Creating an SOR for Less Lethal Weapons*

Donna Wood  
Project Manager  
Defence Research and Development Canada  
Centre for Security Science

**Defence R&D Canada – CSS**

Technical Memorandum  
DRDC CSS TM 2011-27  
December 2011

Canada



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Principal Author

*Original signed by Donna Wood*

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Donna Wood

Project Manager CEWSI

Approved by

*Original signed by Steve Palmer*

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Steve Palmer

Director CPRC

Approved for release by

*Original signed by Mark Williamson*

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Mark Williamson

Chair DRDC CSS Document Review Panel

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## Abstract

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In recent years, Canadian law enforcement has attracted increased public interest in police use of force in addition to the methods by which Less Lethal Weapons (LLWs) are tested and received approval for use. One of the objectives of the Conducted Energy Weapons Strategic Initiative (CEWSI) project is to develop a LLW approval process that could be applied to emerging less lethal technologies. The identification of requirements represents the first step in obtaining a new capability. This paper introduces the characteristics of good requirements, suggests several techniques for obtaining requirements and provides a template and guidelines for creating a Statement of Operational Requirements for a LLW capability.

## Résumé

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Depuis quelques années, le public s'intéresse davantage au recours à la force par la police ainsi qu'aux méthodes d'essai et d'approbation des armes à létalité atténuée (ALA). Un des objectifs de l'Initiative stratégique sur les armes à impulsion (ISAI) consiste à élaborer un processus d'approbation des ALA qui pourrait être appliqué aux nouvelles technologies à létalité atténuée. Le recensement des besoins constitue la première étape à suivre en vue de l'obtention d'une nouvelle capacité. Ce document présente les caractéristiques des besoins pertinents, propose plusieurs techniques permettant de reconnaître les besoins et fournit un modèle et des lignes directrices qui aideront à la rédaction d'un Énoncé des besoins opérationnels relatifs aux armes à létalité atténuée.

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## Executive summary

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### Statement of Operational Requirements (SOR): Guidance for Creating an SOR for Less Lethal Weapons

Wood, D.; DRDC CSS TM 2011-27; Defence R&D Canada – CSS; December 2011.

**Introduction or background:** As an initial step towards the creation of a Canadian Less Lethal Weapon (LLW) approval process, a workshop was held at Defence Research and Development Canada (DRDC) Toronto to develop elements of an operational requirement for LLWs. Participants at this workshop included Canadian policy and police representatives who reviewed related operational requirements and developed a number of operational scenarios.

**Results:** This report presents the operational scenarios developed at the Toronto Workshop by an invited group of law enforcement professionals from several regions and provides guidelines for the development of an SOR. The reader is presented with the characteristics of a good SOR as well as several techniques that can be used to elicit requirements. The report provides a template with examples for creating an SOR for LLWs as well as a template for producing additional operational scenarios.

**Significance:** The generation of formal Statements of Operational Requirements (SOR) prior to the selection and implementation of a LLW capability is new to the law enforcement community. Providing guidelines for the creation of SORs will ensure that the complete requirement is understood in advance of product selection. In addition, the SOR will become a key document to validate the effectiveness and suitability of a LLW during an operational trial and prior to large scale purchases and fielding.

**Future plans:** SORs should be developed from a user's perspective and the content of this report is intended to guide the user community in exploring and stating what will be needed to address capability gaps in LLWs. The content of this report is intended to be used by members of the law enforcement community as guidance to develop SOR to address specific capability gaps. The SOR will be used as a key input to a Canadian LLW approval process.

## Sommaire

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### **Énoncé des besoins opérationnels (EBO) : Consignes de rédaction d'un EBO portant sur les armes à létalité atténuée**

**Wood, D.; RDDC CSS DT 2011-27; R & D pour la défense Canada – CSS; décembre 2011.**

**Introduction ou contexte :** Une première étape en vue de la mise en place d'un processus canadien d'approbation d'armes à létalité atténuée (ALA) a été lancée par la tenue d'un atelier à Recherche et développement pour la défense Canada (RDDC) Toronto dans le but de recenser les éléments d'un besoin opérationnel en matière d'ALA. Au nombre des participants à cet atelier, on comptait des représentants canadiens des domaines politique et policier qui se sont penchés sur les besoins opérationnels connexes et élaboré un certain nombre de scénarios opérationnels.

**Résultats :** Le présent rapport présente les scénarios opérationnels élaborés au cours de l'atelier de Toronto par un groupe de professionnels de l'application de la loi venant de diverses régions. Il contient aussi des consignes de rédaction d'un EBO. Le lecteur peut y lire les caractéristiques d'un bon EBO et trouver plusieurs techniques qui peuvent servir à déterminer les besoins. Le rapport contient un modèle avec des exemples permettant de rédiger un EBO relatif aux ALA ainsi qu'un modèle permettant d'élaborer d'autres scénarios opérationnels.

**Importance :** La collectivité de l'application de la loi n'avait jamais eu auparavant à rédiger d'énoncés des besoins opérationnels (EBO) officiels avant la sélection et la mise en œuvre d'une arme à létalité atténuée. Grâce aux lignes directrices pour la rédaction des EBO, on pourra comprendre tous les besoins avant de procéder à la sélection du produit. De plus, l'EBO deviendra un document clé qui permettra de confirmer l'efficacité et la pertinence d'une ALA pendant un essai opérationnel et avant de procéder à des achats et à une mise en service à grande échelle.

**Projets futurs :** Les EBO devraient être élaborés du point de vue de l'utilisateur et le contenu du présent rapport a pour objet de guider la collectivité des utilisateurs dans l'exploration des besoins et l'énonciation de ceux-ci dans le but de combler les écarts de capacité en matière d'ALA. Le présent rapport s'adresse aux membres de la collectivité de l'application de la loi et leur servira de guide pour l'élaboration des EBO visant à combler des écarts de capacité particuliers. Les EBO constitueront les éléments clés d'un processus canadien d'approbation des ALA.

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# 1 Introduction

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## 1.1 Background

In recent years, Canadian law enforcement has attracted increased public interest in police use of force in addition to the methods by which Less Lethal Weapons (LLWs) are tested and receive approval for use. In 2008, the Federal, Provincial Territorial (FPT) Ministers Responsible for Justice established a Conducted Energy Weapons Working Group (CEW WG) to share information and best practices.

The Conducted Energy Weapons Strategic Initiative (CEWSI) is a project funded by the Canadian Police Research Centre (CPRC) and managed by Defence Research and Development Canada (DRDC) under the Centre for Security Science (CSS). It was created to address research priorities of the FPT CEW WG and was approved in August 2010.

The high-level objectives of the CEWSI project are to [1]:

- a. Develop a CEW test procedure and performance measures for current models in use in Canada as an immediate and interim measure to ensure CEWs are meeting manufacturer's technical specifications;
- b. Recommend a CEW test procedure and develop comprehensive performance measures for possible inclusion in a Canadian national guidance for CEWs employment in Canada as part of an enduring capability;
- c. Convene a panel of medical experts to conduct an independent evaluation of existing research to examine the physiological impact of CEWs, to identify gaps in the research and to recommend steps to address those gaps; and,
- d. Develop a LLW approval process that could be applied to emerging less lethal technologies.

In support of the objective to recommend a LLW approval process, the CEWSI project has initiated a number of work elements:

- a. **Operational Requirement Workshop.** A contract was put in place for a facilitator to lead a workshop in Toronto. The purpose of this workshop was "to develop the elements of an operational requirement for less lethal weapons (LLW) suitable for use by law enforcement in Canada." [3] This workshop forms the basis for this report;
- b. **Approval Process Study.** A study was conducted to review the approval of a number of technology devices as well as international LLW approval processes. This study also made recommendations on the components that should be included in a Canadian LLW approval process[2];

- c. **Development of a LLW taxonomy (classification schema)** suitable for law enforcement. A very detailed taxonomy has already been developed for military forces for the North Atlantic Treaty Organization (NATO). This taxonomy will be reviewed and revised to meet law enforcement needs. This taxonomy will support an approval process by breaking LLWs down by technology and function. The taxonomy will identify any applicable technology standards and the specialty skills that will need to be consulted for medical and technical assessments, and
- d. **Technology Watch.** This paper will outline the emerging technologies that should be of interest to the law enforcement community.

## 1.2 Aim

The aim of this paper is to provide law enforcement personnel with guidance on the preparation of operational requirements. The creation of an operational requirement can be considered the initial step in an approval process for LLW. It is intended that the work presented here will be taken as an initial step and that operators will further develop Statements of Operational Requirement (SOR) to support specific less lethal capabilities.

## 1.3 Limitations

The scenario content for this report was obtained from participants in a workshop held in Toronto in January, 2011. The views presented are those of the workshop participants and do not necessarily reflect the views of the entire law enforcement community. The information presented would need wider stakeholder engagement and potential further development to achieve consensus before being used to evaluate potential technologies. Section 5 contains detailed guidance for creating specific requirements. The examples provided are for illustration only and do not necessarily represent capability gaps.

## 1.4 Document Outline

Section 2 presents concepts related to requirements engineering including elements of a good requirement and some techniques for obtaining operational requirements.

Section 3 introduces examples of four different operational requirements for less lethal weapons.

Section 4 introduces concepts related to the development and management of operational requirements including the use of scenarios to support the elicitation of requirements.

Section 5 provides guidance on completing an SOR providing examples and explanations for each section of an SOR.

Section 6 presents the report conclusion.

Annex A explains useful techniques to elicit operational requirements from stakeholders.

Annex B is a template to guide the generation of additional scenarios.

Annex C includes the details of the operational scenarios developed at the Toronto Workshop.

Annex D is template for the development of an SOR for Less Lethal Weapons.

## 2 Requirements Engineering

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### 2.1 Capability Gaps

The National Defence Research Institute describes capabilities-based planning as ‘planning, under uncertainty, to provide capabilities suitable for a wide range of modern-day challenges and circumstances while working within an economic framework that necessitates choice’[4]. The law enforcement community is similar to the military in that they daily face uncertainty and quickly evolving situations. Unlike military decisions to use force, police officers predominantly make force related decisions alone. They rarely receive decision-making support from supervisors and their force decisions are made rapidly, alone and under high stress. This means they are primarily limited to the use of the resources the individual officer has on their person at the time the event unfolds. The use of any weapon by police is an extremely rare event. Any event involving the use of a less lethal weapon that ends in a fatality or grievous injury has the potential to spur public outcry resulting in high levels of stress for the individual police officer and the organizations.

Capabilities are essentially the general potential or wherewithal to handle not only a single well-defined problem but a variety of potential challenges [4]. A capability deficiency or gap exists when law enforcement lack the proper equipment, training, policies or other resources to deal with situations within the scope of their responsibilities. Economic and other resource constraints means that capability gaps need to be prioritized and options considered that will meet both the operational needs as well as the fiscal realities faced by police services. A Statement of Operational Requirements details what would be needed to fill a specified capability deficiency.

### 2.2 Requirements

The Department of Homeland Security (DHS) defines a requirement as ‘an attribute of a product, service or system necessary to produce an outcome(s) that satisfies the needs of a person, group or organization.’[5] The focus of requirements analysis is the identification of functionality and performance needs and specifically does not define or identify a solution to the problem.

The identification of requirements represents the first step in obtaining a new capability. Requirements are commonly divided into functional and technical requirements but these all result from a clear identification of a need or want provided by the customer or end-user. In the process of identifying operational requirements, the end-user needs to address the following questions [6]:

- a. What is the device intended/required to accomplish?
- b. What are the required performance characteristics (e.g. speed, range, accuracy, power, etc)
- c. When is the device needed and how long is it expected to remain in service?
- d. What is the expected usage? How many hours per day?

- e. To which organizations and in what quantities will the device be distributed?
- f. What is needed in terms of effectiveness? (e.g. Cost, availability, dependability, reliability, supportability)
- g. What are the environmental requirements? (e.g. temperature, physical terrain, humidity, transportation needs)
- h. How will it be supported throughout its life cycle?
- i. When the device is no longer needed or is removed from service, what is required to dispose of it?

The SOR is a document written from the user's perspective that presents the requirements in a formal manner and includes details on the concept of operation, i.e. how the device will be integrated into organizations and existing procedures.

Requirements are important inputs into the verification process – testing should trace back to specific requirements.

## 2.3 Characteristics of Good Requirements

Defining good quality requirements is a difficult task, however poorly stated requirements will result in misunderstandings and rework. The following criteria identified by Kar and Bailey are generally accepted as Characteristics of Good Requirements: [7]

- a. **Necessary.** The requirement is essential to the success of the device/system. If the requirement cannot be met, a deficiency will exist;
- b. **Concise.** The wording of the requirement should be simple, clear, and easy to read and to understand. The statement should represent only one requirement;
- c. **Complete.** The requirement should cover everything and should be able to stand alone from other requirements;
- d. **Implementation Neutral.** The requirement should be independent of any implementation options and should not describe how the requirements can be satisfied;
- e. **Attainable.** The requirement must be reasonable in that it is achievable or feasible from a technical and financial perspective;
- f. **Consistent.** The requirement must not contradict other stated requirements and should not be a duplicate of another requirement;
- g. **Unambiguous.** There should be no confusion as to the meaning of the requirement. Requirements should be stated as imperative needs using the word "shall". The use

of the term ‘will’, ‘should’, or ‘goals’ linked to requirements represent an optional need;

- h. **Verifiable.** All stated requirements need to be capable of verification through one of inspection, analysis, demonstration or test.

The SOR is a critical document that provides a clear definition of a problem and offers a framework to address it. Close attention to the characteristics of a good requirement listed above will ensure that as much information as possible is provided and that the validation of a proposed solution to the problem can be easily conducted.

## **2.4 Techniques for Eliciting Operational Requirement**

The International Institute of Business Analysis (IIBA) has published a Guide to the Business Analysis Body of Knowledge. This book contains a collection of knowledge and best practices and is the principle reference for business analysts. This reference provides details on the techniques that can be used for eliciting operational requirements [8]. The complexity of most areas will require the use of more than one approach to obtain a complete picture of the requirement. Annex A contains detailed descriptions of the most useful techniques for eliciting operational requirements: Brainstorming, Document Analysis, Focus Groups, Interviews, Observation, and Survey/Questionnaire.

## 3 Related LLW Operational Requirements

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Attendees to the CEWSI Operational Requirement workshop in Toronto (Toronto Workshop) were provided with a number of references that provided a good perspective of what could be included in an operational requirement. In particular, four documents related to the requirement for less lethal weapons were considered by the workshop participants. Each document is summarized in the following sections. Elements of each of these documents have been incorporated into the recommended template at Annex C for an SOR for LLWs.

### 3.1 NATO

In 1999, NATO identified the importance of non-lethal weapons (NLW) as a capability that would be needed to address the demands of new security threats and called for a capabilities-assessment to determine NLW requirements and capability gaps. The SAS-078 WG was formed and as an initial effort, undertook a detailed assessment of NATO requirements for NLW. The resulting report has been referenced by many organizations as cornerstone document to support NLW programs.[9]

This document outlines 23 different requirements for NLW required of NATO forces. For each, the document provides examples, and details of the requirement broken down by Target Characterization, Engagement Characterization and Effectiveness Characterization, as well as cross-references to related NATO Tasks.

Most of the requirements identified are unique to defence and military operations, however some could be of interest to security operations. Of particular interest is how the requirements are quantified. While the numbers provided in this document are not applicable in a law enforcement context, this document served as a valuable reference to the Toronto Working Group to demonstrate how a requirement can be quantified and to provide guidance on some of the factors to be considered when considering law enforcement scenarios. It was also used as a reference by the UK and the International Law Enforcement Forum (ILEF) in their work.

### 3.2 UK

The Association of Chief Police Officers (ACPO) General Policing Committee produced a paper that outlines “an Operational Requirement for ‘less lethal options’ for the police service in the UK”. [10] This document is very high level, does not differentiate among different scenarios and is not intended to outline the requirements to fill a specific capability gap. It is written specifically by and for the law enforcement community and addresses the unique characteristics of this environment with specific focus on the operational context faced by police.

This paper summarizes the requirements for less lethal options under the following headings[10]:

- a. Accuracy – ‘the option should be discriminating over a range of between 1 and 25 metres’

- b. Immediacy – ‘the option should be rapidly effective – ideally immediate.’
- c. Subject Population – ‘the option should be effective against the maximum proportion of the population’
- d. Ease of Operation – ‘the option should be capable of being operated by one officer’
- e. Judgement – ‘the option should minimise the number of judgement issues arising from its use’
- f. Injury/Lethality – the option should minimize the risk to any person of serious injury and/or lethality at all ranges/
- g. Effect – ‘the option should at least temporarily neutralise the threat, rendering a subject incapable of carrying out an immediate threat of violence’
- h. Environment – ‘the option should be effective in all operating conditions’
- i. Mobility/Flexibility – ‘the option should be effective against a moving target’
- j. Cumulative Effects – ‘the use of the option should not preclude the use of other tactical options before/after’
- k. Safety/Security – ‘the use of the option, and the equipment required, should be safe to operate and store, and should have minimum security considerations’

The paper also mentions the need to consider other issues when determining the appropriate capability including speed of multiple use, specialist vs. generalist use, training, costs, legal implications, acceptability, visual effect, after-effects, durability, authority required to use, and the need for an audit trail.

The Toronto Workshop participants used these categories to discuss the differences among the various scenarios developed and considered in identifying operational requirements.

### **3.3 International Law Enforcement Forum (ILEF)**

The ILEF brings together policy and technical expertise in order to discuss new concepts, operational requirements, technical evaluation, training, testing, and legal implications related to less lethal weapons and minimal use of force options. [11] This is accomplished through workshops conducted approximately every 18 months. ILEF recognizes the need for information sharing and the development of common standards and the 2004 ILEF specifically identified the need for the development of operational requirements, communication of these requirements to manufacturers, identification of desired effects and outcomes, and development of measures of effectiveness[12].

An Electronic Operational Requirements Group (EORG) was formed to gain end-user perspective on less lethal weapons definitions and operational criteria. This resulted in the production of an “ILEF Report on Less-Lethal Weapons: Definitions and Operational Criteria” that was produced

15 February, 2005. [13] This report introduces the following guiding principles for minimal force options:

- a. Enhance Supportability of Operations
- b. Leverage Simple, Economical Technology
- c. Augment Justifiable Force
- d. Ensure Predictable Results
- e. Focus on Discriminate Applications
- f. Maintain Public Acceptability
- g. Provide Reversibility of Effects
- h. Apply Across the Range of Police Operations

This document suggests some operational parameters that could be used for the establishment of testing and training standards and provides definitions of each of the following terms:

- a. Employment Issues
  - i. Accuracy
  - ii. Maximum Effective Range
  - iii. Minimum Safe Range
  - iv. Ease of Operation
  - v. Operational Effect
  - vi. Acceptability
  - vii. Immediacy
- b. Weapon Issues
  - i. Specification of Weapons
  - ii. Interaction with other Weapons
  - iii. Reliability
  - iv. Safety/Security
  - v. Portability

- vi. Mobility/Flexibility
- c. Human Effects Issues
  - i. Medical Implications
  - ii. Subject Population
  - iii. Cumulative Effects
  - iv. Probable Outcomes
- d. Public Policy Issues
  - i. Areas of use/Environments
  - ii. Costs
  - iii. Training

These documents are of particular interest because they address the need for LLWs from a law enforcement perspective with specific attention paid to the operational scenarios under which they would be employed. Although the output of these forums cannot be considered definitive for Canadian use, they do demonstrate collective agreement from those interested in advancing knowledge in use of force areas.

The content of these reports was used by the Toronto Workshop participants to identify and understand various operational scenarios in which less lethal weapons could be deployed.

### **3.4 CF NLLD SOR**

The Canadian Forces (CF) developed a formal SOR to support the procurement of a Non-Lethal Laser Dazzler (NLLD) as part of a capital procurement project.[11] Unlike the previous SORs, this one was developed specifically to obtain approval to purchase and to implement a particular non lethal capability.

The NLLD SOR provides a great deal of detail outlining the operational context under which the device would be used including a mission description, the climate, potential threats, concepts of operation, methods of employment, user characteristics and concept of support. Detailed design guidance is provided for both essential and desirable requirements covering such things as size, weight and physical functions. The SOR also provides specific system effectiveness requirements (range, aiming and firing, rapid use, compatibility, reliability, and safety), performance measures, personnel and training requirements (tactics, techniques and procedures, personnel, and training) and integrated logistic support (maintenance, accountability).

A well-structured document, this SOR is a good example of the amount of detail that should be included in a capability-specific SOR for less lethal weapons.

## 4 Developing Statements of Operational Requirements

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### 4.1 Scope of an SOR

An SOR should be created to address a specific capability gap. This means there could reasonably be multiple SORs as it is unlikely that a single LLW could satisfy all the requirements for all potential scenarios. For example, a LLW used to remove a subject from a cell may not meet the requirements for a LLW to stop a fleeing vehicle.

Although an end-user may have a good idea of the solution they would like, it is important that the SOR not be written for a specific make/model or type of device. Some of the proposed elements of an SOR such as tactics and training are particularly challenging to complete without a concept of what the final solution may look like. The content of these sections should be high level and should focus on the organizational capacity in these areas. For example in training, it would be sufficient to describe how training is conducted on similar devices and how or if it would be possible to integrate new training into the existing construct. An SOR that has been developed for a specific make or model of device will likely result in a less than optimal solution and could potentially eliminate workable options. The SOR should instead support a review of a wide variety of options that could be provided by industry to meet the requirement. It is also preferable for the SOR to be written such that it incorporates the requirements of the broader law enforcement community and is not restricted to the needs of only a single organization or team. If the same LLW is to be used by multiple specialty teams, the requirements of all groups must be incorporated.

### 4.2 Linkage to LLW Approval Process

The SOR will be used at a number of points in the LLW approval process:

- a. **Initiation.** The creation of an SOR will serve as recognition that a capability gap exists and will trigger the rest of the approval process steps;
- b. **Options Analysis.** The SOR should be used by a technical team that will survey industry for potential LLWs that could satisfy the requirement. In the absence of mature technologies, a research and development project may be needed, or operators may need to adjust their requirements to what is technically feasible;
- c. **Technical Characterization.** Potential products will be evaluated against the physical requirements identified in the SOR. This will quickly screen out potential solutions. For example, if one of the requirements is that a device must be operable by either a left or right-handed person, then any devices not meeting this requirement would not be considered further;
- d. **Develop Concept of Operations.** The SOR will contain a section that informs policy makers as to how law enforcement plans to use the LLW;

- e. **Operational Trial.** Analysts preparing for an operational trial will use the SOR to develop evaluation criteria against which proposed LLWs will be evaluated and scenarios for the trials. One of the goals is to validate that the LLW will satisfy the documented and approved operational requirements, and
- f. **Training, Tactics and Procedures.** Staff responsible for developing training and/or tactics and procedures will refer to the SOR to develop training packages as well as make changes to tactics and procedures

### 4.3 Responsibility for Preparing an SOR

In order to give an accurate accounting of operational requirements, an SOR needs to be developed from an end-user perspective (ie law enforcement) and is best created through consultation with end-users that have significant operational experience in the relevant scenarios. Support in the generation of an SOR can be provided by consultants experienced in conducting business analysis or defining operational requirements using techniques described in Section 2.3. In this circumstance, validation of the SOR by a representative operational community will need to be done to ensure an accurate perspective. An operational requirement needs details that will only be known by those with experience in situations where the LLW might be used. The true value of the SOR is the means by which it captures this real-life experience into a format that can easily be communicated to other stakeholders in the process (eg policy, training, or technical).

An SOR should never be developed by a manufacturer as the resulting SOR may be biased to that manufacturer's solution.

### 4.4 Endorsement of an SOR

Under ideal circumstances, the SOR will be developed by a group of operators who represent the entire law enforcement community. Realistically, however, the SOR is likely to be developed by a small group representing one or more police services with a priority to address a specific capability gap. Because the SOR is expected to be used by policy makers, training staff, technical experts, medical and legal advisors and other involved in the approval process, it is very important that the SOR truly represent a consensus view. Once the SOR is developed, it should be endorsed by the appropriate management level in the police services. This will prevent misunderstanding or disagreements later in the process that could result in delays in approval or unnecessary rework.

### 4.5 Retention and Updating

The SOR is expected to be used by various stakeholders throughout the approval process. The following suggestions will ensure the SOR continues to be a useful document throughout:

- a. The SOR should be maintained as part of the official record supporting the approval decision;

- b. Changes to the SOR should be carefully tracked through the assignment of document versions to ensure stakeholders are referring to the most current version;
- c. If the SOR is generated to address a local capability gap, the SOR should be shared with other law enforcement personnel and where possible, the SOR should be developed to reflect the requirements of the larger community;
- d. In order to prevent unnecessary expenditures of resources, the SOR should be reused by other organizations with similar requirements;
- e. Over time, there will be changes in tactics and technical capabilities, therefore any SOR should be carefully validated before it is reused, and
- f. Where possible, SORs should be accessible to industry so that the information can be used to support the development of new products.

## **4.6 Use of Scenarios**

Operational scenarios provide a valuable tool to guide the elicitation of operational requirements. They are particularly useful for focus groups, brainstorming sessions or interviews to provide the stakeholder context to consider how a less lethal weapon might be used. When considering a specific capability gap, stakeholders should be able to identify which scenarios are applicable to the stated gap and describe in detail how the less lethal weapon would contribute operationally to filling the gap. It is expected that a single capability gap could impact on more than one scenario however it may not be applicable to all scenarios.

## **4.7 Operational Requirements Scenario Development Workshop**

In January, 2011 a workshop was held at DRDC Toronto (Toronto Workshop) to develop elements of an operational requirement for LLWs suitable for use by Canadian law enforcement. Participants included representatives from policy and policing organizations from across Canada. The workshop focused on defining details of operational scenarios that would result in the use of a LLW. For each scenario, the workshop participants described the Situation, the Subject Behaviour, Perception and Tactical Considerations and the Response Required. Annex A contains a template that was used by the workshop participants that can be used to develop additional scenarios.

## **4.8 Initial List of Scenarios**

The scenarios developed during the Toronto Workshop are not meant to be all-inclusive and they represent the opinions of the workshop participants. There may be additional scenarios where LLWs could be employed or there may be differences in the descriptions of the scenarios presented here. These scenarios are presented as examples of situations where LLWs could be employed and provide a picture of the response that would be required. Annex B contains the full details of the scenarios developed during the Toronto Workshop.

## 5 Guidance for Creating a Statement of Operational Requirement

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### 5.1 General

Annex D provides a simple template that can be used to create a Statement of Operational Requirement (SOR). It is intended as a tool and may be adjusted as needed to address specific operational needs. The following paragraphs provide guidance on the kind of information to be included in each of the sections and where appropriate provides examples of suitable phrases. **The examples provided in the sections below are purely for demonstration purposes and do not necessarily represent actual deficiencies or operational requirements.**

### 5.2 Objective

The Objective paragraph should provide the reader with quick and concise summary of the purpose of the document and for which LLW. An example could be:

*The objective of this document is to describe the operational requirements for a less lethal weapon for use by Customs Officers to prevent a prisoner from inflicting self harm while inside a cell.*

Another example:

*The objective of this document is to describe the operational requirements for a less lethal device for Canadian law enforcement that will safely bring a vehicle to a stop under controlled conditions.*

### 5.3 Scope and Limitations

This section should clearly identify the organization or functions to which this operational requirement applies and give specific examples where it does not apply. As an example:

*This SOR was developed to address the needs of RCMP officers deployed in remote locations in Canada. While similar capability deficiencies may exist in urban centres, this SOR does not specifically address those requirements.*

Another example:

*This SOR was developed by the Ontario Provincial Police (OPP) to identify the specific requirements of a specialty tactical team. The requirements identified in this document are unique to this team and do not represent requirements of any other police organization in Canada.*

## 5.4 Capability Deficiency

This section should clearly identify current deficiencies, in other words, what action cannot be performed currently that requires the approval a specific LLW. For example:

*Public order teams in urban centres in Canada do not currently have the ability to easily track subjects through a crowd. Subjects who are observed in the progress of inflicting property damage are able to merge back into the crowd. These subjects often change their clothing and other outward appearances making identification difficult for law enforcement.*

Another example:

*Police officers pursuing a subject in a vehicle that refuses to stop do not currently have the capability to safely bring the vehicle to a stop in order to place the subject in custody. Chases that continue have the potential to result in injuries to the subject, bystanders or police.*

## 5.5 Current Situation

This section should outline options currently open to law enforcement as well as any problems with these options. For example:

*Restraining a subject that is physically fighting against the restraints is a difficult task for law enforcement personnel. In the absence of alternatives, the only option available involves the use of physical force which has a high chance of resulting in injuries to both the subject and to law enforcement personnel. The objective is to quickly safely gain control of the subject to prevent further injuries.*

Another example:

*When faced with an armed subject with a clear intent, police are required to make quick decisions after considering the situation and the options available. In the absence of alternatives, police may need to resort to a lethal force option.*

## 5.6 Alternatives

This section should explain what other LLW alternatives there are and why they are either insufficient or unsatisfactory. It is important to mention the impact of escalating the situation to lethal force as well as the potential for doing nothing. For example:

*In the circumstances where a subject is armed and clearly intends to inflict personal harm, police need to carefully consider the alternatives available. One option is to take no action beyond communications and wait and see if the suspect opens an opportunity for police to move in safely. This can often take a very long time and has a high probability of the suspect taking his/her intended actions. There is also an increased risk the subject will use the weapon against bystanders or law enforcement. At the other*

*extreme, police could use lethal force to end the situation. In some cases, this is the action desired by the subject and can have very undesirable results. The aim of police is to end the situation quickly with no harm to the subject, bystanders or police.*

## **5.7 Applicable Scenarios**

This section should identify the scenarios where it is expected this LLW will be used. Annex C includes a list of scenarios developed by police and policy representatives that can form the basis of this section. If there are other scenarios, they should also be included. If there are any specific situations where the LLW is specifically NOT intended to be used, this should also be indicated. There may be situations where the use of this LLW will explicitly not be used. If there is the potential in the future of using the LLW in other scenarios, then they should not be specifically excluded. For example:

*It is expected that this LLW will be used in the following operational scenarios: (list applicable ones). There is no intention to use this device in the following situations (list if applicable)*

## **5.8 Method of Employment**

This section should describe the vision as to how the less lethal weapon would be used including whether it would be used by general patrol officers, specialist teams, in cooperation with other devices, by single officers, mounted to a vehicle, etc. For example:

*This device is intended to be used by the public order team in an urban centre who must provide instructions to a crowd to move out of the area. The device will be operated by an assigned member of the public order team who will operate under the direction of the on-site Incident Commander. This device could be used in cooperation with any other devices that are part of the regular equipment of an urban public order team.*

## **5.9 Environmental Considerations**

This section should describe the expected environmental conditions the equipment will be exposed to. Detailed system effectiveness requirements will be provided later so this section should focus on describing the operating environment in general terms. For example:

*This device will be used by individual patrol officers operating outside in all weather conditions including but not limited to rain, snow and cold. There are unique conditions related to using this device in the north that include reliability in cold and the need to be operable with standard police cold weather gear.*

## **5.10 Concept of Support**

This section should describe how support for the device will be provided. This may vary from force to force and where there will be differences within the Scope and Limitations identified

previously, these differences should be identified. In some circumstances, the intent may for anything beyond end user maintenance to be handled by the manufacturer. This would be common in situations where the complexity of the system means it could not be maintained in-house or the integrity of the system requires maintenance by qualified technicians. If the intent is for the item to be a single use with no maintenance required, this should be stated here. It is expected that a maintenance contract would be put in place, this should be included. Identify plans/requirements for handling trouble reports related to functioning of the equipment. For example:

*This device is a single use device and there is no requirement for recurring maintenance. The manufacturer has recommended a best before date for the device. It will be the responsibility of the current supplies section to validate that devices in inventory are within the best before date.*

Another example:

*The proposed device is a highly technical device that can only be properly maintained by the manufacturer representative. The intent is to obtain extended warranties for the LLW to cover any technical problems that may be required. End user actions are limited to powering the device on and conducting a physical inspection of the device before use. The responsibility for this will rest with the officer assigned to operate it.*

## **5.11 Physical Characteristics**

This section should outline the physical characteristics of the device. These requirements are normally easily verifiable either through a physical inspection or a review of the manufacturer documentation. The requirements in this section should include both mandatory and desirable and be clearly identified as one or the other. Some examples:

*The weight shall not exceed 1 kg including all power sources.*

*Shall be clearly visible by a subject from a distance of 5m.*

*Shall have an integrated power source that uses commercially available batteries.*

*Should be yellow or orange to distinguish it from a lethal use of force option (this is an example of a desirable requirement)*

## **5.12 Functional Characteristics**

The section should outline the functional characteristics of the device. Functional characteristics are those that are related to the interaction of the device with the operator. Validation of these requirements may require an operator to physically interact with the device. Some examples:

*Shall be safely used by either a right- or left-handed operator*

*Shall be usable by an operator wearing personal protective equipment*

*Shall have a safety switch to prevent inadvertent operation*

*Should be capable of being deployed remotely*

### **5.13 Range and Duration of Engagement**

These requirements relate directly to the operational effectiveness of the device. Quantification of requirements is important and will often be determined considering the applicable scenarios, tactics and procedures. Where engagement distances are provided, both minimum and maximum ranges should be provided. Some examples:

*Minimum Effective Engagement Distance shall be no more than = 1m (numbers indicative only)*

*Maximum Effective Engagement Distance shall be no less than 7m*

*Incapacitation shall be within 2 seconds*

*The effect on the subject shall be reversible within 15 minutes*

*Subject should be incapacitated for at least 15 seconds.*

### **5.14 Accuracy and Precision**

These requirements should describe the need for accuracy and precision. What is the planned method for aiming? Is there a requirement to deploy it in a rapid mode? How quickly does the equipment need to be set up and ready to operate? Some examples:

*Shall be precise within 10 centimetres over a distance of 20 meters (numbers indicative only)*

*Shall be aimed with the support of a laser*

*Should be able to hit a moving subject*

*Should be capable of repeated applications on a subject*

### **5.15 Reliability**

This section should outline the quantifiable requirements for the device to operate reliably under a variety of conditions. Specifically, it looks at factors that could interfere with the end-users ability to operate. Validation of these requirements are normally through testing and evaluation. Some examples:

*Shall withstand a drop from 1 m*

*Shall operate between -40C and +40C*

*Shall be waterproof up to 1m*

*Shall continue to operate in rain or snow*

*Shall operate as intended 99 times out of 100*

## **5.16 Durability**

This section should outline the requirements to continue to operate over the longer term based on common and normal usage. Some examples:

*Shall be washable using common household detergents and materials*

*Shall withstand being splashed with small quantities (10-20ml) of substances such as blood, vomit, cleaning solvents, oil, fuel, etc*

*Shall withstand operational conditions over 3 years of cumulative use*

*Shall be constructed of flame resistant material*

*Should be resistant to mould and fungus*

## **5.17 Interoperability**

If there is a need for the device to work in coordination with another device this needs to be explicitly stated. Interoperability requirements identify the need for the device to connect to or operate with others devices. Some examples:

*Use of the device shall not preclude the use of other tactical options before or after*

*Shall be mountable on current service weapon.*

## **5.18 Usability**

These requirements relate to the ease with which an end-user can use the device to accomplish a task. Some examples:

*Should be deployable in less than 20 secs by a trained officer*

*Should be easy to manipulate in confined spaces*

*Should allow for ease of transitioning to lethal force*

## **5.19 Safety**

This section outlines the safety requirements for the device. Some examples:

*Shall not be integrated with a lethal device (to avoid confusion on behalf of the officer or the subject)*

*Shall not interfere with the ability to provide medical assistance to a subject*

*Shall have no collateral effect on bystanders*

*System documentation shall include clear warnings to ensure the safety of the operator*

*Should not contaminate the area*

## **5.20 Tactics, Techniques and Procedures**

The introduction of a new LLW will undoubtedly require changes to existing tactics and procedures. This section should identify those procedures that are expected to require adjustment. The SOR will not contain updated tactics and procedures as they can only be developed once more information is known about a specific solution. For example:

*This LLW will be used by the public order team to communicate to crowds with the intent of having them move out of the area. Its use will need to be integrated into the procedures currently used by the public order team to influence the direction of flow of large groups of people.*

Another example:

*This LLW will be used by a team executing a warrant. Teams do not currently have this capability therefore a review of the entry procedures will need to be conducted to ensure the safe and effective integration of this device in current procedures.*

## **5.21 Personnel**

With the addition of a new capability, there may be a requirement for additional staff to operate the device. This section should identify the expected operators of the device and what baseline skills they are expected to have. In addition consideration needs to be given to additional support staff to manage or maintain the equipment. For example:

*It is expected that every police officer will be equipped with one of these devices. They will be issued to only fully trained police officers. Because of the quantities expected to be purchased, it will be necessary to identify who will be responsible for managing the inventory of equipment and replacing defective or consumed devices.*

Another example:

*This LLW will be a new addition to the public order team. It requires two dedicated operators that cannot be used for other tasks during the operation of this device because of the need for diligence and attention for its safe operation. This will require an increase to the team size of two people or a reduction from other functions.*

## 5.22 Training

This section needs to identify changes that will be required to the training programs currently in place to account for the new equipment. Provide an indication as to how initial training will likely be conducted and whether or not there is a requirement for refresher training. For example:

*This LLW will only be used by specialist teams and all operators need to be fully training on its safe and effective use before being authorized to use it. Training on the basic functioning of the device will be conducted by the manufacturer. Training on how to incorporate the device into current tactics will need to be conducted at the police college as a specialist course.*

## 5.23 Logistics

This section should include information such as the quantity required, as well as the need for spares and consumables. If there is an expected timeframe for this device to be in service, this should also be identified. Special consideration should also be given to the need for safe and effective disposal. For example:

*This LLW will only be used by tactical teams in the urban domain. No more than one per large urban police service would be required. Because of the important role this device will play with the teams, a spare device should be available. Sufficient consumables (batteries and other supplies) for continued operation for 48 hours should be available in stock. If the device contains hazardous materials that prevent disposal through municipal waste management programs, the manufacturer must have a mechanism to arrange for safe disposal of old devices.*

## 6 Conclusion

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Requirements Engineering provides a structured method of looking at a capability gap and what would be required to fill that gap. This report presents the characteristics of a good requirement and introduces valuable techniques for eliciting operational requirements.

The workshop held at DRDC Toronto represented the first opportunity for Canadian policy and police representatives to explore the creation of operational requirements for less lethal weapons. Considering the examples provided by NATO, UK and ILEF, the workshop participants were able to generate operational scenarios where less lethal weapons were likely to be employed. These scenarios allowed the group to consider the situation, the subject behaviour and tactical considerations in order to verbalize the response or effect that was desired from the employment of less lethal weapons.

Developing an SOR is the initial step in obtaining approval for the introduction of a new LLW and should be initiated and endorsed by the operational community. This SOR is a key document that will be used by other stakeholders in the approval process and will function as the principal tool for validating the effectiveness and suitability of a LLW.

The annexes of this report provide tools and background information to support the development of SORs.

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## **Annex A Techniques for Eliciting Good Requirements**

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The following techniques are recommended options for obtaining operational requirements:

**Brainstorming.** The intent with brainstorming is to quickly gather a broad selection of creative options from a group of stakeholders. This method of obtaining requirements is a good way to get many ideas from a group in a short period of time and this is accomplished primarily by not allowing debate or critiques of the ideas presented during the brainstorming session. Brainstorming should be used in cooperation with other techniques to analyze the options presented;

**Document analysis.** This technique requires the analyst to gather as much information as possible from existing documents and references such as policies, guidelines, procedures or training guides. The process can be time-consuming and will only provide the as-is perspective, however will allow the analyst to better understand the current situation;

**Focus group.** A focus group is comprised of from 6 to 12 specific, qualified individuals. Guided by a moderator to manage interactions, a focus group functions interactively to elicit and develop ideas. More structured than a brainstorming session, a focus group is a good tool for obtaining consensus from stakeholders;

**Interviews.** The use of one-on-one interviews may be used on select stakeholders in order to obtain requirements. An interview may be structured with pre-defined questions or may be unstructured. This technique provides stakeholders an opportunity to express opinions they may not be comfortable sharing in a group setting but is not effective in obtaining consensus due to the absence of dynamic exchange;

**Observation.** One option to obtain operational requirements in a dynamic environment involves watching as the end user works in order to gain a realistic and detailed understanding of how the work is done in an operational environment. Depending on the circumstances, the observer may ask questions during the observation period or could wait until the end to get clarification. While this technique provides realistic input, it can be time-consuming and is difficult to capture every potential situation;

**Survey/Questionnaire.** The use of surveys or questionnaires allows the collection of information from a large number of stakeholders and can be accomplished in a relatively short period of time. It is quick and easy to administer however questions must be very carefully designed to obtain desired results. The use of questionnaires provides an excellent opportunity to obtain quantitative data. This approach is especially useful when the stakeholders are not co-located;

## Annex B Template for Developing Operational Scenarios

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*The following information can be used to guide the development of operational scenarios and to identify the operational requirements for less lethal weapons.*

**TITLE:** short, one-line that clearly represents the scenario

**DESCRIPTION:** one-paragraph that describes the context for the scenario (who, what, where, when, why); you can tell a story

**SITUATION:** detailed physical characteristics related to the scenario. Consider the following:

- Topography & vegetation (barriers between subject and officers)
- Inside/outside
- Buildings and structures
- Number of subjects
- Perceived subject's abilities
- Knowledge of subject
- Time of day
- Presence of bystanders
- Lighting and time of day
- Weather
- Distances
- Emotionally disturbed person
- Alcohol/drugs
- Subject behaviour (cooperative, passive resistant, active resistant, grievous bodily harm or death)

**PERCEPTION AND TACTICAL CONSIDERATIONS:** existence of characteristics that will influence the LLW options. Consider the following:

- Availability of backup/cover
- practicality
- Likelihood of escalation of situation
- Speed with which a response is needed (time available to officer to decide to deploy)

**DESIRED EFFECT:** What is the operational effect you want to achieve? (e.g. Bring the vehicle to a controlled stop; have the suspect in custody). Refer to Deter, Distract, Disrupt

RESPONSE REQUIRED: Look at what the LLW should be capable of doing or how it should interact with the officer. Consider the following:

- Minimum and maximum distance where the weapons needs to be deployed
- Time: How fast must the onset of the effect be?
- Duration: How long does the LLW effect need to last for the officer to take action
- What degree of recovery from the effect is required of the subject? Reversible?
- Transference on first responders?
- Value of visible/audible recognition as a deterrent?
- Wearable or portable?
- Operable by one or more officers?
- One or two hand operation? Ambidextrous?
- Ability to hit a moving target?
- Operable in specific weather and light conditions?
- Need to be separate from lethal options
- Traceability of use?
- Simplicity of deployment? Specialty training appropriate?
- Use by specialty team or all officers?
- Limitations on physiological effect on suspect
- Multiple applications
- Expected response of subject to failed application of LLW
- Manipulation in confined spaces

## **Annex C Operational Scenarios**

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The following scenarios and the desired operational effects were developed by representatives from policy and policing organizations during the Toronto Workshop. They represent the views of the participants and have not been endorsed by any Canadian law enforcement body.

### **Scenario 1: Single Officer, Single Assaultive Subject**

#### **Description**

- Officer stops subject driving car for traffic violation
- Subject is angry and exits his/her vehicle before officer arrives at driver's door

#### **Situation**

- At the roadside in a secluded area
- No other people in the vicinity
- Subject isolates officer from his/her vehicle
- No cover
- Strength and ability of subject is unknown
- Vehicle registration indicates owner/subject has a history of violence

#### **Subject Behaviour**

- Verbally abusive
- Approaches in an aggressive manner
- Closes the gap between subject/officer consistent with impending assault

#### **Perception and Tactical Considerations**

- Officer believes assault is imminent
- Officer perceives possibility of being overpowered
- Backup is not immediately available

#### **Response (*effect*) Required**

- Objective is to “Deter, Distract, and Disrupt,” neutralizing the threat and allowing sufficient time for the officer to reposition
- Disrupt/restrict mobility so assault cannot initiate
- LLW must be obvious – visible/audible/recognizable – to act as deterrent
- Officer/LLW needs to distract subject causing momentary sensory deprivation
- Distance: 1-25m
- Time: immediate incapacitation for a short duration (effects lasting 1 minute) with an ability to reapply if necessary
- The alternative is “persistence in application of the effect “to be completely controlled by the officer
- Use of LLW must not put officer at risk or have adverse effect on officer
- Effect on subject needs to be reversible
- Transference is a critical consideration
- Applicable up to close quarters
- First priority is to slow the subject down in order to allow the police officer to deploy other options
- Operation of LLW needs to be one-handed/ambidextrous
- LLW needs to be easily accessible/wearable
- Training for LLW must be straight-forward in order for all officers, not just specialty teams, to qualify in its use
- Must have known physiological effect on subject (including cumulative effect) not intended to cause grievous bodily harm to subject
- Simple/fast operation (one or two steps to deploy)
- Traceability of use would be useful, but not necessarily critical in this scenario (especially for training devices)
- Employable in all weather conditions
- Ability to hit a moving target
- LLW cannot be integrated with lethal device

## **Scenario 2: Emotionally Distraught Person (EDP)**

### **Description**

- Officers respond to a call at a home with an agitated subject
- Subject has self-inflicted injuries and threatens additional self-harm
- Officer has difficulty communicating with subject who appears dissociative
- Subject has access to a weapon, self-harm is imminent

### **Situation**

- Subject is in the home – an enclosed space – lights are on; subject is seated at a table; table is between subject and officer
- Multiple officers are present; all bystanders have been removed
- Subject's emotional state is distraught/dissociative; judgment is impaired; response is unpredictable
- Subject may be immune to pain

### **Subject Behaviour**

- Risk of grievous bodily harm to subject (self-harm)
- no apparent intention to injure others
- Subject is inwardly focused

### **Perception and Tactical Considerations**

- Person is capable and actively self-harming
- Immediate response is needed
- Public expectations (perceptions) need to be considered
- Direct physical contact is not a suitable option

### **Response (*effect*) Required**

- Effect required is to stop the subject from self-harming and to get medical help; subject needs to be restrained to ensure safety of medical personnel
- Distance: range of 1-7m

- Time: Immediate onset; duration of 1 min
- Multiple application capability (failure of device may aggravate subject)
- Manipulation in confined space is required
- Operation of LLW needs to be one-handed/ambidextrous
- Precision required for targeting (limited target available)
- LLW must not contaminate or damage private residence
- Effect is directed at the subject, stops at the subject
- Limited mobility in confined space for the officers present
- Need ability to re-engage in short period of time
- Non-linear propagation may be useful in confined space (ability to “aim off”)
- Device recognition (auditory, visual) will have no impact in this scenario
- Portable, preferably on the body, but not necessarily wearable
- No transference (cross-contamination) – medical care will be needed post
- Reversibility; effect cannot impact on subsequent medical care and cannot worsen medical condition
- Do not want to have to treat the subject for the result of the LLW before they can be treated medically

### **Scenario 3: Fleeing Vehicle**

#### **Description**

- A child is abducted by a subject and is placed in the back seat of the subject’s vehicle
- Subject in vehicle flees recklessly from scene with child (911 call-precipitated)

#### **Situation**

- It is daytime in an urban residential area; dry roads or winter conditions
- Single subject fleeing scene in vehicle with abducted child
- Officers know that child is in the back seat
- Multiple (2 officially) patrol cars involved

### **Subject Behaviour**

- Assumed assaultive by virtue of abduction
- Behaving and driving recklessly
- Unknown driving ability or legal driving status/age
- Likelihood of grievous bodily harm

### **Perception and Tactical Considerations**

- Need to avoid a vehicle-vehicle interaction/collision
- Must maintain contact and ID of car
- Normal PIT manoeuvre does not apply in this scenario
- Assumed driver will not abandon child and continue with vehicle

### **Response (*effect*) Required**

- Quickly and safely roll the vehicle to a stop (controlled) regardless of environmental conditions
- Vehicle is immobilized until subject removed
- Police or third-party revival capability
- Timing: vehicle immobilization is immediate and long lasting
- Targeted to subject vehicle and no collateral involvement
- Assumed vehicle will be damaged or destroyed in process
- LLW solution maintains occupant safety
- LLW is either patrol car-mounted or portable (feasibly carried)
- May be deployable during driving/pursuing officer(s)
- Range: one city block, or 200m line-of-sight (must maintain visual contact with vehicle)
- LLW must work on any size vehicle (econo/box to bus or tanker truck)

### **Scenario 4: Assaultive Behaviour, non-Cooperative Subject, Close Quarter**

#### **Description**

- Subject is being questioned by an officer when the subject spontaneously assaults the officer and the officer is taken to ground by subject
- Subject takes dominant (top-mount) position hampering the officer's ability to access the equipment on belt

#### **Situation**

- Normal urban exterior streetscape
- Single subject; single officer
- Complete surprise

#### **Subject Behaviour**

- Spontaneous, assaultive, potential for grievous bodily harm
- Physically overpowering

#### **Perception and Tactical Considerations**

- Fight for control is paramount vs. survival
- Create enough time for officer to re-group
- Create conditions for officer to use other tools and distance and time

#### **Response (*effect*) Required**

- Quickly shift power and control back to officer by surprising and distracting and/or disabling subject
- Immediate use
- Duration of effect (4-5 s)
- Operate in close quarters
- Simple operation; effect or system is activated using only gross motor movements *not* fine motor functions
- Function-capable in the subordinate posture, with hands/arms pinned or protecting face
- Effect must not cause subject to fall back on top of officer
- Pain-compliance effect is not the only capability
- Scalable energy/function effects

- Multiple-use/‘firing’ capable
- No cross-contamination to bystanders etc.
- Automatic or manual location beacon/finding ability for assistance from other members
- subjects should not be left with any physical markings/effects from use of LLW (i.e., minimize - as operationally possible)
- Ambidextrous and one-handed use-capable
- Retention of system remains with officer
- Appearance of device - acceptable to public sensibilities and tolerance/perception

### **Scenario 5: Multiple Assailants**

#### **Description**

- Officer attempts arrest in a common area (bar, etc.), bystanders become involved

#### **Situation**

- Anytime/anywhere, day/night
- Innocent bystanders are present – intentions of subject/bystanders unknown
- Difficult for officer to differentiate initial subject after bystanders become involved
- Officer is outside vehicle
- Surprise attacks from 2<sup>nd</sup> and 3<sup>rd</sup> (etc.) parties
- Officer(s) outnumbered and overwhelmed

#### **Subject Behaviour**

- Initial subject may not be the assaultive subject
- Interfering bystanders may become assaultive
- Greater potential for alcohol influence in behaviour of subjects
- Heightened awareness of officers in bar-type venues
- Subject behaviour is not yet a determined attack – only obstructing justice
- Herd mentality is present

- Bystanders have ability to influence/encourage subject behaviour

### **Perception and Tactical Considerations**

- Potential for escalation is very high
- Officer is overwhelmed
- Control over original subject becomes secondary and even irrelevant
- Officer movement is reduced
- Communication using existing tools is impaired/removed
- Shifting priorities and environment is the major theme

### **Response (*effect*) Required**

- Escape and survival from bystander attackers
- Stabilizes situation and remove opportunity for continued group assault of member
- Pain compliance as an option of LLW function
- Containable
- Immediate function
- Show-of-force capable and visible to dissuade subject(s) involvement without injury
- Secondary and tertiary effect that is visible without cross contamination to provide subject with alternative options vs. attack – Deter – distract – disrupt
- Effect limited only to assaultive subjects
- Maintain control of original subject
- Multiple repeated use within short time-frame
- Range: minimum 2 m
- Duration: short term with impact being significant – create a perimeter – 5sec with understanding for variable and flexible duration requirement for second application
- Minimum duration is 5sec, additional time preferred to allow alternate actions
- Recommendation not to put absolute times – actual range is what is needed to provide operational flexibility

- Public needs to understand that the available options will be deployed, including lethal options, if necessary – “I have the capability; if you give me the opportunity, I will demonstrate the intent.”
- Colour, appearance is important deterrent – recognition by the crowd
- Appearance needs to be clear – not a lethal device
- Response/effect on subject of LLW should have a deterrent effect on the other participants
- Officer needs control of the on/off switch – their perception should drive operation;
- Psychological impact of LLW provides future deterrent
- Realistic expectation of consequences – subjects need to have ability to make conscious decision to disengage
- Reversible effects
- Weapon should not be operable by anyone other than the officer if control of weapon is lost

#### **Scenario 6: Combative Subject in Cell**

##### **Description**

- Single subject in cell (in secure custody) requires medical attention and therefore needs to be removed from cell
- The subject does not want to be removed from the cell and becomes combative

##### **Situation**

- High stress, high risk
- Confined space
- Single subject
- No response to verbal communication
- Furniture is bolted to floor – nothing that is moveable
- Knowledge of the individual
- Only one entrance/exit
- Heavy steel door (can cause subject injury)

- Everything must be ready to go when the door is opened
- Video surveillance
- Ventilation is common in the building/cells
- Small detachment or court holding cell (only a few officers are likely to be in attendance)
- Cells are often surrounded by plexi-glass or other barriers

### **Subject Behaviour**

- Self harm; potential for assault is present once the door is opened
- Resistive active
- If subject is already injured, there is concern for officer exposure or contact with subject's biological products which could also pose a mobility hazard for the responding officers
- Possible language barrier – subject may not understand the instructions being provided
- Officers may not be police – difference in training-level, experience, capabilities (e.g. special constables)
- Subject may attempt to take shelter in the cell making targeting difficult

### **Perception and Tactical Considerations**

- Option to deploy LLW from inside the cell or prior to entry into cell
- More officers are available, however often only space for one or two officers plus the subject in the cell
- Use of shield requires multiple-officer response
- Understanding this is not a normal event

### **Response (*effect*) Required**

- Want the subject to cease activity so that subject can be removed from cell
- Restraint can be applied under the effect
- Effect needs to be quick in order to minimize possibility of injury to the subject
- Ideal if LLW can be deployed from behind the bars before opening the door to cell
- Important that area not be contaminated by resulting deployment of LLW

- LLW deployment cannot interfere with condition requiring initial medical care
- Duration needs to be sufficient in order to restrain the subject – method of restraint may be more complex because of physical state of subject
- Duration could be as long as 3-4 minutes; subject should not pose a risk to the officers and should not provide resistance to the intended actions
- Subject needs to be removed from the cell without resistance (removal from cell may be needed before restraint can be applied)
- Multiple devices could be used; staging of response is acceptable
- Easy to manipulate by one or more officers
- Note that if LLW incapacitates the subject, additional officers may be required to take the next actions vs. a LLW option that delivers compliance that allows subject cooperation (this is the preferred)
- Application of the LLW must be sufficient to prevent the subject from further injuring themselves (public perception issue)
- Capable of multiple applications if necessary
- Two hands outside the door; one-hand inside the door of the cell
- Stow-able following use to allow for two-hand actions of officer
- Capable of being deployed through narrow openings (barriers may be in place surrounding cells)
- LLW may need to penetrate plexi-glass, if present
- May require an area LLW vs. precision targeting
- If hand-held, LLW needs to be lightweight
- The LLW could be a wearable device
- LLW could reside inside the cell and could be triggered remotely
- Response needs to be isolated to that specific cell

### **Scenario 7: Public Order Event**

#### **Description**

- Sporting/Family event; crowds; police have established perimeter

- Line has been drawn
- Break of the line is a risk to officer and public safety
- Combination of multiple assailants and unarmed non-compliant subjects and innocent bystanders
- Officers assume that if you are able to breach the line, there is a risk

### **Desired Effect**

- Remove the aggressors
- Disrupt those individuals that are an immediate threat to the perimeter with the intent of deterring others

### **Situation**

- Many bystanders in the vicinity
- Crowd type: passive, upset individuals with no cohesion (angry but acting as individuals) throwing objects, organized common intent
- Crowds have three types of people (curious, wrong place-wrong time, core nucleus)
- Proximity of officers to subjects
- Urban environment; collateral damage
- Wind dynamics
- More than one line of officers will be in place
- Subjects may be deep within the crowd and not necessarily on the front line

### **Subject Behaviour**

- Breach to the police line will trigger use of LLW (active resistance)
- Crowd is not a homogenous
- Crowd is not the subject (danger), however the use of a LLW could create a threat

### **Perception and Tactical Considerations**

- Human nature is fight or flight
- Elements of the crowd are looking to hijack event

- Will use of LLW make things worse?

### **Responses (*effect*) Required**

- Area denial weapon (fight or flight mode) is not acceptable
- LLW must be deliberate, surgical and cannot create a common intent among a group of individuals
- Desire is to remove the aggressors
- Disrupt the core nucleus that are determined is desired
- Ability to communicate to those who do not want to participate, that they have a choice not to participate
- Crowd needs to understand cause and effect (this is what will happen if you attempt to breach the line)
- Public will accept response was targeted
- Remove/redirect crowds
- LLW acts as a deterrent
- Demonstrate a measured response based on behaviour of subjects
- Police have the tool but will not use it unless there is a trigger
- Application must be visible and done consciously
- Dangers with aerosols because of environmental conditions
- Accuracy is important
- LLW will be deployed from behind the police line – LLW must be able to project outward past the initial line of officers
- Remote deployment would be preferred
- Need a gap between line that is being defended and the line of protest
- Delivered from a variety of planes/platforms and in a variety of weather conditions
- Needs to be operable with gloves
- Cannot be flammable because of risk (Molotov cocktails)
- Cannot damage infrastructure or contaminate environment

- No return to sender option; cannot be reused
- Portable/moveable
- Needs to reinforce communications/message
- Could be applied over long distance (direct)

### **Scenario 8: Warrant Service**

#### **Description**

- Unknown-risk warrant execution with individual in a home

#### **Desired Effect**

- Occupants need to be controlled, restrained (if required), and placed in one location for duration of the police activity

#### **Situation**

- Planned event
- Multiple officers
- Possible tactical package (incident command) deployed
- Multiple subjects
- Prior knowledge/intelligence – prior investigation was done to bring situation to bear
- Rapid sequence of events

#### **Subject Behaviour**

- Non-compliance, sometimes unintentional (startled)
- Possible assaultive
- “Flight or freeze”

#### **Perception and Tactical Considerations**

- Friendly or vicious family pets
- Presence of children, other family members
- Element of surprise

- Timing
- Diversion tactics
- Search and secure premises (Subjects will hide)
- Objective taken into consideration (evidence/warrant)
- Time of day (intelligence-based)
- Size of team (intelligence and/or resource-driven) 5-9. SWAT: 7-15
- Possible that only one officer is dedicated to using the LLW – determined by the operational plan
- Chemically contaminated environment possible (i.e., meth lab)

### **Responses (*effects*) Required**

- Seize control occupants, relocate subjects to designated area, continue investigation/search/warrant
- LLW should be carried by all team members
- Ambidextrous and one-handed function – function of perception
- Stand alone – not weapon (lethal weapon) mounted
- Repeated use and reapplication
- Rapid “reloading”
- Limited collateral damage to house structure/occupants
- Range: close: 1-10 m
- No cross contamination – decontamination not required
- Discrete and specific to exact targeted subject – accuracy
- Duration of action: immediate onset with minimum 20-30sec
- No long lasting effects on subject that may interfere with investigative process
- Preserves evidence
- Preserves structural integrity of the residence/structure: non-flammable, non corrosive, etc

## **Scenario 9: Subject Barricaded in Vehicle**

### **Description**

- Impaired driver has crashed the vehicle; need to remove the subject before he can flee – with or without vehicle
- Subject refuses to get out of the vehicle; subject rolls up the window and locks the vehicle and continues to try and re-start the car
- Vehicle is currently immobilized but has the potential to be re-engaged

### **Desired Effect**

- Need to stop ability of driver to attempt to operate the vehicle

### **Situation**

- Single occupant in vehicle
- Might have information on registered owner, but cannot link to subject driver
- Do not know why subject will not exit vehicle
- Do not know if subject is EDP or intoxicated/stimulated
- Do not have visibility of subject's hands– presence of weapon unknown – potential for extreme instantaneous act
- No communication with the driver
- Subject not responding rationally

### **Subject Behaviour:**

- Minimal resistant behaviour

### **Perception and Tactical Considerations**

- Expectation is that officer will not let situation escalate
- Duty of care to eliminate precipitating events
- Need to eliminate causal events (heart attack, language barrier)

### **Responses Required**

- Ability to maintain distance from the vehicle

- Access is from passenger/driver side
- Through a window to a reduced target
- Highly mobile
- Quick deployment
- Safe deployment distance is 1 to 7m
- End state – incapacitated motor skills (should not be able to operate gears or gas pedal)
- Process: immobilize driver, forced entry, assessment, extraction, secure
- Duration required for the length of entire process (range of a minute or less)
- Need a LLW that can be deployed in environment with combustible materials (assumption)

### **Scenario 10: Subject Fleeing on Foot**

#### **Description**

- A subject has fled on foot from a night time break- in offence and has committed a sexual assault and is being pursued through a residential area on foot by uniformed police officer(s).

#### **Situation**

- It is night-time, in an urban residential area; standard residential lighting
- Single subject fleeing the scene on foot
- Subject can change direction and have concealment / cover from houses, trees, out buildings, etc almost every 20 meters on average
- Officers are in pursuit and have visual continuity on the subject
- Officers are pursuing in a two officer element

#### **Subject Behaviour**

- Active resistor by virtue of flight on foot from police
- Assumed assaultive by virtue of sexual offence
- Has ignored verbal direction from police to stop
- Unknown ability, appears goal orientated to escape from uniformed officers

- No known weapons
- Appears physically capable of continuing flight on foot

### **Perception and Tactical Considerations**

- Must maintain visual contact with subject
- Containment capabilities by other officers limited
- Officers not capable to closing the gap on foot; maintain gap only
- Assumed subject will continue flight and escape, not to be identified
- Assume subject may re-offend if not apprehended immediately

### **Response (*effect*) Required**

- Quickly and safely stop the subject in a controlled fashion regardless of environmental conditions
- Subject can be affected with intermediate barriers present (trees, bushes, fences, etc)
- Subject can remain immobilized until gap is closed
- Restraint can be applied while subject is immobilized
- Immobilization can be deactivated by officer only
- Subject cannot deactivate
- no collateral effect to intermediate barriers or bystanders
- LLW solution maintain officer safety
- LLW is portable (feasibly carried)
- May be deployable from a police vehicle (containment car)
- Range: line-of-sight (must maintain visual contact with subject); 20-30 meters LLW must work on any size subject

## Annex D Template for a Less Lethal Weapon Statement of Operational Requirement

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### Statement of Operational Requirement

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Version \_\_\_\_\_

1. **Objective.** The objective of this document is to describe the operational requirements for a less lethal device that will allow Canadian law enforcement to ... *(describe briefly what the operational intent is)*
2. **Scope and Limitations.** *(describe for which organizations this SOR was created for and any limitations on its potential applicability across the broader law enforcement community)*
3. **Background.**
  - a) **Capability Deficiency.** *(outline the current deficiency and the capability gap; describe the risk to law enforcement and subjects of not addressing the capability gap)*
  - b) **Current Situation.** *(outline how law enforcement handle the situation currently)*
  - c) **Alternatives.** *(explain the alternatives and why the alternatives are not sufficient or unsatisfactory solution; mention the impact of escalation to lethal force in addition to the impact of using nothing)*
4. **Concept of Operation.**
  - a) **Applicable Scenarios.** *(identify which scenarios are linked to this requirement, ie under what circumstances it is expected this device would be used)*
  - b) **Method of Employment.** *(describe how the less lethal weapon would be used including whether it would be used by general patrol officers, specialist teams, in cooperation with other devices, by single officers or multiple, mounted to a vehicle, etc)*
  - c) **Environmental Considerations.** *(outline the expected environmental conditions the equipment will be exposed to (eg temperature, humidity, lighting, urban setting, confined spaces, etc)).*
5. **Concept of Support.** *(describe how support for the less lethal weapon will be provided).*

6. **Design Requirements.** *(list mandatory and desirable requirements for each heading)*
  - a) **Physical Characteristics.**
  - b) **Functional Characteristics.**
7. **System Effectiveness Requirements.** *(list mandatory and desirable requirements for each heading)*
  - a) **Range and Duration of Engagement.**
  - b) **Aiming and Firing.**
  - c) **Reliability.**
  - d) **Durability.**
  - e) **Interoperability**
  - f) **Usability.**
  - g) **Safety.**
8. **Personnel and Training Requirements.**
  - a) **Tactics, Techniques and Procedures.** *(describe the changes will need to be made to existing tactics or procedures)*
  - b) **Personnel.** *(identify any changes in personnel that will be required)*
  - c) **Training.** *(identify changes in training programs that will be required)*
9. **Logistics.** *(provide information related to the life cycle of the device)*

Prepared by:

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Name, Position

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Date

Reviewed by:

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Name, Position

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Date

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## List of symbols/abbreviations/acronyms/initialisms

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ACPO	Association of Chief Police Officers
CEW	Conducted Energy Weapon
CEWSI	Conducted Energy Weapons Strategic Initiative
CF	Canadian Forces
CPRC	Canadian Police Research Centre
CSS	Centre for Security Science
DHS	Department of Homeland Security
DND	Department of National Defence
DRDC	Defence Research & Development Canada
DRDKIM	Director Research and Development Knowledge and Information Management
EDP	Emotionally Distraught Person
EORG	Electronic Operational Requirements Group
FPT	Federal, Provincial, Territorial
IIBA	International Institute for Business Analysts
ILF	International Law Enforcement Forum
LLW	Less Lethal Weapon
NATO	North Atlantic Treaty Organization
NLLD	Non-Lethal Laser Dazzler
NLW	Non-Lethal Weapon
R&D	Research & Development
SOR	Statement of Operational Requirement
SWAT	Special Weapons And Tactics
TM	Technical Memorandum
UK	United Kingdom
US	United States
WG	Working Group

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In recent years, Canadian law enforcement has attracted increased public interest in police use of force in addition to the methods by which Less Lethal Weapons (LLWs) are tested and received approval for use. One of the objectives of the Conducted Energy Weapons Strategic Initiative (CEWSI) project is to develop a LLW approval process that could be applied to emerging less lethal technologies. The identification of requirements represents the first step in obtaining a new capability. This paper introduces the characteristics of good requirements, suggests several techniques for obtaining requirements and provides a template and guidelines for creating a Statement of Operational Requirements for a LLW capability.

Depuis quelques années, le public s'intéresse davantage au recours à la force par la police ainsi qu'aux méthodes d'essai et d'approbation des armes à létalité atténuée (ALA). Un des objectifs de l'Initiative stratégique sur les armes à impulsion (ISAI) consiste à élaborer un processus d'approbation des ALA qui pourrait être appliqué aux nouvelles technologies à létalité atténuée. Le recensement des besoins constitue la première étape à suivre en vue de l'obtention d'une nouvelle capacité. Ce document présente les caractéristiques des besoins pertinents, propose plusieurs techniques permettant de reconnaître les besoins et fournit un modèle et des lignes directrices qui aideront à la rédaction d'un Énoncé des besoins opérationnels relatifs aux armes à létalité atténuée.

14. **KEYWORDS, DESCRIPTORS or IDENTIFIERS** (Technically meaningful terms or short phrases that characterize a document and could be helpful in cataloguing the document. They should be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location may also be included. If possible keywords should be selected from a published thesaurus, e.g. Thesaurus of Engineering and Scientific Terms (TEST) and that thesaurus identified. If it is not possible to select indexing terms which are Unclassified, the classification of each should be indicated as with the title.)

Conducted Energy Weapons; Tasers; Operational Requirement; less lethal weapons; non-lethal weapons