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MARCORSYSCOM

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PERFORMANCE SPECIFICATION

FOR THE

COMMON LASER RANGE FINDER INTEGRATED CAPABILITY LIGHT (CLRF IC LIGHT)

SUBMITTED BY: _____ DATE:_____

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Record of Changes

Date	Version	Title and/or Brief Description	Entered By
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PERFORMANCE SPECIFICATION

COMMON LASER RANGEFINDER INTEGRATED CAPABILITY LIGHT

(CLRF IC LIGHT)

1. Scope

This specification covers the Common Laser Rangefinder Integrated Capability Light (henceforth known as CLRF IC Light) system as a foot-mobile replacement for the Common Laser Rangefinder (CLRF) suite of equipment.

1.1 System Description

The CLRF IC Light is a handheld, lightweight, man portable, GPS target location device. The principle function of the CLRF IC System is to assist the operator in determining the location of a target or other object of interest by measuring the distance, direction and vertical angle from the operator to the object. The CLRF IC System shall also provide the capability to export these measurements (in a suitable digital format) through a serial communications port to external digital devices for further processing. The CLRF IC System shall also assist the operator with day and night target detection, recognition, and identification.
The CLRF IC System shall be capable of operating in the full range of environments and operational situations where Marines deploy.

2. Applicable Documents

2.1 General

The documents listed in this section are referenced in sections 3, 4, and 5 of this specification. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, and 5 of this specification, whether or not they are listed.

2.2 Government Documents

2.2.1 Specifications, Standards, and Handbooks

The following specifications, standards, and handbooks of the exact revision listed below form a part of this document to the extent specified herein.

DEPARTMENT OF DEFENSE STANDARDS

MIL-PRF-49324(NVI)	Monocular Night Vision Device AN/PVS-14 Department Of Defense Standards
MIL-STD-129P with CHANGE 4	Military Marking for Shipment and Storage

MIL-STD-130N	Identification Marking of U.S. Military Property
MIL-STD-461F	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-810G	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-882D	Standard Practice for System Safety
MIL-STD-1472F(1)	Human Engineering
MIL-STD-1474D(1)	Noise Limits
MIL-STD-1913	Dimensioning of Accessory Mounting Rail for Small Arms Weapons, Dated 03 Feb 1995, with Change Notice 1 dated 10 June 1999 and Notice of Validation dated 20 April 2004
MIL-STD-1916	DOD Preferred Methods for Acceptance of Product
MIL-STD-1425A	Safety Design Requirements for Military Lasers and Associated Support Equipment
MIL-STD-2073-1E	Standard Practice for Military Packaging

DEPARTMENT OF DEFENSE HANDBOOKS

DOD-HDBK-178(1)	Quantitative Description of Obscuration Factors for Electro-Optical and Millimeter Wave SystemsMIL-
HDBK-217F(2)	Reliability Prediction of Electronic Equipment
DOD-HDBK-743A	Anthropometry of U S Military Personnel (Metric)
MIL-HDBK-783	Chemical and Biological (CB) Contamination Avoidance and Decontamination
MIL-HDBK-784	Design to Minimize Contamination and to Facilitate Decontamination of Military Vehicles and Other Equipment: Interiors and Exteriors
MIL-HDBK-1916	Companion Document to MIL-STD-1916

(Copies of these documents are available online at http://assist1.daps.dla.mil/quicksearch/, http://forms.daps.dla.mil/, http://dodssp.daps.dla.mil, or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government Documents, Drawings, and Publications

The following other Government documents, drawings, and publications of the exact revision level shown form a part of this document to the extent specified herein.

CODE OF FEDERAL REGULATIONS

Title 21, Part 1040	Performance Standards for Light Emitting Products (Revised 01 April 2005)

(Copy of this document available online at http://www.navsea.navy.mil/nswc/dahlgren/TIE/LASER/federal.aspx)

CHAIRMAN OF THE JOINT CHIEFS OF STAFF INSTRUCTION

CJCSI 6130.01D	2007 CJCS Master Positioning, Navigation, and Timing Plan

(Copies of this document are available online at http://www.dtic.mil/cjcs_directives)

DEPARTMENT OF THE ARMY

AR 70-38	Research, Development, Test and Evaluation of Materiel for Extreme Climatic Conditions (15 September 1979 Edition)

(Copies of this document are available online at http://www.apd.army.mil.)

DEPARTMENT OF THE NAVY

NAVSEA S9310- AQ-SAF-010	Technical Manual for Batteries, Navy Lithium Safety Program Responsibilities and Procedures (20 July 1988 Edition)
OPNAVINST 5100.27B/MCO 5104.1C	Navy Laser Safety Hazards Program Dated 02 May 2008

(Copies of these documents are available online at http://www.marcorsyscom.usmc.mil/sites/PMEPS/DOCUMENTS/s9310aqsaf010.pdf)

NAVSTAR GLOBAL POSITIONING SYSTEM JOINT PROGRAM OFFICE (GPS JPO)

IS-GPS-153 REVISION D	GPS User Equipment Interface Specification for the GPS Standard Serial Interface Protocol (GSSIP) of DoD Standard GPS UE Radio Receivers, 23 July 2007 (Target Sight Message ID 5029, pages B-86 and B-87)
SS-M/V-500 REV D Part I	System Specification for NAVSTAR Global Positioning System (GPS) Precision Lightweight GPS Receiver (PLGR), 03 April 1995

SS-M/V-500D/2	Addendum Specification – Specification for NAVSTAR Global Positioning System (GPS) Precision Lightweight GPS Receiver (PLGR), 02 June 2002
SS-M/V-600B	Item Specification for the NAVSTAR Global Positioning System (GPS) Defense Advanced GPS Receiver (DAGR), 13 July 2006
GPU-03-105	Security Approval Requirements for Selective Availability Anti-Spoofing Module (SAASM) Host Application Equipment (HAE), 31 January 2004

NATO DOCUMENTS

STANAG 3733	Pulse Repetition Frequency Codes

(Copies of these documents can be obtained by written request from Marine Corps Systems Command, Procuring Contracting Officer).

2.2.3 Non-Government Documents

The following documents of the exact revision level shown form a part of this document to the extent specified herein.

Kollsman Document EICD48151000-1	Electrical Interface Control Document for the Thermal Laser Spot Imager (TLSI)
Kollsman Drawing MICD48151000-1	Mechanical Interface Control Drawing for the Thermal Laser Spot Imager (TLSI)
Kollsman Drawing MICD48051000	Mechanical Interface Control Drawing for the AN/PAS-22 Long Range Thermal Imager (LRTI)
Kollsman Document EICD48081000-1	Electrical Interface Control Document for the Portable Lightweight Designator Rangefinder (PLDR)
Kollsman Drawing 48081001	PLDR Interface Control Drawing
Kollsman Document EI 8388-1000-00	LTD Electrical Interface for the Joint Terminal Attack Controller Laser Target Designator (JTAC LTD)
Kollsman Drawing IF-8388-1000-00	IF for JTAC (RATTLER G)

(Copies of these documents can be obtained by written request from Marine Corps Systems Command, Procuring Contracting Officer).

2.3 Order of Precedence

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. Requirements

3.1 Nominal Mission Profile

The nominal mission profile for the CLRF IC Light is 72 hours. During the mission, the CLRF IC Light system will be operated for three six-hour periods. Half of the operating hours (9 total hours) will occur during daylight, the other half of the operating hours (9 total hours) will occur at night. A total of 75 targeting measurement/data export operations will be performed. It is acceptable to change the battery set twice during a nominal mission profile and the additional batteries will not count towards the CLRF IC Light system weight.

3.2 Weight

The CLRF IC Light, including the one set of batteries inside the system, shall be no more than 3.0 lbs (Threshold), 2.75 lbs (Objective). The weight does not include ancillary items.

3.3 Optics

3.3.1 Optical System

The CLRF IC Light shall be monocular with a direct or indirect view sensor (Threshold), or binocular with a direct view sensor (Objective).

3.3.2 Daytime Target Recognition

On a 7 km visibility day the CLRF IC Light shall be able to recognize a 1.4 x 1.7 m target from 100 m to 3 km (Threshold), from 100 m to 4 km (Objective).

3.3.3 Nighttime Target Recognition

On a 7 km visibility night with 0.01 lux illumination (1/4 moon) the CLRF IC Light shall be able to recognize a 1.4 x 1.7 m target from 100 m to 900 m (Threshold), from 100 m to 1,500 m (Objective). It is desired that on a 7 km visibility night with 0.001 lux illumination (clear starlight) the CLRF IC Light shall be able to recognize a 1.4 x 1.7 m target from 100 m to 500 m (Objective).

3.3.4 Field of View

3.3.4.1 Wide Field of View

The CLRF IC Light shall have a wide Field of View (FOV) of at least 120 mils (Threshold), or at least 150 mils (Objective).

3.3.4.2 Narrow Field of View

If a narrow field of view is necessary to meet the target recognition requirements (3.3.2, 3.3.3), the narrow FOV shall be no less than 60 mils (Threshold). Additional and/or continuous zoom is desired to allow improved recognition (Objective).

3.4 Angle Measurement Capabilities

3.4.1 Azimuth Performance

3.4.1.1 Disturbed Magnetic Environment

The CLRF IC Light shall have an azimuth accuracy of 10 mils or less in 120 seconds or less with 50% availability in the presence of static, dynamic, and transient magnetic disturbances (Threshold). It is desired that the azimuth accuracy be 10 mils or less in 120 seconds or less with 100% availability in the presence of static, dynamic, and transient magnetic disturbances (Objective).

3.4.1.2 Sterile Magnetic Environment

The CLRF IC Light azimuth accuracy shall be 8 mils or less in 2 seconds or less with 100% availability in a magnetically sterile environment (Threshold).

3.4.2 Maintaining Azimuth upon Relocation

It is desired that once the CLRF IC Light has determined true north and the user moves the CLRF IC Light with or without the tripod, the CLRF IC Light remain calibrated and not have to be recalibrated to find true north again under the slew rate of 300° per second (Objective). It is desired that once the CLRF IC Light has determined true north the accuracy be maintained for at least 30 minutes after initialization (Objective).

3.4.3 Vertical Angle

The CLRF IC Light shall determine the vertical angle (VA) from the observer to a target, through a range of ± 800 mils (Threshold), with an accuracy of 10 mils grid (Threshold) to 5 mils grid (Objective).

3.4.4 Roll Angle

The CLRF IC Light shall be capable of meeting all operational requirements through roll angles ranging from ± 250 mils (Threshold), ± 500 mils (Objective).

3.4.5 Azimuth Upgradeability

The CLRF IC Light shall provide power, data, and timing lines for an external azimuth system. The data line shall include the following messages per IS-GPS-153, Revision D, Message ID 5029, pages B-86 and B-87 from the azimuth sensor to the CLRF IC: Azimuth Heading, Azimuth Measurement Timestamp, Estimated Azimuth Accuracy, Roll Angle, Roll Angle Accuracy, Vertical Angle, and Vertical Angle Accuracy. The data line shall include the following messages from the CLRF IC to the azimuth sensor: Measurement Request, GPS Location In, Timing Signal, and Azimuth In (when available). Additional input and output messages, required for communication, may be created as necessary and shall follow IS-GPS-153, Revision D format. The CLRF IC Light shall also provide the following power lines for CLRF IC Light: +15V, -15V, Ground, and 1 W max. Physical connection points which allow mounting of a device weighing less than 1.0 lb and no greater than 4 inches on a side. The location of the mounted device shall not cause interference with the CLRF IC Light (Threshold).

3.5 Setup Time

3.5.1 Rapid Startup Time

The CLRF IC Light rapid startup shall provide the operator with the capability to determine Observer to Target (OT) distance and shall consist of no more than removing protective optics covers and turning on the power. The CLRF IC Light shall permit the operator to complete rapid startup in no more than 5 seconds (Threshold); less than 1 second (Objective).

3.5.2 Full Setup Time

Full setup shall include all actions necessary for the CLRF IC Light to provide target location (OT distance, direction, and vertical angle) to the threshold limits. The CLRF IC Light shall permit the operator to complete full setup in five minutes (Threshold); two minutes (Objective).

3.6 SAASM GPS

The CLRF IC Light shall include a GPS JPO approved per GPU-03-105 internal SAASM GPS to provide self location and target location (Threshold). GPS shall run in continuous mode with a Figure of Merit (FOM) 2 or greater (Threshold.

3.7 Laser Rangefinder

3.7.1 Laser Rangefinder Eye-Safety

The CLRF IC Light shall include a Class 1 eye-safe laser range finder (Threshold).

3.7.2 Man-Size Target Range Finding

During clear daylight conditions, the CLRF IC Light shall measure the distance, within an accuracy of 10 meters for a 2.0 m x 0.5 m dismounted man-size target from 100 meters to 2,500 meters (Threshold); 100 meters to 5,000 meters (Objective).

3.7.3 NATO Standard Target Range Finding

During clear daylight conditions, the CLRF IC Light shall measure the distance, within an accuracy of 10 meters for a 2.3 meter x 2.3 meter NATO standard target from 100 meters to 4,000 meters (Threshold); 100 meters to 10,000 meters (Objective).

3.7.4 Stabilization Device

The CLRF IC Light shall be able to measure OT Distance to the threshold accuracy to within 10 meters to a distance of at least 2,000 meters without requiring the operator to use any type of stabilization device (i.e. tripod) 50 percent of the time (Threshold). It shall be able to measure all elements of target location: OT Distance (Requirements 3.7.2, 3.7.3), direction (Requirements 3.4.1.1, 3.4.1.2), VA (Requirement 3.4.3) to the threshold accuracies, specified above, without requiring the operator to use any type of stabilization device (i.e. tripod) 100 percent of the time (Objective).

3.7.5 First/Strongest/Last Return

After a single range measurement, the CLRF IC Light rangefinder shall provide First/Strongest/Last Return, which will show the range of the closest target, the range of the strongest return, and the range of the furthest target, respectively (Threshold).

3.7.6 Multiple Target Indicator

The CLRF IC Light rangefinder shall provide a Multiple Target Indicator, which will alert the user in the case that multiple range targets were present during any single range finding operation and allow the user to cycle through and select a desired range (Threshold).

3.7.7 Range Gate

The CLRF IC Light shall be equipped with a minimum range control that permits the operator to set the minimum range to the nearest 10 meters from 100 meters to maximum range, at which the CLRF IC Light will register a laser return. The system shall enable a user to perform this operation in less than 10 seconds (Threshold).

3.8 Laser Spot Imaging

3.8.1 1064nm Laser Viewing/Detection

It is desired that the CLRF IC Light be capable of viewing or indicating the location of the 1064 nm designator energy (Objective).

3.8.2 Pulse Repetition Frequency Codes

It is desired that the CLRF IC Light display the Pulse Repetition Frequency code of any PRF-encoded 1064 nm laser spot within the CLRF IC Light field of view (Objective).

3.8.3 IR Pointer Viewing/Detection

It is desired the CLRF IC Light be capable of viewing or indicating the location of 805-870 nm laser energy (Objective).

3.8.4 Laser Rangefinder Viewing/Detection

It is desired the CLRF IC Light be capable of viewing or indicating the location of its own rangefinder laser energy (Objective).

3.9 Mechanical Interface

3.9.1 Interface with External Devices

The CLRF IC Light shall interface with the following external devices: Joint Terminal Attack Controller Laser Target Designator (JTAC LTD), AN/PAS-22 Long Range Thermal Imager (LRTI), AN/PAS-25 Thermal Laser Spot Imager (TLSI), AN/PEQ-17 Portable Lightweight Designator Rangefinder (PLDR), and AN/PAS-28 Medium Range Thermal Bi-ocular (MRTB) (Threshold).

3.9.2 Picatinny Rail

The CLRF IC Light shall include at least one Picatinny rail to facilitate mounting day/night sighting optics/imagers (Threshold). The rail shall be aligned with the emitted laser beams (Threshold). If provided as ancillary equipment, the adapter shall be installable by the maintainer (Threshold).

3.9.3 1/4-20 Adapter

The CLRF IC Light shall have the ability to mount to a standard 1/4-20 UNC threaded tripod (Threshold). The 1/4-20 UNC threaded hole shall be provided as an ancillary equipment adapter that mounts without tools (Threshold), or it may be integrated into the device near the center of gravity (Objective).

3.9.4 Picatinny Rail Grabber

A Picatinny rail grabber shall be provided (Threshold). The rail grabber shall be aligned with the optical path of the emitted lasers (Threshold). The rail grabber

shall contain azimuth and elevation adjustments to facilitate boresighting to a device with a Picatinny rail (Threshold). The rail grabber shall be provided as an ancillary equipment adapter that mounts to the CLRF IC Light without tools (Threshold), or it may be integrated into the device (Objective).

3.9.5 Protective Optics Covers

The CLRF IC Light shall include tethered or hinged covers to protect all lenses and fully block all emitted laser beams (Threshold).

3.9.6 Neck Strap

The CLRF IC Light shall be equipped with a carrying strap that permits the operator, dressed in all authorized variations of Marine Corps combat clothing, to carry and operate the CLRF IC Light while it is suspended from his neck (Threshold).

3.9.7 Transit Case

The transit case shall be designed to protect the CLRF IC Light, and associated equipment, from dust, rain, snow, sleet, and salt spray while it is being transported or stored, and be made of a non-reflective material. The transit case shall be able to hold one CLRF IC Light with neck strap, tripod (if required), two sets of spare batteries, associated cables, cleaning kit, ancillary equipment, and operator's manual (Threshold).

3.9.8 Remote Fire Cable

The remote fire cable shall fire upon button release, shall not exceed 1 m in length, and shall trigger a full measurement to calculate a target location within the system (Threshold).

3.10 Digital Interface

The CLRF IC Light shall output a 5029 serial communication message per IS-GPS-153 Revision D, Message ID 5029, pages B-86 and B-87 (Threshold). The CLRF IC Light shall receive and display information from the JTAC LTD and PLDR per the Kollsman Documents EICD48081000-1 and EI 8388-1000-00, respectively (Threshold). In addition to the 5029 message, it is desired that the CLRF IC Light also be capable of outputting a Sensor Link Protocol (SLP) message (Objective). It is desired that the CLRF IC Light be capable of wireless data export (Objective).

3.11 Interface Cables

The CLRF IC Light shall include a Strikelink interface cable (15 pin) which shall be at least 1.5 m in length which has the capability of transmitting the following messages per IS-GPS-153, Revision D, Message ID 5029, pages B-86 and B-87: Azimuth Heading, Azimuth Measurement Timestamp, Estimated Azimuth Accuracy, Roll Angle, Roll Angle Accuracy, Vertical Angle, and Vertical Angle

Accuracy (Threshold). The CLRF IC Light shall include a JTAC LTD, PLDR, and TLSI interface cable (Threshold).

3.12 Field-Carry Pouch

A soft material, field carry pouch shall be provided which is attachable to the MOLLE system (Threshold). The field carry pouch shall fit the CLRF IC Light and one extra set of batteries (or rechargeable battery pack, if so equipped) (Threshold). The field carry pouch shall retain the CLRF IC Light securely to the Marine's body/equipment while walking, running, and jumping (Threshold).

3.13 Tripod Soft Carry Pouch

It is desired that a soft material, field carry pouch be provided to carry the tripod which is attachable to the MOLLE system (Objective). If provided, it is desired that the tripod field carry pouch also be able to carry any cables and adapters that are provided with the system (Objective).

3.14 Trigonometric Capabilities

The CLRF IC Light shall calculate and display the following trigonometric capabilities: slant range, elevation angle, fall of shot correction, horizontal distance and height difference to remote object, slant range between two remote objects, horizontal and vertical distance between two remote objects, combined azimuth and elevation angle, azimuth and horizontal distance between two remote objects, relative horizontal and vertical angle between two remote objects (Threshold).

3.15 Battery Component

3.15.1 Interchangeable Battery Cartridges

The CLRF IC Light shall operate with interchangeable cartridges. One type of cartridge shall accept AA (lithium or alkaline) and one type of cartridge shall accept CR123s (Threshold). It is desired that a single battery cartridge accept both CR123s and AA size batteries (Objective). It is desired that the batteries may be inserted into the battery cartridge in any orientation and still function correctly (Objective). It is desired that the battery cartridge cannot be inserted into the system incorrectly (Objective).

3.15.2 Rechargeable Battery Pack

It is desired that, in addition to the use of AA or CR123s, a rechargeable battery pack be provided and fit the same space as the AA and CR123 cartridges (Objective). It is desired that the battery pack cannot be inserted into the system incorrectly (Objective).

3.15.3 External Power

The CLRF IC Light shall accept external power from BA-5590, BB-2590, 110 VAC, and 12 and/or 24 VDC Vehicular Power (Threshold).

3.15.4 System Damage

The CLRF IC Light shall not be damaged by over/under voltage from external power sources. The system shall not be damaged by connecting or disconnecting to the external battery while the system is operating (Threshold).

3.15.5 Battery Status

The CLRF IC Light system shall provide a battery status indicator that alerts the user when the CLRF IC Light has only enough battery life remaining for 30 minutes of operation (Threshold).

3.15.6 Battery Life

The CLRF IC Light shall permit 6 hours of operation on a single set of batteries (Threshold). It is desired that the CLRF IC Light will permit 8 hours of operation on a single set of batteries (Objective).

3.15.7 Auto Power Shut-Off

The CLRF IC Light shall execute an auto-shutdown command to automatically turn off the system after 20 minutes without operator interaction (Threshold).

3.16 Boresight Alignment

The system shall maintain internal boresight across all FOVs, magnifications, optical systems, lasers and laser receivers to within 0.5 mils (Threshold). It is desired the CLRF IC Light not need periodical boresight and calibration adjustments (Objective).

3.17 Tripod

The tripod shall be non-reflective and non-magnetic, weigh less than or equal to 2.5 lbs, and have an azimuth, elevation fine adjust capability, and be at least equal in durability to the CLRF IC Light (Threshold). It is desired to weigh less than or equal to 2.0 lbs (Objective).

3.18 Tripod Size

The tripod shall be compact enough, when not in use, to fit in the cargo pocket of standard issue camouflage utility uniform (Threshold).

3.19 Viewing Optics

3.19.1 Eye Protection

The CLRF IC Light optics shall contain laser eye protection against other laser systems from 1W, 830 nm to 860 nm (IR pointer) and 80 mJ, 1064 nm (designator) at the aperture (Threshold).

3.19.2 Diopter Adjustments

The CLRF IC Light optics shall have a diopter adjustment from +2 to -6 diopters (Threshold).

3.19.3 Reticle and Reticle Scales

3.19.3.1 Reticle Operation

The CLRF IC Light reticle shall be viewable by the operator during daylight and nighttime operation (Threshold).

3.19.3.2 Reticle Resolution

The CLRF IC Light reticle shall be graduated in 5 mil increments and labeled in 10 mil increments (Threshold).

3.19.3.3 Reticle Pattern

The CLRF IC Light reticle shall be of the mil-scale variety to allow trained users to estimate ranges (Threshold), user-selectable (Objective).

3.19.4 Data Display

The CLRF IC Light system shall display target location data (OT True Azimuth, OT Range, OT Vertical Angle), target location, self-location, and shall include indication of coordinate reference, measurement units, battery status, and north reference (Threshold).

3.19.5 Legibility

3.19.5.1 Visibility

The CLRF IC Light system visual display shall be legible under all light conditions encountered during system operation even when users are wearing polarized eye wear (Threshold). CLRF IC Light display shall have a user-selectable light level down to fully off for night (Threshold).

3.19.5.2 Display Viewing

The CLRF IC Light display shall be viewable to the user without removing his eye from the eyepiece (Threshold).

3.19.5.3 Visual Display Features

The CLRF IC Light visual display shall be visible within 0.5 seconds of the observer activating the laser fire switch and shall remain visible, as long as the laser fire button is depressed (Threshold).

3.19.6 Display Units

The CLRF IC Light shall display angle measurements in mils and degrees and be user selectable (Threshold). The CLRF IC Light shall display the north reference in user-selectable grid true or magnetic (Threshold). The CLRF IC Light system shall display ranges in meters or yards (user-selectable) in single digit increments (Threshold). The CLRF IC Light shall display self location and target location in user-selected coordinate format per IS-GPS-153, Revision D (Threshold). The CLRF IC Light shall display FOM (Threshold).

3.19.7 Resolution of Display

The CLRF IC Light system visual display resolution shall be accurate to less than or equal to 1 mil when set to mil units or less than or equal to 0.1° when set to degrees (Threshold).

3.19.8 Resolution of Digital Data

The CLRF IC Light digital data resolution for angular measurements shall be less than or equal to 0.1 mil (Threshold). The CLRF IC Light digital data resolution for distance shall be less than or equal to 0.1 m (Threshold).

3.19.9 Target Location Error Indicator

It is desired that the CLRF IC Light system display an estimation of the Target Location Error Category (dictated by the Joint Close Air Support publication 3-09.3, dated 08 July 2009) to the user for each measurement taken and include the errors introduced from self-location accuracy, range finding accuracy, and azimuth accuracy (Objective). Target Location Error Categories are shown in Figure 1.

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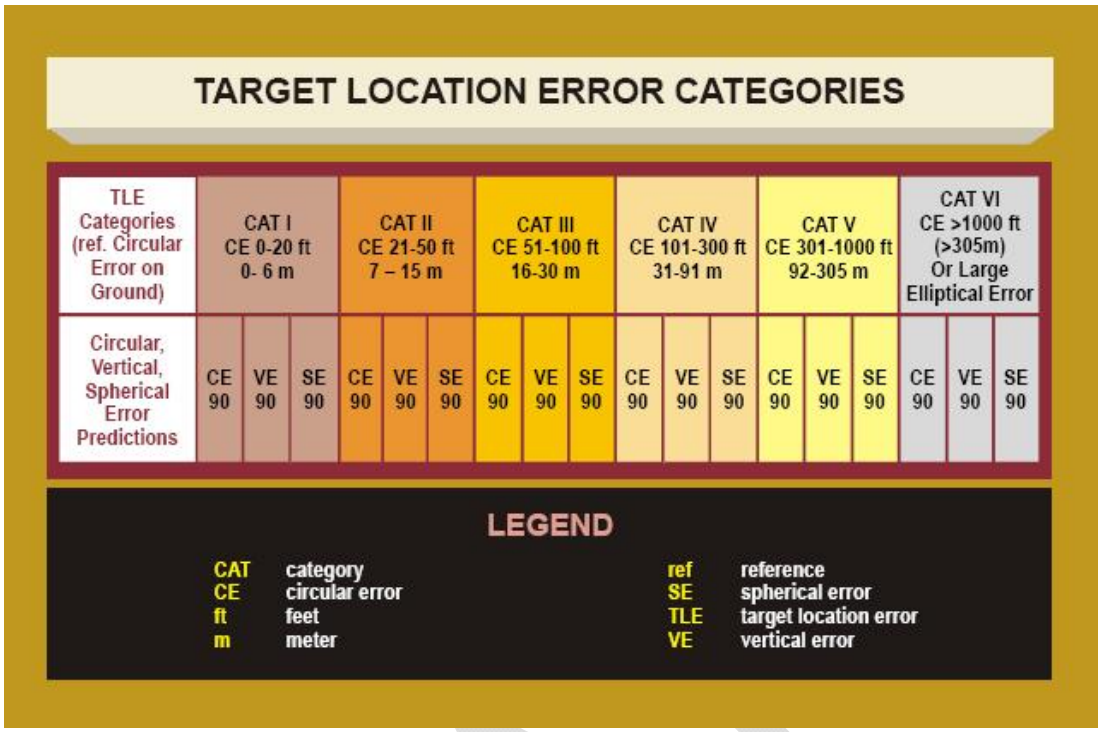

Figure 1. Target Location Error Categories

3.19.10 Safety Messages

3.19.10.1 Warning Messages

The CLRF IC Light shall display a warning message notifying the user that their present position is less than the user-defined Minimum Safe Range value from the target position relative to the ordnance being used and injury or death could result (Threshold).

3.19.10.2 Danger Messages

The CLRF IC Light shall display a danger message notifying the user that their present position is less than 100 m from the target position relative to the ordnance being used and injury or death could result (Threshold).

3.20 Built-In-Test (BIT)

3.20.1 BIT Accuracy

The CLRF IC Light shall have a Built In Test (BIT) capability that will check system status with 95% accuracy (Threshold). It is desired the BIT capability have 99% accuracy (Objective).

3.20.2 BIT False Alarm Rate

The false alarm rate shall be less than 10% for system status tests (Threshold).

3.20.3 BIT Display

The CLRF IC Light system Built-In Test (BIT) capability shall display the software version and check the display segments (Threshold).

3.21 Graceful Degradation

CLRF IC Light shall be designed for graceful degradation, meaning that the failure of one or more subsystems shall not result in the failure of the entire system, and, in as much as is practicable, shall not compromise the mission (Threshold).

3.22 System Signature

3.22.1 Aural Nondetectability

It is desired that the CLRF IC Light aural nondetectability distance be 20 meters during operation (Objective).

3.22.2 Stray Light Security

A method shall be provided that allows the operator to adjust the brightness of all illuminated indicators to minimize detection (Threshold). If a self-closing eye cup is used, the eye cup shall be able to be locked in the open position once fully depressed (Threshold). It is desired that the CLRF IC Light not be visible (displays, indicators) at ranges greater than 20 meters to unaided viewing or when viewing with 3rd generation NVGs (Objective).

3.23 Environmental Requirements

3.23.1 Chemical, Biological, Radiological and Nuclear (CBRN) Decontamination

The CLRF IC Light shall be able to withstand, with limited operational degradation, at least 4 exposures to the material-damaging effects of CBRN contaminants, decontaminants, and decontaminating procedures in a 72-hour period (Threshold), indefinitely (Objectively). NOTE: Removing and discarding external covering materials to meet this requirement is acceptable provided the procedure to do so can be performed by the operator in a tactical environment and that the functionality of the CLRF IC Light is not degraded by the removal of the covering material.MIL-HDBK-783 and MIL-HDBK-784 may be referred to for guidance.

3.23.2 Military Free Fall Operations-Altitude (Non-operational)

The CLRF IC Light shall not suffer any damage or degradation in performance (as a result of atmospheric pressure related effects) after being subjected to a military free fall operation while being carried by a user conducted from 25,000 ft Mean Sea Level. It is desired that The CLRF IC Light will not suffer any damage or degradation in performance (as a result of atmospheric pressure related effects)

after being subjected to a military free fall operation conducted from 42,000 ft Mean Sea Level (Objective).

3.23.3 Military Free Fall Operations-Shock (Non-operational)

The CLRF IC Light shall not suffer any damage or degradation in performance (as a result of shock related effects) after being subjected to a military free fall operation while being carried by a user (Threshold).

3.23.4 Immersion (30 ft)

The CLRF IC Light shall not suffer any damage or degradation in performance following a 30-minute submersion in water at a depth of 30 ft while sealed in a waterproof bag (Threshold). It is desired that the CLRF IC Light will not suffer any damage or degradation in performance following a 30-minute submersion in water at a depth of 40 ft while sealed in a waterproof bag (Objective).

3.23.5 Immersion (1.0 m)

The CLRF IC Light shall not suffer any damage or degradation in performance following a 10-minute submersion unprotected in fresh or salt water at a depth of 1.0 m (Threshold).

3.23.6 Humidity

The CLRF IC Light shall be able to survive up to 100% humidity (Threshold).

3.23.7 Operating Temperature

The CLRF IC Light shall be capable of operating in air temperatures ranging from -25°F to 125°F (Threshold).

3.23.8 Storage Temperature

The CLRF IC Light shall be capable of being stored in temperatures ranging from -30°F to 145°F without the benefit of the field carry pouch or transit case (Threshold).

3.23.9 Temperature Shock

The CLRF IC Light shall not suffer any damage or degradation in performance following sudden changes in ambient air temperature of up to 35.6°F/min (Threshold), or up to 50°F/min (Objective).

3.23.10 Fungus

The CLRF IC Light (free of all salt residues) shall neither support fungal growth nor suffer damage or degradation of performance caused by the presence of fungus spores or adjacent fungal growth (Threshold).

3.23.11 Mechanical Vibration (Minimum Integrity)

The CLRF IC Light, within its transit case, shall be able to withstand the vibration effects experienced during transport in military aircraft (to include helicopter), cross-country (off-road) vehicular movement, and maritime transport (Threshold).

3.23.12 Transportation Vibration (Loose Cargo)

The CLRF IC Light shall operate without damage or degradation following exposure, while in its transit case, to transportation vibration (Threshold).

3.23.13 Rugged Handling

The CLRF IC Light in its Field Carry Pouch shall not be damaged or degraded in performance after experiencing mechanical shocks commonly induced during operations such as entering and exiting vehicles, running and jumping (Threshold). It is desired that the CLRF IC Light without its Field Carry Pouch not be damaged or degraded in performance after experiencing mechanical shocks commonly induced during operations such as entering and exiting vehicles, running and jumping (Objective).

3.23.14 Sand and Dust

The CLRF IC Light shall operate without damage or degradation after exposure to blowing dust (Threshold).

3.23.15 Salt Fog

The CLRF IC Light shall operate without leakage, damage or degradation after exposure to a salt fog environment.

3.23.16 Explosive Atmosphere

Authorized operator actions including but not limited to CLRF IC Light operation, system assembly/disassembly, and operator maintenance, checks, and services, shall not cause ignition of an atmosphere that is heavily laden with fumes from ground vehicles or aircraft fuels (Threshold).

3.23.17 Electromagnetic Interference/Electromagnetic Vulnerability (EMI/EMV)

In the operational configuration, the CLRF IC Light shall be characterized for the emission requirement of RE102 of MIL-STD-461F (Threshold). It is desired that the electric field emissions from the CLRF IC Light and its associated cabling conform to the performance requirements specified for RE101, RE102 (2 MHz - 1 GHz, limit for ground applications), RS101, and RS103 (2 MHz - 18GHz) when tested in accordance with the test methodology of MIL-STD-461F (Objective).

3.23.18 Solar Radiation

The CLRF IC Light shall not suffer any damage when exposed to solar radiation of up to 1120W/m^2 (Threshold). It is desired that the CLRF IC Light be capable

of operating in ambient temperature fluctuations from 14°F to 122°F with exposure to solar radiation of up to 1120W/m^2 (Objective).

3.24 Logistics

3.24.1 Mean Time Between Failure (MTBF).

The CLRF IC Light shall have a Mean Time Between Operational Mission Failure (MTBOMF) no less than 11,500 hours (Threshold).

3.24.2 Operational Availability (A_o)

The CLRF IC Light shall have an achieved operational availability (A_o) of 0.95 (Threshold).

3.24.3 Preventive Maintenance

The CLRF IC Light Preventive Maintenance shall be performed weekly while in storage and daily under operational conditions. The mean time to perform PM shall not exceed 15 minutes (Threshold), five minutes (Objective).

3.24.4 Reliability

The CLRF IC Light shall have an initial failure rate not less than 114 hours (Threshold); not less than 234 hours (Objective).

3.25 Human Systems Integration

3.25.1 Control Accessibility

The CLRF IC Light controls shall be accessible and distinguishable when the system is in its operational configuration and when it is supported by artificial means (i.e. tripod) (Threshold).

3.25.2 Power Controls

The CLRF IC Light shall have a single finger/thumb operated control shall turn the power on and off (Threshold).

3.25.3 Firing Controls

The CLRF IC Light shall have a single finger/thumb operated control shall fire the laser and cause the target location data to be displayed both when pushing the control and upon release of the control (Threshold).

3.25.4 Operation

The CLRF IC Light shall be capable of being operated by a single 5th through 95th percentile male Marine per MIL-STD-1472F(1) while wearing any of the full range of Marine Corps combat clothing to include camouflage utilities, cold and wet weather protective clothing, arctic clothing, and Mission Oriented

Protective Posture (MOPP) Gear - Levels I through IV with no more than minimal degradation to the user's ability to accomplish the mission (Threshold).

3.26 Safety

3.26.1 Battery Safety Requirements

If the CLRF IC Light battery contains Lithium, the system and the battery shall be capable of meeting all requirements needed for approval by the Naval Lithium Battery Safety Program per NAVSEA S9310-AQ-SAF-010 (Threshold); is already approved (Objective).

3.26.2 Safety Assessment

The operation, maintenance, storage, transportation, or disposal of the CLRF IC Light shall not present any hazards that are assessed as more severe than Medium risks as specified in MIL-STD-882D (Threshold). It is desired that the operation, maintenance, storage, transportation, or disposal of the CLRF IC Light does not present any hazards that are assessed as more severe than Low risks as specified in MIL-STD-882D (Objective).

3.27 Manufacturing

3.27.1 Marking

The CLRF IC Light shall have an IUID-compliant identification plate of corrosion-resistant material permanently attached to the outside of the system (Threshold). The identification plate shall be marked in accordance with MIL-STD-130N and shall include as a minimum human-readable nomenclature and serial number (Threshold). It is desired that the CLRF IC Light also have a human-readable warranty label providing pertinent warranty information affixed to the unit (Objective).

3.27.2 Workmanship

Workmanship in the fabrication and assembly of CLRF IC Light components shall comply with best commercial practices (Threshold). The components shall be clean and free of burrs, sharp edges, unblended radii, surface defects, cracks, chips, dirt, grease (except where specifically required), rust, foreign matter or any evidence of poor workmanship that could render the system unsuitable for its intended purpose or that would affect life, serviceability or appearance (Threshold).

3.27.3 Materials Selection

The CLRF IC Light contractor shall avoid the use of toxic chemicals, hazardous substances, or ozone depleting chemicals if feasible. Recycled, recovered, or environmentally preferable materials shall be used to the maximum extent possible, provided the materials meet or exceed the operational and maintenance

requirements and promote economically advantageous life cycle costs (Threshold).

4. Verification

4.1 First Article Testing

The contractor is responsible for conducting First Article Testing to show compliance with sections 4.9 through 4.34 of this performance specification. Proof of previous testing, with government oversight, which satisfies a first article test requirement may be submitted in lieu of current testing.

4.2 Classification of Inspections

The inspection requirements specified herein are classified as follows:

First article inspection (see 4.5)

Conformance inspection (see 4.6)

4.3 Verification Methods

Methods utilized to accomplish verification include:

Analysis
An element of verification that utilizes established technical or mathematical models or simulations, algorithms, charts, graphs, circuit diagrams, or other scientific principles and procedures to provide evidence that stated requirements were met.

Demonstration
An element of verification that involves the actual operation of an item to provide evidence that the required functions were accomplished under specific scenarios. The item may be instrumented and performance monitored.

Examination
An element of verification that is generally nondestructive and typically includes the use of sight, hearing, smell, touch, and taste; simple physical manipulation; and mechanical and electrical gauging and measurement.

Test
An element of verification in which scientific principles and procedures are applied to determine the properties or functional capabilities of items.

4.4 Inspection Conditions

Unless otherwise specified, all inspections shall be performed in accordance with the conditions specified in the applicable paragraphs in this specification or

applicable verification methods (Threshold). If inspection conditions are not specified, the inspection may be performed at any temperature between 18°C (64°F) and 30°C (86°F) and at 1.0±0.1 atmosphere of pressure.

4.5 First Article Inspection

The first article inspection shall be performed on a minimum of two systems. A minimum of one system shall be used to perform the tests listed (in the order specified) for Series #1 in Table 1 and a minimum of one system shall be used to perform the tests listed (in the order specified) for Series #2 in Table 1. All other first article inspections shall be performed in any order, and with the number of inspection units acceptable to the Government. Disposition of first article sample systems shall be as specified in the contract or purchase order.

Table 1. First Article Inspection Test Sequence Matrix

First Article Inspection	Requirement Paragraph	Verification Paragraph	Series #1	Series #2
Mechanical Vibration (Minimum Integrity)	3.23.11	4.30.11	1	1
Storage Temperature	3.23.8	4.30.8	2	2
Operating Temperature	3.23.7	4.30.7	3	3
Temperature Shock	3.23.9	4.30.9	4	4
Solar Radiation	3.23.18	4.30.18	5	5
Military Free Fall Operations – Altitude (Non-operational)	3.23.2	4.30.2	6	6
Military Free Fall Operations – Shock (Non-operational)	3.23.3	4.30.3	7	7
Rugged Handling	3.23.13	4.30.13	8	8
Transportation Vibration (Loose Cargo)	3.23.12	4.30.12	9	9
Immersion (1.0 m)	3.23.5	4.30.5	10	10
Immersion (30 ft)	3.23.4	4.30.4	11	11
Explosive Atmosphere	3.23.16	4.30.16	These tests may be performed with either the Series #1 or Series #2 system.	
Electromagnetic Interference/Electromagnetic Vulnerability (EMI/EMV)	3.23.17	4.30.17		
Humidity	3.23.6	4.30.6		
Sand and Dust	3.23.14	4.30.14		
Salt Fog	3.23.15	4.30.15		

4.6 Conformance Inspection

Unless otherwise specified in this document or in the contract or purchase order, the contractor shall subject all CLRF IC Light systems to inspection for conformance to this specification in accordance with MIL-STD-1916.

Contractors that have an acceptable quality system and proven process controls relevant to the products being procured using this specification are encouraged to consider submitting an alternate acceptance method for verifying conformance to this specification. The acceptability of alternate acceptance methods is dependent upon the existence of a quality system, the demonstration of its process focus, and the availability of objective evidence of effectiveness. The contractor developed Acceptance Test Procedure shall be approved by the Government and revised as necessary (Threshold).

4.7 Responsibility for Conformance

Contractors are required to deliver CLRF IC Light systems that conform to the requirements of this specification and the applicable contract or purchase order, and to generate and maintain sufficient evidence of conformance. Contractors are responsible for establishing their own manufacturing and process controls to produce results in accordance with the requirements. Contractors are expected to use recognized prevention practices such as process controls and statistical techniques to reduce or eliminate manufacturing defects. Absence of any inspection or process control requirement in this specification or in the contract does not relieve the contractor of responsibility for assuring that all products submitted to the Government for acceptance conform to all requirements of the contract and this specification.

4.8 Government Verification of Conformance

The Government reserves the right to verify the conformance of any system offered for delivery to the requirements of this specification through independent analyses, inspections, testing, or demonstrations. Deficiencies found by the Government shall be a cause for rejection of the CLRF IC Light until the manufacturer has provided evidence that the deficiencies have been corrected (Threshold). The manufacturer shall correct all such deficiencies at no additional cost to the Government (Threshold). The Government also reserves the right to verify the contractor's implementation of, and adherence to, their manufacturing and process controls and to witness the contractor's performance of conformance inspection procedures.

4.9 Operational Utility

4.9.1 Nominal Mission Profile

The ability of the CLRF IC Light to conform to the requirements specified in 3.1 shall be verified through analysis and demonstration.

4.9.2 Weight

The ability of the CLRF IC Light to conform to the requirements specified in 3.2 shall be verified through examination.

4.10 Optics

4.10.1 Optical System

The ability of the CLRF IC Light to conform to the requirements specified in 3.3.1 shall be verified through, through examination.

4.10.2 Target Recognition

System performance modeling of target recognition sensors shall use the following models and parameters:

Emissive energy sensor performance (NVTHERM Parameters)

Parameter	Value
Display Brightness (for modeling only)	20 Ft-L
Minimum Frame Rate	30 Hz
NVThermIP Parameters: (Version 2009)	1.4 x 1.7 m Target V50 Recognition = 12 (variable gain) RSS ΔT = 1.25 Kelvin Non-Turbulent Conditions Cn2 = 1.0 e-15 Scene Contrast Temperature = 3.75 Kelvin

Reflective energy sensor performance (SSCamIP Parameters)

Parameter	Value
Illumination	Clear Daylight (SSCamIP Intrinsic Value)
Sky to Ground Ratio	3
SSCamIP Modeling Parameters (Version 2009)	1.4 x 1.7 m Target V50 Recognition = 12 Target Intrinsic Reflectivity = 40% Background Intrinsic Reflectivity = 20% No Contrast Enhancement

4.10.2.1 Daytime Target Recognition

The ability of the CLRF IC Light to conform to the requirements specified in 3.3.2 shall be verified through, through analysis.

4.10.2.2 Nighttime Target Recognition

The ability of the CLRF IC Light to conform to the requirements specified in 3.3.3 shall be verified through, through analysis.

4.10.3 Field of View

The ability of the CLRF IC Light to conform to the requirements specified in 3.3.4 shall be verified through, through examination.

4.11 Angle Measurement Capabilities

4.11.1 Azimuth Performance

4.11.1.1 Disturbed Magnetic Environment

The ability of the CLRF IC Light to conform to the requirements specified in 3.4.1.1 between $\pm$ 38° latitude shall be verified through, through analysis and test.

4.11.1.2 Sterile Magnetic Environment

The ability of the CLRF IC Light to conform to the requirements specified in 3.4.1.2 between $\pm$ 38° latitude shall be verified through, through analysis and test.

4.11.2 Maintaining Azimuth Upon Relocation

The ability of the CLRF IC Light to conform to the requirements specified in 3.4.2 shall be verified through, through demonstration.

4.11.3 Vertical Angle

The ability of the CLRF IC Light to conform to the requirements specified in 3.4.3 shall be verified through, through test.

4.11.4 Roll Angle

The ability of the CLRF IC Light to conform to the requirements specified in 3.4.4 shall be verified through, through demonstration.

4.11.5 Azimuth Upgradeability

The ability of the CLRF IC Light to conform to the requirements specified in 3.4.5 shall be verified through examination.

4.12 Setup Time

4.12.1 Rapid Startup Time

The ability of the CLRF IC Light to conform to the requirements specified in 3.5.1 shall be verified through demonstration.

4.12.2 Full Setup Time

The ability of the CLRF IC Light to conform to the requirements specified in 3.5.2 shall be verified through demonstration.

4.13 Self Location

The ability of the CLRF IC Light to conform to the requirements specified in **Error! Reference source not found.** shall be verified through analysis.

4.14 Laser Rangefinder

4.14.1 Laser Rangefinder Eye-Safety

The ability of the CLRF IC Light to conform to the requirements specified in 3.7.1 shall be verified through demonstration.

4.14.2 Target Range Finding

System performance range modeling and testing shall use the following parameters:

Target Range Determination Parameters

Parameter	Target Type	
Target Size	Man-Size Target 2.0 m x 0.5 m	Standard NATO Target 2.3 m x 2.3 m
Target Reflectivity	10% Lambertian	50% Lambertian
Target Orientation	Normal to Beam	

4.14.2.1 Man-Size Target Range Finding

The ability of the CLRF IC Light to conform to the requirements specified in 3.7.2 shall be verified through testing.

4.14.2.2 NATO Standard Target Range Finding

The ability of the CLRF IC Light to conform to the requirements specified in 3.7.3 shall be verified through testing.

4.14.3 Stabilization Device

The ability of the CLRF IC Light to conform to the requirements specified in 3.7.4 shall be verified through demonstration.

4.14.4 First/Last/Strongest Return

The ability of the CLRF IC Light to conform to the requirements specified in 3.7.5 shall be verified through demonstration.

4.14.5 Multiple Target Indicator

The ability of the CLRF IC Light to conform to the requirements specified in 3.7.6 shall be verified through demonstration.

4.14.6 Range Gate

The ability of the CLRF IC Light to conform to the requirements specified in 3.7.7 shall be verified through demonstration.

4.15 Laser Spot Imaging

4.15.1 1064nm Laser Viewing/Detection

The ability of the CLRF IC Light to conform to the requirements specified in 3.8.1 shall be verified through demonstration.

4.15.2 Pulse Repetition Frequency Codes

The ability of the CLRF IC Light to conform to the requirements specified in 3.8.2 shall be verified through demonstration.

4.15.3 IR Pointer Viewing/Detection

The ability of the CLRF IC Light to conform to the requirements specified in 3.8.3 shall be verified through demonstration.

4.15.4 Laser Rangefinder Viewing/Detection

The ability of the CLRF IC Light to conform to the requirements specified in 3.8.4 shall be verified through demonstration.

4.16 Mechanical Interface

4.16.1 Interface with External Devices

The ability of the CLRF IC Light to conform to the requirements specified in 3.9.1 shall be verified through examination.

4.16.2 Picatinny Rail

The ability of the CLRF IC Light to conform to the requirements specified in 3.9.2 shall be verified through examination.

4.16.3 1/4-20 Adapter

The ability of the CLRF IC Light to conform to the requirements specified in 3.9.3 shall be verified through examination.

4.16.4 Picatinny Rail Grabber

The ability of the CLRF IC Light to conform to the requirements specified in 3.9.4 shall be verified through examination.

4.16.5 Protective Optics Covers

The ability of the CLRF IC Light to conform to the requirements specified in 3.9.5 shall be verified through examination.

4.16.6 Neck Strap

The ability of the CLRF IC Light to conform to the requirements specified in 3.9.6 shall be verified through examination.

4.16.7 Transit Case

The ability of the CLRF IC Light to conform to the requirements specified in 3.9.7 shall be verified through examination.

4.16.8 Remote Fire Cable

The ability of the CLRF IC Light to conform to the requirements specified in 3.9.8 shall be verified through examination and demonstration.

4.17 Digital Interface

The ability of the CLRF IC Light to conform to the requirements specified in 3.10 shall be verified through demonstration and/or testing.

4.18 Interface Cable

The ability of the CLRF IC Light to conform to the requirements specified in 3.11 shall be verified through demonstration.

4.19 Field-Carry Pouch

The ability of the CLRF IC Light to conform to the requirements specified in 3.12 shall be verified through examination and demonstration.

4.20 Tripod Soft Carry Pouch

The ability of the CLRF IC Light to conform to the requirements specified in 3.13 shall be verified through examination and demonstration.

4.21 Trigonometric Capabilities

The ability of the CLRF IC Light to conform to the requirements specified in 3.14 shall be verified through demonstration.

4.22 Battery Component

4.22.1 Interchangeable Battery Cartridges

The ability of the CLRF IC Light to conform to the requirements specified in 3.15.1 shall be verified through examination.

4.22.2 Rechargeable Batteries

The ability of the CLRF IC Light to conform to the requirements specified in 3.15.2 shall be verified through demonstration.

4.22.3 External Power

The ability of the CLRF IC Light to conform to the requirements specified in 3.15.3 shall be verified through demonstration.

4.22.4 System Damage

The ability of the CLRF IC Light to conform to the requirements specified in 3.15.4 shall be verified through examination.

4.22.5 Battery Status

The ability of the CLRF IC Light to conform to the requirements specified in 3.15.5 shall be verified through examination.

4.22.6 Battery Life

The ability of the CLRF IC Light to conform to the requirements specified in 3.15.6 shall be verified through demonstration.

4.22.7 Auto Power Shut-Off

The ability of the CLRF IC Light to conform to the requirements specified in 3.15.7 shall be verified through demonstration.

4.23 Boresight Alignment

The ability of the CLRF IC Light to conform to the requirements specified in 3.16 throughout the operating temperatures shall be verified through test.

4.24 Tripod

The ability of the CLRF IC Light to conform to the requirements specified in 3.17 shall be verified through examination.

4.25 Tripod Size

The ability of the CLRF IC Light to conform to the requirements specified in 3.18 shall be verified through examination.

4.26 Viewing Optics

4.26.1 Eye Protection

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.1 shall be verified through examination.

4.26.2 Diopter Adjustments

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.2 shall be verified through examination.

4.26.3 Reticle and Reticle Scales

4.26.3.1 Reticle Operation

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.3.1 shall be verified through demonstration.

4.26.3.2 Reticle Resolution

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.3.2 shall be verified through demonstration.

4.26.3.3 Reticle Pattern

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.3.3 shall be verified through examination.

4.26.4 Data Display

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.4 shall be verified through demonstration.

4.26.5 Legibility

4.26.5.1 Visibility

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.5.1 shall be verified through demonstration.

4.26.5.2 Display Viewing

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.5.2 shall be verified through examination.

4.26.5.3 Visual Display Features

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.5.3 shall be verified through demonstration.

4.26.6 Display Units

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.6 shall be verified through demonstration.

4.26.7 Resolution of Display

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.7 shall be verified through examination.

4.26.8 Resolution of Digital Data

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.8 shall be verified through examination.

4.26.9 Target Location Error Indicator

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.9 shall be verified through demonstration.

4.26.10 Safety Messages

4.26.10.1 Warning Messages

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.10.1 shall be verified through demonstration.

4.26.10.2 Danger Messages

The ability of the CLRF IC Light to conform to the requirements specified in 3.19.10.2 shall be verified through demonstration.

4.27 Built-In-Test (BIT)

4.27.1 BIT Accuracy

The ability of the CLRF IC Light to conform to the requirements specified in 3.20.1 shall be verified through test.

4.27.2 BIT False Alarm Rate

The ability of the CLRF IC Light to conform to the requirements specified in 3.20.2 shall be verified through test.

4.27.3 BIT Display

The ability of the CLRF IC Light to conform to the requirements specified in 3.20.3 shall be verified through demonstration.

4.28 Graceful Degradation

The ability of the CLRF IC Light to conform to the requirements specified in 3.21 shall be verified through analysis.

4.29 System Signature

4.29.1 Audible Delectability

The ability of the CLRF IC Light to conform to the requirements specified in 3.22.1 shall be verified through testing in accordance with requirement 2, Table 2-II of MIL-STD-1474D.

4.29.2 Stray Light Security

The ability of the CLRF IC Light to conform to the requirements specified in 3.22.2 shall be verified through demonstration.

4.30 Environmental Requirements

4.30.1 Chemical, Biological, Radiological and Nuclear (CBRN) Decontamination

The ability of the CLRF IC Light to conform to the requirements specified in 3.23.1 shall be verified through analysis.

4.30.2 Military Free Fall Operations-Altitude (Non-operational)

To determine conformance to 3.23.2, the CLRF IC Light shall be tested at an altitude change rate of 26 ft/s to 33 ft/s for a period of 1 hour within the operating temperatures specified in 3.23.7 in accordance with MIL-STD-810G, Method 500.5, Procedure I.

4.30.3 Military Free Fall Operations-Shock (Non-operational)

To determine conformance to 3.23.3, the CLRF IC Light shall be drop tested without its transit case inside a standard USMC parachutist assembly, drop bag (NSN 1670-01-508-9053) dropped from a height of 10.5 ft onto two-inch plywood backed by concrete on one axis. Use of a field-carry pack is acceptable.

4.30.4 Immersion (30 ft)

To determine conformance to 3.23.4, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 512.5, Procedure I. The system shall be conditioned for 2 hours at 50°F above the water temperature.

4.30.5 Immersion (1.0 m)

To determine conformance to 3.23.5, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 512.5, Procedure I. The system shall be conditioned for 2 hours at 50°F above the water temperature.

4.30.6 Humidity

To determine conformance to 3.23.6, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 507.5, Procedure 2, for 10 cycles per Figure 507.5-7.

4.30.7 Operating Temperature

To determine conformance to 3.23.7, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 501.5, Procedure II (high temperature), and Method 502.5, Procedure II (low temperature). The system shall soak at 60 minutes at each temperature.

4.30.8 Storage Temperature

To determine conformance to 3.23.8, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 501.5, Procedure I (high temperature), and Method 502.5, Procedure I (low temperature). The system shall soak at 60 minutes at each temperature. The system shall not be in its field carry pouch or transit case while being tested.

4.30.9 Temperature Shock

To determine conformance to 3.23.9, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 503.5, Procedure I-B, between ambient air temperatures of -14°F and 122°F for a period of two (2) hours at each temperature.

4.30.10 Fungus

The ability of the CLRF IC Light to conform to the requirements specified in 3.23.10 shall be verified through analysis in accordance with MIL-STD-810G, Method 508.6.

4.30.11 Mechanical Vibration (Minimum Integrity)

To determine conformance to 3.23.11, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 514.6, Procedure I General Vibration. Random vibration levels shall be as identified in Figure 514.6E-1 of Annex E (General Minimum Integrity Exposure), with a test duration of one hour for each of three orthogonal axes. Inspect for damage and verify system operation after completion of testing.

4.30.12 Transportation Vibration (Loose Cargo)

To determine conformance to 3.23.12, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 514.6, Procedure II, Category 5 (Threshold). The total test time shall be three hours.

4.30.13 Rugged Handling

To determine conformance to 3.23.13, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 516.6, Procedure IV, with the exception that the drop height shall be 39 inches vice 48 inches. The CLRF IC Light shall undergo a drop test on all axes from a height of 39 inches onto concrete. The device does not have to be "on" during the test and optics can have a lens cover attached. The device should be fully operational following this test.

4.30.14 Sand and Dust

To determine conformance to 3.23.14, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 510.5, Procedure I. The duration for steps 3 and 7 shall be six hours and the air velocity shall be 1,750 ft/min. Optical surfaces and connectors are to be covered. A degraded finish is permissible. Markings shall still be legible.

4.30.15 Salt Fog

To determine conformance with 3.23.15, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 509.5. The CLRF IC Light shall be exposed for two 24-hour periods with a 24-hour drying time between each exposure. The CLRF IC Light shall not be operating during exposure. Optical surfaces and connectors shall be covered.

4.30.16 Explosive Atmosphere

To determine conformance with 3.23.16, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 511.5, Procedure I.

4.30.17 Electromagnetic Interference/Electromagnetic Vulnerability (EMI/EMV)

To determine conformance to section 3.23.17, the CLRF IC Light system shall be tested in accordance with MIL-STD-461F, RE101, RE102, RS101, and RS103 (2 MHz - 18GHz).

4.30.18 Solar Radiation

To determine conformance with 3.23.18, the CLRF IC Light shall be tested in accordance with MIL-STD-810G, Method 505.5, Procedure I, subjected to a minimum of 3 solar diurnal cycles for the A1 environment.

4.31 Logistics

4.31.1 Mean Time Between Failure (MTBF).

The ability of the CLRF IC Light to conform to the requirements specified in 3.24.1 shall be verified through demonstration and analysis.

4.31.2 Operational Availability (A_o)

The ability of the CLRF IC Light to conform to the requirements specified in 3.24.2 shall be verified through analysis.

4.31.3 Preventive Maintenance

The ability of the CLRF IC Light to conform to the requirements specified in 3.24.3 shall be verified through demonstration.

4.31.4 Reliability

The ability of the CLRF IC Light to conform to the requirements specified in 3.24.4 shall be verified through analysis.

4.32 Human Systems Integration

4.32.1 Control Accessibility

The ability of the CLRF IC Light to conform to the requirements specified in 3.25.1 shall be verified through demonstration.

4.32.2 Power Controls

The ability of the CLRF IC Light to conform to the requirements specified in 3.25.2 shall be verified through demonstration.

4.32.3 Firing Controls

The ability of the CLRF IC Light to conform to the requirements specified in 3.25.3 shall be verified through demonstration.

4.32.4 Operation

The ability of the CLRF IC Light to conform to the requirements specified in 3.25.4 shall be verified through examination.

4.33 Safety

4.33.1 Battery Safety Requirements

The ability of the CLRF IC Light to conform to the requirements specified in 3.26.1 shall be verified through a combination of testing, analysis, demonstration and examination.

4.33.2 Safety Assessment

The ability of the CLRF IC Light to conform to the requirements specified in 3.26.2 shall be verified through a combination of testing, analysis, demonstration and examination.

4.34 Manufacturing

4.34.1 Marking

The ability of the CLRF IC Light to conform to the requirements specified in 3.27.1 shall be verified through examination.

4.34.2 Workmanship

The ability of the CLRF IC Light to conform to the requirements specified in 3.27.2 shall be verified through examination.

4.34.3 Materials Selection

The ability of the CLRF IC Light to conform to the requirements specified in 3.27.3 shall be verified through examination.

The contractor shall verify, by examination, the ability of the CLRF IC Light to conform to the requirements specified in 3.27.3.

5. Packaging

Material shall be packaged for entry into the military distribution system in accordance with MIL-STD-2073-1E (Threshold).

6. Notes

6.1 Intended Use

The CLRF IC Light covered by this specification is intended for use by USMC infantry units, artillery units, reconnaissance personnel and supporting arms observers, spotters, and controllers to determine targeting coordinates of battlefield targets for conventional or GPS guided munitions.

6.2 Ordering Data

Acquisition documents should specify the following:

- Title, number, and date of specification
- Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced.
- Whether or not first article inspection is required.
- Number of sample systems to undergo first article inspection (if applicable).
- Disposition of sample systems/components that have undergone first article inspection (if applicable).
- Selection of applicable level and packaging requirements (see 5).

6.3 First Article

When first article inspection is required, the Government Contracting Officer shall provide specific direction to offerers regarding the specific type of systems to undergo first article inspection, (e.g., a first production item, sample systems from the current production line, or a standard production item from the contractor's current inventory), the number of items to undergo first article inspection and how they are to be selected. The Government Contracting Officer should also include specific instructions in the acquisition document regarding approval of first article test procedures and results and the disposition of first article systems / components. Invitations for bids should stipulate that the Government reserves the right to waive the requirement for first article inspection (in whole or in part) to those bidders offering a product which has been previously acquired or tested by the Government.

6.4 Definitions

Target Location Error (TLE) is defined as the radius of a circle in which 50% of the calculated radial target location errors are encircled.

A mil is defined as $1/6400^{th}$ of a full circle. This is not to be confused with a milliradian which is defined based upon pi.