PERFORMANCE SPECIFICATION

FOR THE

NEXT GENERATION HANDHELD TARGETING SYSTEM (NGHTS)

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AMSC N/A FSC 1240

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<th>Date</th>
<th>Version</th>
<th>Title and/or Brief Description</th>
<th>Entered By</th>
</tr>
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<tbody>
<tr>
<td>24 August 2017</td>
<td>1</td>
<td>Initial Release</td>
<td>Paul Knight</td>
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PERFORMANCE SPECIFICATION
NEXT GENERATION HANDHELD TARGETING SYSTEM (NGHTS)

1 Scope

This specification covers the Next Generation Handheld Targeting System (henceforth known as NGHTS) system as a foot-mobile replacement for the Portable Lightweight Designator/Rangefinder (PLDR) & Thermal Laser Spot Imager (TLSI) suite of equipment.

1.1 System Description

The NGHTS is a handheld, lightweight, man portable device capable of performing rapid target acquisition, laser terminal guidance operations, and laser spot imaging. The principle functions of the NGHTS include: 1.) assisting 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 and 2.) allowing the operator to designate a target to enable the use of laser guided munitions. The NGHTS provides the Marine Air Ground Task Force (MAGTF) with the capability to conduct Close Air Support (CAS) utilizing laser guided munitions. MAGTF Joint Terminal Attack Controllers (JTAC), Forward Air Controllers (FAC), Firepower Control Teams (FCT), Supporting Arms Liaison Teams (SALT) of the Air Naval Gunfire Liaison Company (ANGLICO), and Reconnaissance teams use the NGHTS to designate, mark, and handoff targets during amphibious and ground combat operations. Employment of the NGHTS reduces target location error and minimizes collateral damage especially while operating in an urban environment.

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  Military Marking for Shipment and Storage
with CHANGE 4
MIL-STD-130N  Identification Marking of U.S. Military Property
MIL-STD-461G  Requirements for the Control of Electromagnetic
Interference Characteristics of Subsystems and
Equipment
MIL-STD-810G  Environmental Engineering Considerations and
Laboratory Tests
MIL-STD-882E  Standard Practice for System Safety
MIL-STD-1472G  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 Systems
MIL-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

(Copies of these documents are available 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.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm?fr=1040.10)

DEPARTMENT OF THE ARMY

AR 70-38  

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

Night Vision’s Thermal and Image Processing (NVThermIP) Model, 2009 Release

Solid State Camera and Image Processing (SSCamIP) Model, 2009 Release

Image Intensified Camera and Image Processing (IICamIP) Model, 2009 Release

(Copies of these models can be purchased online at www.sensiac.org under the Models and Simulations tab on the left.)

Night Vision Integrated Performance Model (NV IPM) version 1.1

(This model may be obtained from the NGHTS Contracting Officer, or by contacting nvlmodels@nvl.army.mil.)

DEPARTMENT OF THE NAVY

Azimuth and Inertial MEMS (AIM) Interface Control Document, Draft

NAVSEA S9310- AQ-SAF-010, Rev 2  

OPNAVINST 5100.27B/MCO 5104.1C  
Navy Laser Safety Hazards Program Dated 02 May 2008

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

NAVSTAR GLOBAL POSITIONING SYSTEM JOINT PROGRAM OFFICE (GPS JPO)
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.

- Ashbury Document 2213-A-4005, Rev. 3
- Interface Control Document for Vector 21 Modification B-CLRF

(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 NGHTS is 72 hours. During the mission, the NGHTS will be operated for three six-hour segments. Table 1 defines one six-hour segment by clarifying the actions and time allotted/required to perform each action. 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.

Emplacement is defined as the time required to setup, initialize, bore sight, perform sensor calibration, and establish external communications via interface. In between operating periods the NGHTS will be carried by the operator in a field pack or rucksack while conducting dismounted maneuvers. This may include special insertion and extraction methods such as military free-fall and combat diving operations. Additionally, the system and its operator may be transported over long distances via military aircraft (fixed or rotary wing), ground vehicle (tracked or wheeled), or watercraft. Operator-level maintenance may also be performed in between operating periods. It is acceptable for the operator to change the primary system battery twice during a 72-hour mission profile.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Occurrences</th>
<th>Total time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emplacement</td>
<td>2 @ 12 min</td>
<td>24 min</td>
</tr>
<tr>
<td>Provide self-location data and export data via digital format to connected external devices</td>
<td>Continuous @ 1 Hz</td>
<td>6.0 hours</td>
</tr>
<tr>
<td>Provide target observation</td>
<td>32 @ 4 min</td>
<td>128 min</td>
</tr>
<tr>
<td>Perform target measurement to generate target location data, and export data via digital format to connected external devices</td>
<td>32 @ 10 sec</td>
<td>5 min</td>
</tr>
<tr>
<td>Export tactical imagery via a compressed digital format to connected external devices</td>
<td>4 @ 30 sec</td>
<td>2 min</td>
</tr>
<tr>
<td>Perform laser target designation or mark</td>
<td>8 @ 40 sec</td>
<td>5 min</td>
</tr>
<tr>
<td>Provide laser spot imaging</td>
<td>8 @ 40 sec</td>
<td>5 min</td>
</tr>
</tbody>
</table>

Table 1. Six hour segment of mission profile

3.2 NGHTS Kit Components

3.2.1 NGHTS Handheld Unit

3.2.1.1 NGHTS Handheld Unit. The NGHTS Handheld Unit shall contain at a minimum the following integrated hardware: 1064nm laser designator, laser rangefinder, SAASM GPS, azimuth/elevation sensor(s), day optic, and night optic (Threshold).

3.2.1.2 Mechanical Interfaces
3.2.1.2.1 Neck strap. The NGHTS shall include a padded neck strap suitable for long-term carry as ancillary equipment that permits the operator, dressed in all authorized variations of Marine Corps combat clothing, to carry and operate the NGHTS while it is suspended from his neck (Threshold).

3.2.1.2.2 Eye Cup. The NGHTS shall include a tethered eyecup, removable and replaceable without tools, and self-closing or able to be locked in the open position once fully depressed (Threshold).

3.2.1.2.3 Picatinny Rail

3.2.1.2.3.1 The NGHTS shall include a detachable Picatinny rail provided as ancillary equipment (Threshold).

3.2.1.2.3.2 Any required tool and fasteners, to include thread locking compound if necessary, shall be provided (Threshold).

3.2.1.2.3.3 The Picatinny rail shall be aligned with the emitted laser beams (Threshold).

3.2.1.2.4 Tripod Adapter. The NGHTS shall have the ability to mount to a tripod by integrating a standard 1/4-20 UNC threaded hole into the NGHTS device on the bottom near the center of gravity (Threshold).

3.2.1.2.5 Protective Optics Cover(s). The NGHTS shall include securely tethered or hinged covers to protect all lenses and fully block all emitted laser beams (Threshold).

3.2.1.2.6 Interface with Target Handoff System. The NGHTS shall provide an interface (NGHTS output) to the current Marine Corps Target Handoff System (THS) through a physical female serial port connection (Threshold). The USMC THS at the time of Performance Specification development was the Target Handoff System version 2 (THSv2).

3.2.1.2.7 External Power. The NGHTS shall provide an external connection and cable(s) for the purpose of powering the NGHTS from the following electrical sources: BA-5590, BB-2590, and 10 to 32 VDC (Threshold).

3.2.1.2.7.1 The NGHTS shall not be damaged by over/under voltage from external power sources (Threshold).

3.2.1.2.7.2 The NGHTS shall not be damaged by connecting or disconnecting to the external battery while the system is operating (Threshold).

3.2.1.2.7.3 The NGHTS shall continue to operate when connecting or disconnecting the external power source to/from the NGHTS (Threshold).
3.2.1.2.7.4 The NGHTS shall switch to external power from internal battery power when connected to an external power source while the NGHTS is operating (Threshold).

3.2.1.3 Digital/Electrical Interfaces

3.2.1.3.1 When prompted by the operator, the NGHTS shall output a 5029 and 5040 serial communication message per IS-GPS-153 Revision D, Message ID 5029, pages B-86 and B-87 (Threshold).

3.2.1.3.2 The NGHTS shall be able to output a 5029 and 5040 serial messages to the THS at all times, regardless of what other equipment is connected to the NGHTS (Threshold).

3.2.1.3.3 The NGHTS shall receive CoT messages from the THS (Threshold).

3.2.1.3.4 The NGHTS shall provide the user the ability to duplicate the NGHTS user display as video imagery output to the THS at all times, regardless of what other equipment is connected to the NGHTS (Threshold).

3.2.1.3.5 The NGHTS shall provide the user the ability to output a screen capture of the NGHTS user display in JPEG 2000 format to the THS at all times, regardless of what other equipment is connected to the NGHTS (Threshold).

3.2.1.3.6 The NGHTS data export shall be designed to ensure that the integrity of the digital data generated, processed, and exported by the device is maintained (Threshold).

3.2.1.3.7 Power for Wireless Adapter. The NGHTS serial connector provide +5 VDC and 500 mA to provide power for a potential future wireless adapter (Threshold). Wireless transmission will not count against the battery life requirements of this Performance Specification.

3.2.1.3.8 All requirements of paragraph 3.2.1.3.1 shall be met while utilizing a wireless adapter. (Threshold).

3.2.2 Tripod

3.2.2.1 A tripod shall be provided to give users additional support when the operational situation permits/requires and when used to provide terminal guidance to laser seeking ordnance (Threshold).

3.2.2.2 The tripod shall weigh no more than 2.5 lbs (Threshold), less than 2.0 lbs (Objective).

3.2.2.3 The tripod shall be capable of supporting the NGHTS in its operational configuration, with cables and batteries installed (Threshold).

3.2.2.4 The tripod shall be adjustable from 16-23 inches in height (Threshold) or 8-30 inches in height (Objective).

3.2.2.5 The tripod shall provide a means for course and fine adjustment of azimuth and elevation (pan and tilt) (Threshold).

3.2.2.6 The tripod shall not exceed 18 inches in any dimension when stowed (Threshold).
3.2.2.7 The tripod shall be non-reflective (Threshold).
3.2.2.8 The tripod shall be equal in durability to the NGHTS (Threshold).

3.2.3 Remote Firing Cable

3.2.3.1 The NGHTS shall include a Remote Fire Cable (Threshold).
3.2.3.2 When connected to the NGHTS, the Remote Fire Cable shall enable the LRF to be fired remotely upon button release (Threshold).
3.2.3.3 The fire buttons on the Remote Fire Cable shall be dead-man switches as per OPNAVINST 5100.27B (Threshold).
3.2.3.4 The designator fire button on the Remote Fire Cable shall require two steps to designate with the Class 4 laser (Threshold).
3.2.3.5 The NGHTS shall conform to the interlock requirements between modes described in FDA Form 3682 (8/17). (Threshold).
3.2.3.6 The designator fire button on the Remote Fire Cable shall be guarded (Threshold).
3.2.3.7 The Remote Fire Cable shall be 1 +0.2/-0.0 meter long (Threshold).
3.2.3.8 The LRF button on the remote fire cable shall trigger a full measurement (azimuth, elevation, and distance) to calculate a target location within the system (Threshold).
3.2.3.9 The laser designator button on the remote fire cable shall fire the laser until the button is released (Threshold).
3.2.3.10 The remote fire cable shall be able to be used in any system configuration, such as when the NGHTS is cabled to another device as specified elsewhere in this performance specification (Threshold).
3.2.3.11 The remote fire switch shall be able to be used while the external power cable is powering the unit (Threshold).

3.2.4 Picatinny Rail Grabber

3.2.4.1 A Picatinny Rail Grabber shall be provided (Threshold).
3.2.4.2 The rail grabber shall be aligned with the optical path of the emitted lasers (Threshold).
3.2.4.3 The rail grabber shall contain azimuth and elevation adjustments to facilitate boresighting to a device with a Picatinny rail (Threshold).
3.2.4.4 The rail grabber shall be provided as an ancillary equipment adapter that mounts to the NGHTS without tools (Threshold), or it may be integrated into the device (Objective).
3.2.4.5 If the rail grabber is provided as an ancillary equipment adapter that mounts to the NGHTS without tools, re-compensation of the Digital Magnetic Compass (DMC) may be required when the rail grabber is attached or detached from the NGHTS. Regardless of whether the rail grabber is provided as a separate ancillary equipment
adapter or integrated into the device, movement of the azimuth and elevation adjustments shall not require a re-compensation of the DMC in order to comply with the azimuth accuracy requirements (Threshold).

3.2.5 Batteries

3.2.5.1 The NGHTS shall have a cartridge to accept CR123s (Threshold).
3.2.5.2 The NGHTS shall also utilize a provisioned rechargeable battery readily available in the supply system (Objective).
3.2.5.3 The NGHTS shall include the minimum number of battery cartridges and rechargeable batteries (if applicable) required to meet the nominal mission profile (Threshold).
3.2.5.4 The battery cartridge(s) shall not be able to be inserted into the system incorrectly (Threshold).
3.2.5.5 Batteries must be able to be removed and replaced by users in an operational environment without the use of tools (Threshold).

3.2.6 Transit Case

3.2.6.1 A transit case shall be provided that is capable of holding one NGHTS (in its field carry pouch), neckstrap, tripod (in its field carry pouch), battery cartridges, rechargeable batteries (if applicable), associated cables, cleaning kit, ancillary equipment, and operator’s manual (Threshold).
3.2.6.2 The transit case shall be designed to protect the NGHTS and associated equipment from shock, vibration, abrasion, dust, rain, snow, sleet, and salt spray during transport (Threshold).
3.2.6.3 The transit case shall be made of a non-reflective material.

3.2.7 Field-Carry Pouch

3.2.7.1 The NGHTS is intended to be a handheld device that is easily carried by a Marine in combat in such a manner that it is immediately accessible when needed, i.e. in a Troops-in-Contact situation. A soft material, field carry pouch shall be provided which is attachable to the Modular Lightweight Load-carrying Equipment (MOLLE) system (Threshold).
3.2.7.2 The field carry pouch shall fit the NGHTS and the minimum set of battery cartridges (or rechargeable battery pack, if so equipped) required to meet the nominal mission profile (Threshold). The additional set(s) of battery cartridges may be in an outside compartment on the Field-Carry Pouch.
3.2.7.3  The field carry pouch shall retain the NGHTS securely to the Marine’s body/equipment while walking, running, and jumping (Threshold).

3.2.7.4  The dimensions of the field carry pouch shall not exceed 1.0 inch more than the maximum length, width, and height of the NGHTS itself not including an outside compartment on the Field Carry Pouch for the extra battery cartridges if applicable. (Threshold).

3.2.8  Tripod Soft Carry Pouch. A soft material, field carry pouch shall be provided to carry the tripod which is attachable to the MOLLE system (Threshold). The tripod field carry pouch shall also be able to carry any cables and adapters that are provided with the system that are not required to fit in the Field Carry Pouch (Objective).

3.2.9  Cables.

3.2.9.1  The NGHTS shall include all cables necessary to allow the NGHTS to function in accordance with this Performance Specification. At a minimum, this includes the following cables: THS interface cable, external power cable(s), remote fire cable, GPS crypto fill cable, and WMM update cable (Threshold).

3.2.9.2  THS Cable

3.2.9.2.1  The THS cable shall be made per Ashbury Document, Interface Control Document for Vector 21 Modification B-CLRF 2213-A-4005, Rev. 3 (Threshold).

3.2.9.2.2  The THS cable shall be at least 1.5 min length to permit the operator to connect the NGHTS to the THS when the operator is holding the NGHTS in the standing off-hand position and the THS is resting on the ground (Threshold).

3.2.10  Operators Manual. The NGHTS shall include an Operator’s Manual written and formatted in accordance with Marine Corps Style Guide SG-1A and Mil-Std-38784A (Threshold).

3.3  Weight

3.3.1  Operational Weight. The NGHTS handheld unit, including one loaded battery cartridge inside the system, lens cover(s), and all other items permanently attached to the NGHTS shall be no more than 7.5 lbs (Threshold), 5.5 lbs (Objective). Note: This weight requirement must be met with the battery type and cartridge which meets the battery life requirements in paragraph 3.10.3.
3.3.2 Full System Weight. The NGHTS full system weight shall be no more than 15.0 lbs (Threshold) 12.0 lbs (Objective) and includes those items listed in paragraph 3.3.1 plus the following: remote fire cable, minimum number of battery cartridges to meet the nominal mission profile with batteries (of the type which meets the battery life requirements in paragraph 3.10.3), tripod, and eyecup. The following required elements of the NGHTS do not count against either of the two weight requirements listed above in this paragraph: transit case, THS cable, GPS crypto fill cable, external power cable, tripod soft carry pouch, NGHTS field carry pouch, Picatinny rail, neckstrap defined in paragraph 3.2, World Magnetic Model update cable, Picatinny Rail Grabber, Operator’s Manual, and battery cartridges with batteries of the other required battery type which is not designated as the primary battery.

3.4 Optics

3.4.1 Viewing Optics. The NGHTS shall be monocular (Threshold); biocular (Objective).

3.4.2 Glint Protection. The NGHTS shall provide glint protection in the form of anti-reflective lens coatings (Threshold). The NGHTS shall provide an additional measure of glint protection (Objective). If an additional measure of glint protection is provided, it may be detachable and provided as ancillary equipment which does not count against the system weight requirement. If an additional measure of glint protection is provided, and if it is detachable, then day/night target recognition ranges and laser rangefinding ranges will not be evaluated with the additional measure of glint protection installed.

3.4.3 Daytime Target Recognition. The NGHTS shall permit an operator who is trained in target recognition to be able to recognize an unobstructed 2.3 x 2.3 meter NATO standard target on a clear day from 100 meters to 5,000 meters (Threshold) 6,500 meters (Objective).

3.4.4 Nighttime Target Recognition

3.4.4.1 The NGHTS shall permit an operator who is trained in target recognition to recognize an unobstructed 2.3 x 2.3 meter NATO standard target on a clear starlight illuminated night from 100 meters to 2,000 meters (Threshold); 100 meters to 3,000 meters (Objective).

3.4.5 Field of View
3.4.5.1 Wide Field of View. The NGHTS shall have a wide Field of View (FOV) of at least 120 mils horizontal (Threshold), or at least 150 mils horizontal (Objective).

3.4.5.2 Narrow Field of View. A separate narrower field of view shall not be necessary to meet the target recognition requirements (3.4.3, 3.4.4) (Objective). If a separate narrow FOV is required to meet the target recognition requirements (3.4.3, 3.4.4), it shall be no less than 60 mils horizontal (Threshold).

3.4.6 Eye Protection. The NGHTS optics shall contain Laser Eye Protection capable of, at a minimum, attenuating laser radiation levels below the Class I AEL at the aperture for an 80 mJ energy 1064 nm laser (Threshold).

3.4.7 Eyepiece

3.4.7.1 Diopter Adjustments. The NGHTS optics shall have a diopter adjustment from +2 to -6 diopters (Threshold).

3.4.7.2 Exit Pupil. The NGHTS optics shall have an exit pupil diameter not less than 6mm (Threshold).

3.4.7.3 Eye Relief. The NGHTS optics shall have an eye relief not less than 18mm (Threshold).

3.4.8 Reticle and Reticle Scales

3.4.8.1 Reticle Operation. The NGHTS reticle shall be viewable by the operator during daylight and nighttime operation (Threshold).

3.4.8.2 Reticle Resolution. The NGHTS reticle shall be graduated in 5 mil increments and labeled in 10 mil increments (Threshold).

3.4.8.3 Reticle Pattern. The NGHTS reticle shall be of a mil-scale variety (as shown in Figure 0-1) to allow trained users to estimate ranges (Threshold), user-selectable (Objective).
3.5 Angle Measurement Capabilities

3.5.1 Azimuth Performance

3.5.1.1 Azimuth Measurement. The NGHTS shall measure the OT direction with an accuracy of 10 mils or less at two sigma (Threshold) 4 mils or less at two sigma (Objective), relative to true north, with 100% availability in the presence of static, dynamic, and transient magnetic disturbances following any required sensor pre-calibration described in paragraph 3.5.1.2.

3.5.1.2 Azimuth Sensor Pre-calibration. If required, the NGHTS azimuth sensor pre-calibration shall take no more than 120 seconds (Threshold).

3.5.1.3 Azimuth Accuracy Alert. The NGHTS shall alert the user when the accuracy of the azimuth sensing device is above 10 mils (Objective).

3.5.1.4 Maintaining Azimuth upon Relocation. The NGHTS shall provide the OT direction with an accuracy of 10 mils or less at two sigma, relative to true north, for up to 30 minutes (Threshold) 1 hour (Objective) after acquiring a true north vector and without re-acquiring a new true north vector. During the timeframe the user may reposition and/or change orientation of the device not to exceed an angular velocity of 300° per
second about any axis. Note: Turning the NGHTS off may require a new Pre-
calibration in the event of significant environmental or other changes.

3.5.2 Vertical Angle. The NGHTS shall determine the vertical angle (VA) from the observer
to a target, through a range of ± 800 mils with an accuracy of ± 5 mils one sigma
(Threshold).

3.5.3 Roll Angle. The NGHTS shall be capable of meeting all operational requirements
through roll angles ranging from ± 250 mils (Threshold), ± 500 mils (Objective), with
an accuracy of ± 5 mils one sigma.

3.6 Setup Time

3.6.1 Rapid Startup for Day Observation. The NGHTS rapid startup for day shall commence
at initiation of power on and complete when the visual displays are up and the operator
may begin observation. The NGHTS shall permit the operator to complete rapid startup
for observation in no more than 15 seconds (Threshold); less than 5 seconds
(Objective).

3.6.2 Rapid Startup for Night Observation. The NGHTS rapid startup for night shall
commence at initiation of power on and complete when the visual displays are up and
the operator may begin observation during night operations. The NGHTS shall permit
the operator to complete rapid startup for night observation in no more than 2 minutes
(Threshold).

3.6.3 Rapid Startup for Designations. The NGHTS rapid startup for designations shall
commence following the time allotted to complete 3.6.1 and 3.6.2 and includes the
time required to begin designation or marking, including setting the PRF code. The
NGHTS shall permit the operator to complete rapid startup for designation in no more
than 30 seconds (Threshold); less than 15 seconds (Objective).

3.6.4 Warm Startup Time. Full setup shall include all actions necessary for the NGHTS to
provide target location (OT distance, direction, and vertical angle) and designation to
the threshold limits. With current GPS almanac data loaded, the NGHTS shall permit
the operator to complete full setup in 4 minutes (Threshold); 2 minutes (Objective).

3.6.5 Rapid Startup from Standby. When the NGHTS is not actively in use, the NGHTS shall
be capable of rapid startup from standby which will provide target location (OT
distance, direction, and vertical angle) and designation to threshold limits within 2
minutes from standby (low power GPS and northfinding/northkeeping) (Threshold).
3.6.6 Cold Startup Time. The NGHTS shall permit rapid transition from stowed configuration (man-packed or vehicle packed) to a fully operational configuration (system set up, GPS acquired, and northfinding/keeping calibrated) within 12 minutes (Threshold).

3.7 SAASM GPS

3.7.1 The NGHTS shall include a GPS JPO approved per GPU-09-105 and GPU-09-071 internal SAASM GPS to provide self-location (Threshold).

3.7.2 FOM Warning Message. The NGHTS shall display a GPS FOM warning message when the GPS FOM exceeds 2 (Threshold).

3.7.3 The NGHTS shall provide the electrical interface required to update the DoD World Magnetic Model (WMM) loaded into the SAASM GPS receiver (Threshold). Note: The DoD World Magnetic Model is published by the National Geophysical Data Center (NGDC) of the National Oceanic and Atmospheric Administration (NOAA).

3.7.4 The GPS receiver shall be capable of operating in either continuous mode or time averaging (Threshold).

3.7.5 Continuous mode will be the system default setting, and the default setting at system power up (Threshold).

3.7.6 The NGHTS shall alert the user whenever self-location or calculated target location is based upon any mode other than continuous (Threshold).

3.7.7 The NGHTS will automatically reset a time-averaging GPS self-location if the system is moved (Objective).

3.7.8 The user shall be able to load GPS keys, zeroize GPS keys, and check the version of which GPS keys are loaded (Threshold).

3.7.9 All classified GPS information and algorithms shall be within the security boundary of the SAASM in accordance with GPU-09-105 (Threshold).

3.7.10 The user shall be able to manually enter self-location into the NGHTS (Objective).

3.8 Laser Rangeﬁnder Performance
3.8.1 Laser Rangefinder Eye-Safety. The NGHTS Laser Rangefinder shall use a Class 1 eye-safe laser (Threshold).

3.8.2 Range Finding. The NGHTS shall include a laser rangefinder capable of measuring at a minimum distances up to the range defined in 3.4.3 with an accuracy of +/-2.5 meters (Threshold).

3.8.3 Laser Rangefinder Probability of Detection. The NGHTS shall exhibit no more than one range failure out of any 100 consecutive range attempts (Threshold).

3.8.4 NATO Standard Target Range Finding. The NGHTS shall include a laser rangefinder capable of measuring the distance to a 2.3 meter x 2.3 meter NATO standard target with 20% reflectivity from 100 meters to the range defined in 3.4.3 (Threshold).

3.8.5 Stabilization Device Use During Range Finding. The NGHTS shall be able to measure all elements of target location, OT Distance (Requirements 3.8.2, 3.8.4), Azimuth (Requirements 3.5.1), and VA (Requirement 3.5.2) to the threshold accuracies, while used in a handheld operation without the support of a tripod or similar device (Objective).

3.8.6 First/Strongest/Last Return

3.8.6.1 The NGHTS laser rangefinder shall be able to discriminate between two targets separated by 25 meters along the Observer to Target line (Threshold).

3.8.6.2 After a single range measurement, the NGHTS rangefinder shall provide a distance measurement for up to three objects; these three objects shall be the closest, the farthest, and the object with the strongest laser rangefinder (LRF) return(s) between the closest and farthest objects (Threshold).

3.8.6.3 If multiple objects are detected, the distances (up to three: closest, strongest in between, farthest) shall be displayed in order from closest to farthest (Threshold).

3.8.6.4 The NGHTS 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).

3.8.7 Target Recognition and Identification Assistance

3.8.7.1 Image Stabilization. The NGHTS shall provide recognition of a NATO-STD tank target to the effective day and night viewing ranges of the system as defined in paragraphs 3.4.3 and 3.4.4 in a handheld configuration (Objective).
3.8.7.2 The NGHTS shall provide assistance to the user in target recognition through onscreen cueing of potential targets and items of interest (Objective).
3.8.7.3 The NGHTS shall provide assistance to the user in target identification of cued items of 3.8.7.2 (Objective).
3.8.7.4 If the requirements of 3.8.7.2 is met, the NGHTS shall provide the user option to disable onscreen cueing of potential targets/items of interest (Threshold).

3.8.8 Range Gate

3.8.8.1 The NGHTS shall be equipped with a minimum and maximum range control that permits the operator to set the minimum and maximum range to the nearest 100 meters from 100 meters to the maximum range of the rangefinder, at which the NGHTS will register a laser return (Threshold).
3.8.8.2 The system shall enable a user to set the Range Gates specified in 3.8.8.1 in less than 10 seconds (Threshold). If a system is able to accurately range at distances less than 100 meters, the minimum range gate may be set at that distance vice 100 meters.

3.9 Laser Designator Performance

3.9.1 1064 nm Designation/Marker. The emitted 1064 nm laser energy shall be greater than or equal to 50 milliJoules (mJ) (Threshold).

3.9.2 Stationary Target. The NGHTS shall be capable of designating (providing terminal guidance to laser-guided munitions) a 20% reflective 2.3 meter x 2.3 meter NATO standard target placed normal to the laser beam for all US DoD and NATO laser-seeking precision guided munitions at the day and night ranges specified in 3.4.3 and 3.4.4 respectively while on a tripod or similar device (Threshold) in a handheld configuration (Objective).

3.9.3 Moving Target. The NGHTS shall be capable of designating (providing terminal guidance to laser-guided munitions) a 20% reflective 2.3 meter x 2.3 meter NATO standard target moving at a crossing speed of 40 kilometers per hour (kph) at the day and night ranges specified in 3.4.3 and 3.4.4 respectively while on a tripod or similar device (Threshold) in a handheld configuration (Objective).

3.9.4 Pulse Stability. Within a maximum of 5 seconds after activation, and for the entire Laser Operational Duty Cycle as defined in paragraph 3.9.10, the NGHTS shall have an energy amplitude within +/- 15 percent of the average pulse output energy (Threshold). The average pulse output energy is determined using the arithmetic mean of 120 consecutive pulses.
3.9.5 Missed Pulses. A missed pulse is defined as any pulse that fails to meet the energy or pulse coding requirements of this specification.

3.9.5.1 The NGHTS, operating at any of the pulse repetition rates, shall not miss any 2 pulses in succession (Threshold).

3.9.5.2 The total number of missed pulses shall not exceed 2 over a 60 second period (Threshold).

3.9.6 Laser Containment. Within 5 seconds after activation, 90 percent of the laser energy shall be contained within a stationary 2.3 x 2.3 meter target out to 2,000 meters (Threshold). NOTE: meeting the beam divergence and boresight error threshold requirements listed elsewhere in this document will not necessarily meet this laser containment threshold requirement.

3.9.7 Beam Divergence. Beam divergence is to be measured as the full angle (in mRad) of a circle that contains 95% of the laser energy. Within 5 seconds after activation, the beam divergence shall be less than or equal to 0.5 mRad (Threshold).

3.9.8 PRF Coding.

3.9.8.1 The NGHTS shall meet all the NATO Pulse Repetition Frequency code requirements specified in the STANAG 3733 throughout the temperature range and duty cycle requirements (Threshold).

3.9.8.2 The NGHTS shall transmit at tri-service Band I and Band II PRF codes (Threshold).

3.9.8.3 The pulse coding and interpulse tolerances shall meet the requirements described in STANAG 3733 (Threshold). The inter-pulse period specified is the time increment between the leading edges of successive laser pulses.

3.9.9 Pulse Width. The laser output pulse width shall be between 8-20 nanoseconds, measured full width half maximum (Threshold).

3.9.10 Laser Operational Duty Cycle.

3.9.10.1 The NGHTS shall be capable of being operated at 20 Hz with a duty cycle of 40 seconds on, 30 seconds off over the entire operational temperature range (Threshold).

3.9.10.2 The NGHTS shall be able to sustain this duty cycle continuously until reaching 5 minutes of cumulative lasing with one set of batteries (Threshold).

3.9.11 Over-Temperature Shutdown
3.9.11.1 The NGHTS shall detect when an over temperature condition occurs (a condition that can cause permanent damage to the unit if lasing continues) and warn the user to override or else lasing will be terminated (Threshold).

3.9.11.2 The over temperature warning shall be displayed as long as the over temperature condition exists (Threshold).

3.9.11.3 While in an override state, the NGHTS shall continue to lase until the battery is depleted or until the over-temperature condition causes damage to the device and it is no longer able to operate (Threshold). The user shall be able to enter the override state without interruption to lasing (Objective).

3.10 Laser Spot Imaging

3.10.1 1064nm Laser Viewing/Detection. The NGHTS shall be capable of viewing the location of all 1064 nm designator energy (NGHTS produced as well as 1064 nm energy produced by others) within the field of view of the NGHTS (Threshold).

3.10.2 1064nm Laser Identification. The NGHTS shall be capable of differentiating its own laser energy from others within the NGHTS field of view (Threshold) decoding and display the PRF codes of a minimum of three 1064 nm designator spots within the NGHTS field of view (Objective).

3.10.3 Battery Life

3.10.3.1 The NGHTS shall permit the user to complete one 6 hour mission profile segment defined in 3.1 with at least one of the following types of batteries: provisioned rechargeable battery readily available in the supply system or a cartridge of CR123 batteries (Threshold).

3.10.3.2 The NGHTS shall be capable of meeting the full operational temperature range with at least one battery type (Threshold).

3.10.3.3 The NGHTS shall execute an auto-standby command to automatically transition the system into standby after a default of 20 minutes without operator interaction in order to conserve battery life (Threshold).

3.10.3.4 The NGHTS auto-standby default of 20 minutes shall be user adjustable (Threshold).

3.10.3.5 The NGHTS shall execute an auto-shutoff command to automatically shutoff the system after a default of 60 minutes without operator interaction in order to conserve battery life (Threshold).

3.10.3.6 The NGHTS auto-shutoff default of 60 minutes shall be user adjustable (Threshold).

3.11 Boresight Alignment
3.11.1 The NGHTS shall maintain internal boresight across all FOVs, magnifications, optical systems, lasers and laser receivers to within 0.50 mils over the operational temperature range (Threshold).

3.11.2 The NGHTS shall be factory boresighted prior to delivery such that no user boresighting is required (Threshold).

3.11.3 The NGHTS The boresight error between the center of the 1064 nm laser beam and the aimpoint of the internal direct or indirect view optic, shall not exceed 0.25 mRad at 20 degrees Celsius, ± 5 degrees Celsius (Threshold).

3.12 User Interface

3.12.1 Laser System Operating Paradigm (LSOP) User Interface Standard. The NGHTS shall comply with the LSOP user interface standard detailed in Appendix A unless otherwise specified in the body of this document. Where conflicts occur, this performance specification takes precedence.

3.12.2 Target Data Display.

3.12.2.1 The NGHTS system shall simultaneously display target location data (OT True Azimuth, OT Range, OT Vertical Angle) and 10-digit grid target location following the completion of a measurement (Threshold).

3.12.2.2 The NGHTS shall display the Target Data Display (3.12.2.1) within 2 seconds of completion of measurement (Threshold).

3.12.2.3 The NGHTS visual display of Target Data Display (3.12.2.1) shall have a timeout feature with a user selectable time, initially set to a default of 15 seconds (Threshold).

3.12.3 Persistent Display.

3.12.3.1 In addition to LSOP requirements of Appendix A, the NGHTS shall display the following information continuously during NGHTS operation: GPS Key Status, GPS FOM, GPS signal, coordinate system.

3.12.3.2 The NGHTS shall allow the operator to individually disable/enable the default on-screen items contained in 3.12.3.1 (Threshold).

3.12.4 User Selected Options Display.

3.12.4.1 The NGHTS shall calculate and allow the user the option to 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).

3.12.5 Safety Messages

3.12.5.1 Warning Messages. The NGHTS 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 and injury or death could result (Threshold).

3.12.5.2 Danger Messages. The NGHTS shall display a danger message notifying the user that their present position to the target location is less than 100 m from the target position used and injury or death could result (Threshold).

3.12.5.3 Safety Message Priority. The Warning Message and Danger Message are mutually exclusive. If both conditions are met, only the Danger Message shall be displayed (Threshold).

3.12.6 Fault Indicator

3.12.6.1 The NGHTS shall provide visual fault indicator(s) that indicates when a condition (i.e. over temperature) that can cause permanent damage to the LRF is detected (Threshold).

3.12.6.2 The NGHTS shall provide visual fault indicator(s) that indicates when a condition (i.e. over temperature) that can cause permanent damage to designator is detected (Threshold).

3.12.6.3 The indicator(s) shall remain illuminated as long as the fault condition exists (Threshold).

3.12.7 Battery Status.

3.12.7.1 The NGHTS system shall provide a battery power status indicator that alerts the user when the NGHTS has only enough battery life remaining for 30 +/- 15 minutes of operation (Threshold).

3.12.8 Legibility

3.12.8.1 Visibility. The NGHTS system visual display shall be legible under all light conditions encountered during system operation (10,752 lux to 0.0001 lux) including when users are wearing polarized eye wear (Threshold).
3.12.8.2 Character Size. The NGHTS shall provide visual display indicators and all alphanumeric indicators shall be of sufficient size to be legible by the operator (Threshold).

3.12.8.3 Adjustable Light Level. NGHTS display shall have a user-selectable light level down to fully off for night (Threshold).

3.12.8.4 Display Viewing. The NGHTS display shall be viewable to the user without removing his eye from the eyepiece (Threshold).

3.12.9 Display Units

3.12.9.1 The NGHTS shall display angle measurements in mils and degrees and be user selectable (Threshold).

3.12.9.2 The NGHTS shall display the north reference in user-selectable grid, true, or magnetic (Threshold).

3.12.9.3 The NGHTS system shall display ranges in meters or yards (user-selectable) in single digit increments (Threshold).

3.12.9.4 The NGHTS shall display self-location and target location in user-selected coordinate format per IS-GPS-153, Revision D (Threshold).

3.12.9.5 The NGHTS shall allow the user to select from the following coordinate systems: Latitude/ Longitude (LAT/LONG), Universal Transverse Mercator Grid (UTM), Degrees, Minutes, Seconds (DMS), and Military Grid Reference System (MGRS) (Threshold).

3.12.9.6 The NGHTS shall use the World Geodetic System 1984 (WGS84) standard datum when displaying or exchanging location data (Threshold).

3.12.10 Display Precision

3.12.10.1 Precision of Data Display. The NGHTS system data display precision shall be 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).

3.12.10.2 Precision of Digital Data. The NGHTS digital data precision for angular measurements shall be less than or equal to 0.1 mil (Threshold). The NGHTS digital data precision for distance shall be less than or equal to 0.1 m (Threshold).

3.12.11 Human Systems Integration

3.12.11.1 Control Accessibility. The NGHTS controls shall be accessible and distinguishable by a user wearing combat clothing identified in 3.12.11.4 when the system is in its operational configuration, including but not limited to being supported by a tripod or similar device (Threshold).
3.12.11.2 Power Controls
The NGHTS shall have a single finger/thumb operated control that shall turn the power on and off (Threshold).

3.12.11.3 Laser Firing Controls

3.12.11.3.1 The NGHTS shall have a single finger or thumb operated control which shall perform a complete target location measurement (Threshold).

3.12.11.3.2 The LRF shall fire upon button release (Threshold).

3.12.11.3.3 The fire buttons shall be dead-man switches as per OPNAVINST 5100.27B (Threshold).

3.12.11.3.4 The designator fire button shall require two steps to designate with the Class 4 laser (Threshold).

3.12.11.3.5 The NGHTS shall conform to the interlock requirements between modes described in FDA Form 3682 (8/17) (Threshold).

3.12.11.3.6 The designator fire button shall be guarded (Threshold).

3.12.11.3.7 The LRF button shall trigger a full measurement (azimuth, elevation, and distance) to calculate a target location within the system (Threshold).

3.12.11.3.8 The laser designator button shall fire the laser until the button is released (Threshold).

3.12.11.4 Operation. The NGHTS shall be capable of being operated by a single 5th through 95th percentile Marine per MIL-STD-1472G while wearing Mission Oriented Protective Posture (MOPP) Gear Level IV or cold weather clothing with no more than minor degradation to the user’s ability to accomplish the mission (Threshold).

3.13 Built-In-Test (BIT)

3.13.1 BIT Capability. The NGHTS shall have a BIT capability that indicates whether or not the NGHTS is functioning nominally (Threshold).

3.13.2 Graceful Degradation. NGHTS 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).
3.14 System Signature

3.14.1 Aural Detectability. The NGHTS shall not emit noise detectable at a range greater than or equal to 20 meters during operation (Threshold).

3.14.2 Stray Light Security – Displays and Indicators

3.14.2.1 A method shall be provided that allows the operator to adjust the brightness of all illuminated indicators to minimize detection (Threshold).

3.14.2.2 The NGHTS shall not be visible (displays, indicators) at ranges greater than 20 meters to unaided viewing and when viewing with 3rd generation NVGs (Threshold).

3.14.3 Stray Light Security – Emissions

3.14.3.1 The NGHTS stray light emissions (laser energy) shall not be visible to the naked eye at a distance of 20 meters or greater with any external displays disabled, and with the system operating in any mode and at any PRF code (Threshold).

3.14.3.2 When using night vision goggles, stray light emissions shall not be visible at radial distances that are greater than or equal to 20 meters from the NGHTS and that are outside a 5 degree cone that is centered on the optical axis of the transmitter (see Figures 1 and 2) and outside a 5 degree cone that is centered on the optical axis of the sighting telescope (if so equipped) (Objective). Using Figures 1 and 2 as a guide, this means it is desired that no stray light emissions be visible in the crosshatched areas.

The following conditions apply to the 3.14.3.2 this requirement:

- Night Vision Goggles: unity magnification goggle
- Illumination: $1 \times 10^{-4}$ lux (overcast starlight)
- Visibility: visual range shall be 20 kilometers
3.15 Environmental Requirements

3.15.1 Chemical, Biological, Radiological and Nuclear (CBRN) Decontamination.

The NGHTS 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 (Objective). 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 NGHTS is not degraded by the removal of the covering material. MIL-HDBK-783 and MIL-HDBK-784 may be referred to for guidance.

3.15.2 High Altitude Operations (Non-operational)

The NGHTS shall not suffer any damage or degradation in performance related to the atmospheric pressure effects of altitude while being carried by a user at 25,000 ft Mean Sea Level (MSL) (Threshold) 42,000 ft MSL (Objective) in accordance with MIL-STD 810G, Method 500.5, Procedure I with an altitude change range of at least 8 m/s (Threshold).
3.15.3 Immersion (30 ft)

The NGHTS shall not suffer any damage or degradation in performance upon completion of system conditioning at 50°F above water temperature for 2 hours followed by a 30-minute submersion in fresh water at a depth of 30 ft while sealed in a waterproof bag in accordance with MIL-STD 810G, Method 512.6, Procedure I (Threshold).

3.15.4 Immersion (1.0 m)

The NGHTS shall not suffer any damage or degradation in performance upon completion of system conditioning at 50°F above water temperature for 2 hours followed by a 10 minute submersion unprotected in fresh or salt water at a depth of 1.0 m in accordance with MIL-STD 810G, Method 512.6, Procedure I (Threshold).

3.15.5 Humidity

The NGHTS shall not suffer any damage or degradation in performance when exposed to 10 cycles prescribed in accordance with MIL-STD 810G, Method 507.6, Procedure II (Threshold).

3.15.6 Operating Temperature

The NGHTS shall be capable of operating in air temperatures ranging from -25°F to 125°F in accordance with MIL-STD 810G, Method 501.6, Procedure II (high temperature) and Method 502.6, Procedure II (low temperature) following an initial 60 minute soak (Threshold).

3.15.7 Storage Temperature

The NGHTS shall be capable of operation following storage in temperatures ranging from -30°F to 145°F in accordance with MIL-STD 810G, Method 501.6, Procedure II (high temperature) and Method 502.6, Procedure II (low temperature) following an initial 60 minute soak without the benefit of the field carry pouch or transit case (Threshold).

3.15.8 Temperature Shock

The NGHTS shall not suffer any damage or degradation in performance following sudden changes in ambient air temperature in accordance with MIL-STD 810G,
Method 503.6, Procedure I-B, between temperatures -14°F and 122°F with a period of two hours at each temperature (Threshold).

3.15.9 Fungus

The NGHTS (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 in accordance with MIL-STD 810G, Method 508.7 (Threshold).

3.15.10 Mechanical Vibration (Minimum Integrity)

The NGHTS, 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 in accordance with MIL-STD 810G, Method 514.7, Procedure I, Category 5 with vibration levels identified in Figure 514.7C-4 (Threshold).

3.15.11 Transportation Vibration (Loose Cargo)

While in its transit case, the NGHTS shall operate without damage or degradation following exposure to transportation vibration in accordance with MIL-STD 810G, Method 514.7, Procedure I, Category 5 (Threshold).

3.15.12 Rugged Handling

The NGHTS in its Field Carry Pouch (Threshold) without its Field Carry Pouch (Objective) 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 in accordance with MIL-STD 810G, Method 516.7, Procedure IV from a modified drop height of 36 inches.

3.15.13 Blowing Sand and Dust

The NGHTS shall operate without damage or degradation following exposure to blowing dust in accordance with MIL-STD 810G, Method 510.6, Procedure I & II with optical surfaces and connectors covered (Threshold).

3.15.14 Salt Fog
The NGHTS shall operate without leakage, damage or degradation after exposure to a salt fog environment in accordance with MIL-STD 810G, Method 509.6 with optical surfaces and connectors covered (Threshold).

3.15.15 Explosive Atmosphere

Authorized operator actions including but not limited to NGHTS 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 in accordance with MIL-STD 810G, Method 511.6, Procedure I (Threshold).

3.15.16 Electromagnetic Interference/Electromagnetic Vulnerability (EMI/EMV)

In all of its operational configurations, the NGHTS shall meet requirements as specified for RE102 (2 MHz - 18GHz) and RS103 (2 MHz - 18GHz) in MIL-STD-461G (Threshold).

3.15.17 Solar Radiation

The NGHTS shall not suffer any damage when exposed to solar radiation in accordance with MIL-STD 810G, Method 505.6, Procedure I for the A1 environment defined in Figure 505.6-2 (Threshold). The NGHTS shall be capable of operating in ambient temperatures from 14°F to 122°F with exposure to solar radiation in accordance with MIL-STD 810G, Method 505.6, Procedure I for the A1 environment defined in Figure 505.6-2 (Objective).

3.16 Logistics

3.16.1 Operational Mission Failures (OMF). The NGHTS shall provide a 95% probability of completing a 72-hour mission profile defined in 3.1 without an OMF (Threshold). An OMF is defined as a loss of any system function that the operator cannot resolve in the field by adjustment, repair, or replacement using controls or provided tools within five minutes.

3.16.2 Operational Availability. The NGHTS shall have an operational availability to the user of 90 percent (threshold); 95 percent (objective).

3.16.3 Preventive Maintenance
3.16.3.1 NGHTS Preventive Maintenance (PM) shall not be required while in storage (Threshold).

3.16.3.2 NGHTS PM shall not be required more than 5 times during a mission profile defined in 3.1 (Threshold)

3.16.3.3 The mean time to perform PM shall not exceed 15 minutes (Threshold), 5 minutes (Objective).

3.16.4 Shot Counter/System Use Meter
The NGHTS shall provide a method to track usage, including but not limited to a designation and LRF counter and elapsed time powered on (Threshold).

3.17 Safety

3.17.1 Battery Safety Requirements
If the NGHTS 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, Rev 2 (Threshold).

3.17.2 Safety Assessment. The operation, maintenance, storage, transportation, or disposal of the NGHTS shall not present any hazards that are assessed as more severe than Serious risks as specified in MIL-STD-882E (Threshold).

3.17.3 The NGHTS shall meet the Design Requirements of OPNAVINST 5100.27B/MCO 5104.1C Navy Laser Safety Hazards Program (Threshold).

3.18 Spectrum Supportability. The NGHTS shall be compliant with existing service, DoD, Joint, national and international spectrum management policies and regulations and obtain spectrum certification, a statutory requirement (DoDI 5000.02, dated 7 January 2015), including the submission of a Department of Defense Form (DD Form) 1494 “Application for Equipment Frequency Allocation” for each spectrum dependent component, or confirmation shall be obtained from cognizant authorities that an approved frequency allocation already exists.

3.19 Manufacturing

3.19.1 Identification and Item Unique ID (IUID)

3.19.1.1 The NGHTS handheld and the NGHTS transit case shall have a IUID identification plate of corrosion-resistant material permanently attached to the outside (Threshold).
3.19.1.2 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).

3.19.1.3 The identification plate shall also include the name of the system and the TAMCN (Threshold).

3.19.2 Workmanship

3.19.2.1 Workmanship in the fabrication and assembly of NGHTS components shall comply with best commercial practices (Threshold).

3.19.2.2 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).

3.19.3 Materials Selection

3.19.3.1 The NGHTS contractor shall avoid the use of toxic chemicals, hazardous substances, radioactive, or ozone depleting chemicals if feasible.

3.19.3.2 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 Error! Reference source not found. through Error! Reference source not found. of this performance specification. Proof of previous testing or analysis, with government oversight, which satisfies a First Article Test requirement may be submitted in lieu of current testing or analysis.

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 fourteen systems. The ten tests listed in Table 2 shall be performed in the stated order. All other first article inspections shall be performed in any order. Disposition of first article sample systems shall be as specified in the contract or purchase order.
Table 2. First Article Inspection Test Sequence Matrix

<table>
<thead>
<tr>
<th>First Article Inspection</th>
<th>Requirement Paragraph</th>
<th>Verification Paragraph</th>
<th>Test Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Vibration (Minimum Integrity)</td>
<td>3.15.10</td>
<td>Error! Reference source not found.</td>
<td>1</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>3.15.7</td>
<td>Error! Reference source not found.</td>
<td>2</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>3.15.6</td>
<td>Error! Reference source not found.</td>
<td>3</td>
</tr>
<tr>
<td>Temperature Shock</td>
<td>3.15.8</td>
<td>Error! Reference source not found.</td>
<td>4</td>
</tr>
<tr>
<td>Solar Radiation</td>
<td>3.15.17</td>
<td>Error! Reference source not found.</td>
<td>5</td>
</tr>
<tr>
<td>Military Free Fall Operations – Altitude (Non-operational)</td>
<td>3.15.2</td>
<td>Error! Reference source not found.</td>
<td>6</td>
</tr>
<tr>
<td>Rugged Handling</td>
<td>3.15.12</td>
<td>Error! Reference source not found.</td>
<td>7</td>
</tr>
<tr>
<td>Transportation Vibration (Loose Cargo)</td>
<td>3.15.11</td>
<td>Error! Reference source not found.</td>
<td>8</td>
</tr>
<tr>
<td>Immersion (1.0 m)</td>
<td>3.15.4</td>
<td>Error! Reference source not found.</td>
<td>9</td>
</tr>
<tr>
<td>Immersion (30 ft)</td>
<td>3.15.3</td>
<td>Error! Reference source not found.</td>
<td>10</td>
</tr>
</tbody>
</table>

4.6 Conformance Inspection
Unless otherwise specified in this document or in the contract or purchase order, the contractor shall subject all NGHTS systems to environmental stress screening prior to inspection for conformance to this specification in accordance with MIL-STD-1916. The NGHTS shall be subjected to two temperature cycles in accordance with Table 3 below, followed by the vibration test. The NGHTS shall be subjected to ten minutes of vibration in each of the three primary axes in accordance with the Government approved vibration curves from the Acceptance Test Plan to detect infant mortality of individual components without damaging the system due to internal resonance. 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).

Table 3. ESS Temperature Cycles

<table>
<thead>
<tr>
<th>Temperature (˚C)</th>
<th>Interval Time (h)</th>
<th>Temperature (˚C)</th>
<th>Interval Time (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 to -34.5</td>
<td>30 min</td>
<td>63 to 52</td>
<td>6 min</td>
</tr>
<tr>
<td>-34.5</td>
<td>1</td>
<td>52</td>
<td>2</td>
</tr>
<tr>
<td>-34.5 to -32</td>
<td>2 min</td>
<td>52 to -32</td>
<td>42 min</td>
</tr>
<tr>
<td>-32</td>
<td>2</td>
<td>-32</td>
<td>2</td>
</tr>
<tr>
<td>-32 to 63</td>
<td>48 min</td>
<td>-32 to 52</td>
<td>42 min</td>
</tr>
<tr>
<td>63</td>
<td>1</td>
<td>50</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>52 to 25</td>
<td>14 min</td>
</tr>
</tbody>
</table>

4.7 Responsibility for Conformance

Contractors are required to deliver NGHTS 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 NGHTS until the manufacturer has provided evidence that the deficiencies have been corrected (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 Defined Verification Methods for Each Performance Metric will be added on the final version of the Performance Specification.

5 Packaging

For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point’s packaging activities within the Military Service or Defense Agency, or within the military service’s system commands. Packaging data retrieval is available from the managing Military Department’s or Defense Agency’s automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6 Notes

6.1 Intended Use

The NGHTS covered by this specification is intended for use by USMC JTACs to determine targeting coordinates of battlefield targets for conventional or GPS guided munitions as well as provide terminal guidance through the use of a Class 4 laser designator.

6.2 First Article

When first article inspection is required, the Government Contracting Officer shall provide specific direction to offerors 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.

6.3 Definitions

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

An operational mission failure for the NGHTS is defined as any failure which precludes one or more of the following functions: self-location, range finding, target marking/designation, azimuth determination and target observation.

Sterile magnetic environment is defined as an environment free of any local magnetic disturbances.

Light Haze is defined as an 8km visibility day.
Appendix A

LASER System Operating Paradigm (LSOP) V 2.5

1. PURPOSE

1.1 The purpose of the LSOP is to provide for limited standardization of the Graphical User Interface (GUI) across multiple product lines, and future generations, of Laser Target Locators and similar devices.

1.2 Definitions of key terms.

1.2.1 Soft Key. A soft key is defined as any graphical selectable control located within the GUI home view which is an icon located in the display which may be navigated to and selected utilizing external buttons, and performs a function when selected. All soft keys shall be clearly labeled with the action they perform.

1.2.2 Neutral Background. An appropriate opaque background color which contrasts with the label and enables clear understanding of the label regardless of operating mode or displayed image.

2. CONTENT
2.1 The LSOP is comprised of four parts, each describing a key element of the system interface with the user. These parts include: Home View Layout, Menu Hierarchy Concept, Interface Logic, and external connections.

2.1.1 The LSOP is subordinate to all other elements of this product specification. The contractor may deviate when necessary to meet a conflicting specification. Nothing in the LSOP prevents additional functionality; however, the government will approve all additional GUI menu options, soft keys, and button labels. The government’s intent is to lean development efforts and provide for a collaborative development effort of the GUI.

2.2 Home View Layout

2.2.1 Home View layout. The home view describes the view used during targeting operations, both day and night. GUI layout will be common between day and night modes where common functionality applies. Whenever possible, all displays and soft keys will be arranged so as to offer the widest field of view possible without causing the user difficulty in reading them, and without compromising height of view as described in MIL STD 1472G.

2.2.2 Quadrant Organization. The home view will be described in the LSOP as four quadrants as indicated in Figure 1.

![Figure 1](image)

2.2.3 Target Location. Target Location shall be displayed in quadrant 2, and labeled “TARGET LOCATION.” It shall include target location and elevation in the units selected.

2.2.4 Self-Location. Self-location shall be displayed in quadrant 4, and labeled “SELF LOCATION”. It shall include self-location, elevation, and GPS accuracy. Self-location will not be persistently displayed. It shall be accessed through a self-location soft key in the same location. Self-location shall disappear immediately once the laser is fired. Self-location and target location shall never be displayed simultaneously.

2.2.5 Polar Data. The polar data (Direction, Distance, Vertical Angle) shall be persistently displayed in quadrant 1 whenever a ranging event is executed. It shall display as three lines of,
in the units selected. The line labels shall read: “DIR”, “DIST”, and “VA” in that order top to bottom, or left to right. The distance will represent the slant range to target with the word “SLANT” displayed below the distance measurement in smaller, legible, font. The direction will indicate grid or magnetic, defaulting to grid. All numerical values will be labeled with units.

2.2.6 Persistent compass. The compass direction shall persistently display at the top center of the home view. It shall represent the approximate azimuth updating at 1Hz or faster. It shall be displayed on a neutral background with the label “DEGREES” or “MILS” following the number. This is the default operating mode; the user may select to deactivate the persistent compass to save battery life.

2.2.7 Battery Life Indicator. The battery life remaining shall be displayed in quadrant 1, clearly representing approximate battery life remaining in both day and thermal modes.

2.2.8 Hollow Reticle Center. Regardless of the reticle selected, the center shall be described by a hollow shape closely matched to the beam divergence of the LRF in all magnifications and fields of view.

2.2.9 PRF Code Indicator. When required to display a Pulse Repetition Frequency (PRF) code, the display shall be located in quadrant 3 and labeled “PRF”.

2.3 Menu Hierarchy Concept

2.3.1 Menu Hierarchy Concept. The menu hierarchy will not be dictated however, Appendix B describes the common nomenclature to be used, where applicable, for menu and soft key option labels.

2.3.2 Menu Hierarchy. The menu hierarchy shall be organized such that one “MENU” soft key will enter the main menu. Categories and sub-categories shall be labeled with meaningful whole words when possible, and when not, standard abbreviations shall be used, if they exist. Items which are commonly used options shall be accessible with a minimum of control actions in the hierarchy. The government’s intent is to collaboratively develop the menu structure based on the contractor’s initial design. The government retains approval authority over the final menu design.

2.4 Interface Logic

2.4.1 Interface Logic. The interface logic specification describes the general manner in which an operator will navigate the menus and soft keys. This ensures that an operator trained on one system, can operate a different system with the maximum positive transfer of training due to common interface logic.

2.4.2 Circular Navigation. The soft keys displayed on the home view shall be arranged in a general wrap-around manner. This enables the operator to scroll through selections utilizing a
circular navigation technique. The main menu and all subordinate functions should follow a consistent control logic with emphasis on ease of use and intuitiveness.

2.4.3 **Button feedback.** All physical buttons shall exhibit positive intrinsic tactile feedback upon operating, which informs the operator that the control was physically activated. The size and spacing shall accommodate operation with both hot and cold weather gloves. Extrinsic visual feedback that the activation was registered (received by device) shall be shown immediately and clearly on the display. All controls shall be in accordance with MIL STD 1472F where applicable.

2.4.4 **Button Soft Keys.** All external buttons (excepting a possible thumb scroll) shall be represented by fully labeled soft keys in adjacent locations on the home view. This enables users to quickly reference the functionality of the button, and allows the button to be re-tasked in certain operating modes. The soft keys shall be scrollable in the home view, allowing alternate selection if desired. The long press shall not be used except for power on/off functionality.

2.4.5 **Multi-functionality of Buttons.** Efforts should be made to avoid multitasking buttons such that they require, multiple presses or modded controls (pressing multiple buttons to perform one function)