Next Generation Maritime Optical System Problem Statements and Assessment Criteria

Problem Statement #1 – "Passive Ranging"

Problem Statement: Current technology lacks an integrated passive ranging capability.

Assessment Criteria: Next generation EO/IR system must contain passive ranging capabilities

Problem Statement #2 – "Decreased Footprint"

Problem Statement: Size, weight, power and cost (SWaP-C) are the key primary driving factors during sensor development. Current system and component (i.e. batteries, communications, sensors, etc.) technologies are large, heavy, with high power demands, and high cost.

Assessment Criteria:

Optimized size – no larger than CCFLIR 2

Problem Statement #3 – "Improved Signature Management"

Problem Statement: Current SGA shape causes radar cross section issues

Assessment Criteria:

Shaping of Next Generation Maritime Optical System should result in a lower radar cross section, therefore minimizing multi sensor detectability whether through in house design or a government released shell design.

Problem Statement #4 – "Increased Operational Range"

Problem Statement: Limited EO/IR effective reach based on height of eye limitations on Combatant Craft Systems

Assessment Criteria:

The range of sensors shall provide the longest range possible with the best resolution for zoom possible. An increase in Focal Plane Array resolution is required to detect, recognize and identify targets at extended ranges.

Problem Statement #5 – "All Weather Capability"

Problem Statement: Thick fog and adverse weather conditions result in poor image quality

Assessment Criteria:

Must provide best performance possible in darkness, fog, smoke, and adverse weather conditions whether through optics or other methods.

Problem Statement #6 – "Seamless Craft and Combat Systems Integration"

Problem Statement: Next Generation craft will have everything connected and controlled by a Mission Management System.

Assessment Criteria:

Must ensure the EO/IR system can connect with other onboard systems.

Problem Statement #7 – "Increased Sea State Operation"

Problem Statement: Current EO/IR system struggles with rough sea states and windows are blown out due to shaping / potting from the interior outwards.

Assessment Criteria:

Must ensure EO/IR system can survive operations during Sea State 5 conditions. If at all possible, the windows should be bonded to the outside of the gimbal shell, providing a more robust window to gimbal shell interface.

Problem Statement #8 – "Ensuring Increased Maintainability"

Problem Statement: Future System sustainment is a key part of the next generation EO/IR sensor.

Assessment Criteria:

Sustainment, especially regarding fragile components like glass and cables, requires a multi-pronged approach focusing on design, material selection, and maintenance procedures. Ensure parts and materials are sustainable and available. Minimize purging and maintenance processes.

Problem Statement #9 – "Artificial Intelligence / Machine Learning"

Problem Statement: Current System lacks AI/ML capabilities

Assessment Criteria:

Next Generation system must provide AI / ML capability whether through internal software hosted

on the system and additionally being controlled by software hosted on the craft's Multi Mission System/SSN8 and have abilities to produce Automatic Target Recognition. This will require a maritime centric ATR algorithm tailored to our operating environment.

Problem Statement #10 – "Optical Situation Awareness"

Problem Statement: Current system does not provide real time 360-degree awareness to the crew.

Assessment Criteria:

Future system approach can leverage a range of optical sensors to provide a real time situational awareness picture for the CC out to relevant distances for obstacle avoidance.

Problem Statement #11 – "Threat Warning and Detection"

Problem Statement: Current system cannot detect and track relevant threats to operational distances or provide warning when it is queried by an optical targeting system such as a laser.

Assessment Criteria:

The system can warn the crew if there are active laser range finders or designators in the area. The system can detect, track, and report on surface contacts/threats.

Problem Statement #12 – "All Weather Capability"

Problem Statement: Thick fog and adverse weather conditions result in poor image quality

Assessment Criteria:

The system must be able to function during adverse conditions, within the limits of physics and the most advanced technology available.

Problem Statement #13 – "Laser Designator"

Problem Statement: Current EO/IR system lacks a laser designator.

Assessment Criteria:

The next gen EO/IR system shall contain an option for a laser designator within the SGA.

Additional Assessment Criteria Specifications:

MUST meet and or exceed below CCFLIR 2 specifications along with the assessment criteria numbered above:

- Continuous Azimuth (AZ) and elevation (EL)
- Gyro-stabilized to two, or three, -axis for a SOCOM vessel in sea state 3, idle to full throttle.
- Accept geo-location input or have geo-location capability utilizing Selective Availability Anti-Spoofing module (SAASM) Global Positioning Service (GPS)
- Auto-track a selected object of interest
- Laser Range Finder; ANSI Class I Eye Safe LRF with a range ≥ 20km, accuracy of ± 5m with a readout in 1m increments
- Laser Pointer: A single button push ANSI class 3B Infrared Laser Pointer (830-860 nm) with a range ≥ 39km, beam divergence ≤ 0.5mrad
- Shock resistant to ≥ 10g, 100ms, 1/2 sine. The turret ball is stowed in transit case during craft parachute drops
- Vibration resistant during operation to ≥ 4G RMS, 5-500 Hz, and 2G RMS, 500-2000Hz.
- Immersion: Components and cables exposed to the environment must meet or exceed IP66 and have caps or plugs for all connections. All caps or plugs must have tethers to prevent loss.
- Maximum current draw ≤ 18Amps @ 24VDC
- Gimbal weight < 56lbs
- Maximum Gimbal dimension ≤ 16in
- HD Color camera with low light level capability
- HD Near-Infrared (NIR) camera
- HD Mid-Wave Infrared (MWIR) cooled camera
- Focus: Both operator controlled and auto focus
- Drift: Operator control of system drift while underway
- Slew Rate: User adjustable and auto-slew for different FOV to decrease the slew rate when going from WFOV to NFOV
- Sufficient FOV for pilotage and SA, at least one sensor with a FOV ≥ 30deg
- Continuous optical zoom ≥ 1:16 ratio
- 360-degree panoramic imaging capability
- Sensor resolution: Minimum resolution ≥ 1280x1024, the exception of Daylight television sensors which shall have a HD compatible resolution
- Sensor Image: The system shall allow the operator to blend a percentage (0-100%) of the Midwave Infrared (MWIR), w/o ghosting or other image degradation throughout the full Field of View (FOV) range, with the color camera or the Near Infrared (NIR).
- Video output compatible with VDU and related boat interfaces with formats of RS170, DVI, H.264/MPEG-4 Part 10 per ISO/IEC 14496-10:2012, and all HD formats
- Hand Control Unit (HCU) that fully controls and operates all the features of the system