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# ANNEX A1

**DRAFT**

## **SYSTEM PERFORMANCE SPECIFICATION**

### **LASER TARGET DESIGNATOR (LTD)**



**NOTICE**

This documentation has been reviewed by the Technical Authority and does not contain controlled goods.

**AVIS**

Cette documentation a été révisée par l'Autorité technique et ne contient pas de marchandises contrôlées.

## 2.

**LIST OF ACRONYMS AND ABBREVIATIONS**

<b>Acronym / Abbreviation</b>	<b>Description</b>
ANSI	American National Standards Institute
BOP	Basis of Payment
CAF	Canadian Armed Forces
CFM	Contractor Furnished Material
CFSD	Canadian Forces Supply Depot
CY	Calendar Year
DDP	Delivery Duty Paid
DMC	Digital Magnetic Compass
DND	Department of National Defence
DRI	Detection, Recognition and Identification
DVO	Day View Optic
FFP	Firm Fixed Price
FFSP	Firm Fixed Session Price
GEMS	General Engineering and Maintenance Services
GFE	Government Furnished Equipment
GFI	Government Furnished Information
GPS	Global Positioning System
GSM	Government Supplied Material
GST	Goods and Services Tax
HST	Harmonized Sales Tax
ILS	Integrated Logistics Support
ISS	In-Service Support
JTAC	Joint Terminal Attack Controller
LTRU	Laser Transmitting/Receiving Unit
LTD	Laser Target Designator
MIL-STD	Military Standard
MOPP	Mission Oriented Protective Posture
NATO	North Atlantic Treaty Organization
NEMA	National Electrical Manufacturers Association
NSN	NATO Stock Number
PA	Procurement Authority
PRF	Pulse Repetition Frequency
PWGSC	Public Works Government Services Canada
QETE	Quality Engineering Test Establishment

R&O	Repair and Overhaul
RSPL	Recommended Spare Parts List
RTML	Recommended Training Materials List
SOW	Statement of Work
SPS	System Performance Specifications
STANAG	Standardization Agreement
UI	User Interface
UII	Unique Item Identifier

1. Title:
  - a. System Performance Specification – Laser Target Designator (LTD)
2. Background:
  - a. This System Performance Specification describes the key performance requirements for a modern lightweight Laser Target Designator (LTD) system for use by Canadian Joint Terminal Attack Controllers (JTACs), for the purpose of marking targets for attack by coalition aircraft, as well as terminal guidance of precision laser guided weapons.
  - b. The current in-service laser target designators are too heavy and cumbersome to be easily carried on missions. Being of older technology, they are also loud, power-hungry devices, which all highlights the need for a silent, low power-consumption, small form-factor designator capable of high laser energy output, at STANAG 3733 Edition 2-compliant pulse repetition frequencies (PRFs).
4. Instructions:
  - a. The following instructions apply to this document:
    - 1) Requirements identified by the word “must” are mandatory. Deviations will not be permitted;
    - 2) Requirements identified by the word “should” are desirable and will be rated in accordance with Annex C0 – Technical Evaluation Matrix;
    - 3) Where “must” is not used, the information provided is for guidance only;
    - 4) Where technical certification is required, a copy of the certification or an acceptable proof of compliance must be provided upon request;
    - 5) Metric measurements must be used to define the requirement; and
    - 6) Dimensions stated as nominal must be treated as approximate dimensions. Nominal dimensions reflect a method by which materials or products are generally identified for sale commercially, but which differ from the actual dimensions.
5. General:
  - a. The LTD system must be a lightweight, high-energy, low beam-divergence laser target designator system, suitable for target marking and range-finding as well as terminal guidance of precision laser guided weapons, in a battlefield environment, including inclement weather, haze, dust and smoke.
  - b. The LTD system is defined as the following:
    - 1) Main Laser Transmitting/Receiving Unit (LTRU) assembly;
    - 2) Main batteries;
    - 3) Tripod assembly, including pan and tilt mechanism;
    - 4) Main battery charger;
    - 5) Remote firing cable;

- 6) Ancillary communication and power cables, as applicable; and
  - 7) Carrying/transport bags and cases.
  - c. The LTD system must be a fully-developed, operationally-proven and currently-fielded system.
  - d. The LTD system should be a fully-developed, operationally-proven and currently-fielded system within a North Atlantic Treaty Organization (NATO) military.
6. Laser:
- a. The LTD system must be compliant with STANAG 3733 Edition 2, across all operating conditions outlined in the Environmental Requirements section of this document including, but not limited to, the following:
    - 1) The LTD system must have a time-averaged single pulse output energy of at least 50mJ, as defined by STANAG 3733 Edition 2.
    - 2) The LTD system must implement the Band I and Band II Pulse Repetition Frequency (PRF) codes, as defined by STANAG 3733 Edition 2.
    - 3) The LTD system must operate at a wavelength of 1.06 microns, as defined by STANAG 3733 Edition 2.
  - b. The LTD system must be pre-loaded with STANAG 3733 Edition 2 Band I and Band II PRF codes.
  - c. The LTD system must be a Class 4 laser.
  - d. The LTD system must use athermal laser technology in order to eliminate warm-up times, standby power consumption and excessive noise during operation.
  - e. The LTD system should have a time-averaged single pulse output energy of a least 70mJ.
  - f. The LTD system must have a beam divergence of no more than 0.3mrad at all operating temperatures outlined in the Environmental Requirements section of this document.
  - g. The LTD system should have a beam divergence of no more than 0.2mrad at an ambient temperature of 20C.
  - h. The LTD system must have an effective designation range in daylight of at least 5km against a 2.3m x 2.3m standard NATO target with a reflectivity of 40%, where the background reflectivity is 20% and the local visibility is unlimited.
  - i. The LTD system must have an effective range-finding range in daylight of at least 10km against a 2.3m x 2.3m standard NATO target with a reflectivity of 40%, where the background reflectivity is 20% and the local visibility is unlimited.
  - j. The LTD system should include an integrated digital magnetic compass (DMC) and global positioning system (GPS), or support their integration in the future.
  - k. The LTD system must be capable of STANAG 3733 Edition 2-compliant designation of a target using the default PRF code, from a completely powered down, but fully deployed

state, in no more than five (5) seconds. The default PRF code is defined as the last-used PRF code prior to system shut-down.

- I. The LTD system must include a means to communicate range data to other devices through a serial interface.
- m. If wireless communication capabilities exist within the LTD system, it must be possible to disable these capabilities manually.

7. Day View Optic (DVO):

- a. The LTD system must include a Day View Optic (DVO), integral to the LTRU, for the purposes of observing potential targets and aiming the laser spot.
  - 1) The DVO must have a magnification of at least seven (7) times.
  - 2) The DVO should have a magnification of at least ten (10) times.
  - 3) The DVO must contain a superimposed reticle for precise aiming of the laser spot.
  - 4) The DVO must have a field of view of at least two (2) degrees in both the horizontal and vertical direction.
- b. The LTD system must have Detection, Recognition and Identification (DRI) ranges of 9km, 5km and 3km respectively, using the following parameters:
  - 1) The DRI ranges are to be evaluated in daylight, using a 2.3m x 2.3m standard NATO target with a reflectivity of 40%, where the background reflectivity is 20% and the local visibility is unlimited, where:
    - a. Detection is the ability to distinguish an object from the background (something is there);
    - b. Recognition is the ability to determine the object class (animal, human, vehicle); and
    - c. Identification is the ability to describe the object in detail (vehicle type, gender).
  - 2) The determined ranges are those at which there is a 50% probability of successfully discriminating the object to the specified level.
- c. The LTD system must require no operator boresighting maintenance during normal operations, to maintain alignment of the laser with the DVO aiming reticle.

8. Physical:

- a. The LTD system critical subcomponents weight should be as light as possible. The critical subcomponents weight is defined as the combined weight of the following items:
  - 1) Main Laser Transmitting/Receiving Unit (LTRU) assembly;
  - 2) Single main battery;
  - 3) Any main battery power cables, mounting bracketry or devices required to make the LTD system functional;
  - 4) Tripod assembly, including the pan and tilt mechanism; and

- 5) Remote Firing Cable.
  - b. The main LTRU assembly, including the main battery should be as small a volume as possible.
  - c. The LTD system's external colouring must be non-reflective and subdued, not in sharp visual contrast to other Canadian Army operational equipment and material.
  - d. The LTD system must provide covers for all exposed lenses, to protect them from environmental hazards (dust, rain, snow, debris). These covers must be easily removed while the system is in-use, and the covers must remain securely tethered to the system.
  - e. The LTD system must include a minimum of one (1) MIL-STD-1913 Picatinny rail mounted on the upper surface of the LTRU body.
    - 1) All mounted Picatinny rails must be aligned to the laser datum;
    - 2) All mounted Picatinny rails must be detachable from the LTRU assembly in a workshop environment;
    - 3) All mounted Picatinny rails must include a reference system that ensures they return to zero when reinstalled on the LTRU assembly; and
    - 4) At least one (1) mounted Picatinny rail on the top surface of the LTRU must be at least ten (10) slots long, to accept SeeSpot and low-light optical devices.
  - f. The LTD system must include a stable, robust tripod capable of accepting the main LTRU assembly, including a payload mounted to the upper Picatinny rail of no more than two (2) kg:
    - 1) The tripod must contain a device that allows the LTRU assembly to pan and tilt.
    - 2) The tripod must contain knobs that allow the operator to adjust both the coarse and fine travel of the azimuth and elevation of the laser point of aim;
    - 3) The tripod must contain a device that allows the operator to lock the tripod in position, thereby locking the laser point of aim;
    - 4) The tripod must use a standard ¼-20 thread for attachment of the main LTRU assembly;
    - 5) The tripod must have height-adjustable legs;
    - 6) The tripod must allow each leg to be locked in position individually, to allow for use on uneven terrain; and
    - 7) The tripod must be quickly and easily height adjustable, allowing an operator to use the system while in either a prone or sitting position.
9. User Interface:
- a. The LTD system must have a User Interface (UI) that displays information from the system to the operator.

- b. The LTD system must be operable while wearing standard issue CAF cold weather and work gloves.
- c. The LTD system must be operable while wearing Mission Oriented Protective Posture (MOPP) Level 4 gear.
- d. The LTD UI must allow the operator to perform, as a minimum, the following functions:
  - 1) Arm/disarm the laser;
  - 2) Fire/stop the laser;
  - 3) Set the laser Pulse Repetition Frequency (PRF) code; and
  - 4) Perform range finding operations.
- e. The LTD system UI must display, when not firing the laser, as a minimum, the following information concurrently:
  - 1) System mode (for example; standby, laser armed, laser firing or ranging); and
  - 2) Laser Pulse Repetition Frequency code (PRF) of the laser.
- f. The LTD system UI must display, when firing the laser, the range to target.
- g. The LTD system UI must display error codes, to be used in field-level trouble-shooting of the system. As a minimum, the following error codes must be possible:
  - 1) Low battery warning;
  - 2) Temperature warning; and
  - 3) Operational fault.
- h. The LTD system UI should display error codes, to be used in field-level trouble-shooting of the system. The following error codes should be possible:
  - 1) Low laser output energy, but the laser will still fire; and
  - 2) Operational fault, in which general component, and whether the laser will still fire.
- i. The LTD system UI must include a means for the operator to communicate with the laser via a wired connection at least 2m long, allowing the operator to safe, arm and fire the laser without disturbing the point-of-aim of the laser.
- j. The LTD system UI must allow the operator to select whether the first or last range returned to the range receiver will be displayed on the UI.
- k. The LTD system UI must be readable in direct, bright sunlight.
- l. The LTD system UI must be readable in darkness.
- m. The LTD system UI must be readable using night vision goggles (NVGs).
- n. The LTD system UI must store a minimum of five (5) operator pre-set PRF codes, readily-accessible and able to be set in a field-environment directly on the LTD system, to allow for efficient lasing operations. Readily accessible is defined as selection of the desired



pre-set PRF code being possible within five (5) seconds, when the system is powered on and in standby mode.

#### 10. Power Requirements:

- a. The LTD system must operate from a single, detachable and rechargeable lithium ion battery. This battery is referred to as the main battery.
- b. The LTD system main battery should be integrated to the main LTRU assembly, such that the system be a single, well-balanced unit that can be hastily relocated without trailing cables.
- c. The LTD system must include a minimum of two (2) main batteries to ensure continuous system availability during battery recharging.
- d. The LTD system main batteries must include a simple capacity display, to indicate the current state of charge of the battery to the operator.
- e. CONTINUOUS DESIGNATION DURATION – TO BE ADDED.
- f. BATTERY LIFE – TO BE ADDED.
- g. DUTY CYCLE RESTRICTIONS – TO BE ADDED.
- h. The LTD system, when lasing, should not be limited by duty cycle restrictions. If connected to a permanent power source, such as mains or vehicle power, the system should be capable of continuous, uninterrupted lasing at the STANAG 3733 Edition 2 energy output and any STANAG 3733 Edition 2 Band I or Band II PRF code.
- i. The LTD system must include a means to recharge the main battery, using 100-240VAC, 50-60Hz power drawn from a NEMA 5-15R receptacle.
- j. The LTD system must include a means to recharge the main battery, using 28VDC vehicle power in accordance with MIL-STD-1275.
- k. The LTD system must include any required adapters and cables to allow the system to operate from 100-240VAC, 50-60Hz power drawn from a NEMA 5-15R receptacle.
- l. The LTD system must include any required adapters and cables to allow the system to operate from 28VDC vehicle power in accordance with MIL-STD-1275.
- m. The LTD system must include any required adapters and cables to allow the system to operate from a single BA-5590 battery.

#### 11. Load Carriage:

- a. The LTD system must include a hard transport case large enough to transport, as a minimum, the LTRU assembly, two (2) main batteries where one can be installed on the LTRU assembly if applicable, battery charger, cabling, tripod and pan and tilt mechanism.
- b. The LTD system must include a soft field carrying bag or pouch, large enough to transport, as a minimum, the LTRU assembly and two (2) main batteries where one can be installed on the LTRU assembly if applicable.

- c. The LTD system must include a soft field carrying bag for the tripod and pan and tilt mechanism.
- d. All LTD system carrying cases and bags must be in a non-reflective, subdued colour, not in sharp visual contrast to other Canadian Army operational equipment and material.

## 12. Environmental Requirements:

- a. The LTD system must meet the following minimum environmental demands:
  - 1) High Temperature (Storage). The LTD system must operate normally within the operation temperature range outlined in this section, following un-powered storage as hot as 65C per MIL-STD-810G Method 501.5, Procedure II.
  - 2) High Temperature (Operation). The LTD system must operate normally at temperatures as hot as 49C per MIL-STD-810G Method 501.5, Procedure I.
  - 3) Low Temperature (Storage). The LTD system must operate normally within the operation temperature range outlined in this section, following un-powered storage as cold as -40C per MIL-STD-810G Method 502.5, Procedure I. A start-up delay of not more than 10 minutes is acceptable to allow for internal heating of the system.
  - 4) Low Temperature (Operation). The LTD system must operate normally at temperatures as cold as -30C per MIL-STD-810G Method 502.5, Procedure II.
  - 5) Humidity. The LTD system must operate normally in environments of up to 95% relative humidity at 30C ambient temperature per MIL-STD-810G Method 507.5, Procedure I Natural.
  - 6) Temperature Shock. The LTD system must operate normally after experiencing temperature shock per MIL-STD-810G, Method 503.5, Procedure I-C from 21C to minimum operating temperature.
  - 7) Ingress Protection. The LTD system must meet or exceed the International Electrotechnical Commission (IEC) standard 60529 (International Protection (IP) Marking) code 67.
  - 8) Vibration. The LTD system must withstand the vibration caused by highway and cross-country transportation, in accordance with MIL-STD-810G, Method 514.6, Procedure III; Category 5 of Annex C, in a transport configuration.
  - 9) Shock (Transit Drop). The LTD system must be fully functional after experiencing shock per MIL-STD-810G, Method 516.7, Procedure IV for unpackaged handling.
  - 10) High Altitude Magnetic Pulse (HEMP). The LTD system must operate normally in the presence of electromagnetic interference per MIL-STD-461F, Radiated Susceptibility (RS) 103.

## 13. Maintainability:

- a. The LTD system must have a minimum Mean Time Between Failure of six thousand (6000) hours, operational and standby time combined, for all required operating conditions per MIL-HDBK-217F.

- b. The LTD system 90th percentile of repair times must not exceed four hours, excluding repairs requiring return to the manufacturer.
- c. The LTD system must not require more than fifteen (15) minutes of Operator Maintenance per day.