NAVAL SURFACE WARFARE CENTER

CRANE DIVISION

Emerging Technologies for Kinetic Countermeasures RFI: 26-06

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Agenda

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  - Technology Area 5: Autonomy Package
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Background

Problem Statement

- The Navy is interested in countering low-cost, multi-domain uncrewed systems (UxS) threats. These **threats,** capable of operating individually or in coordinated drone swarms (e.g. at least 3 drone threats), can leverage advanced techniques such as autonomous flight or machine vision to overwhelm traditional, manually operated defensive systems. The Navy is interested in an integrated and automated defensive solution.

Counter Threat Profiles include:

- Fast Attack Craft (FAC),
- Fast Inshore Attack Crafts (FIAC),
- Unmanned Surface Vehicles (USV),
- Unmanned Underwater Vehicles (UUV),
- Groups 1 through 3 Unmanned Aircraft Systems (UAS)

Table 1. Group 1 through 3 UAS Definitions

Group	Operating Altitude (in ft)	Max Speed (in knots)	Max Takeoff Weight (in lbs)
1	x <1,200 AGL*	x < 100	0 to 20
2	x <3,500 AGL*	x < 250	21 to 55
3	x <18,000 MSL**	x < 250	56 to 1,320

**Above Ground Level (AGL)*
***Mean Sea Level (MSL)*

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Background (cont.)

Objective

- NSWC Crane seeks innovative **system-of-systems prototypes** consisting of - networked sensors and remote weapons that can autonomously
  - **detect** threats,
  - **classify** threat types,
  - **track** threat movement,
  - **collaborate** with other networked weapon systems to
  - **engage** threats through **prioritization**,
  - **correct fire** during engagement, and
  - **assess** engagement effects

with minimal human supervision, thereby increasing defensive effectivity and reducing operator burden.

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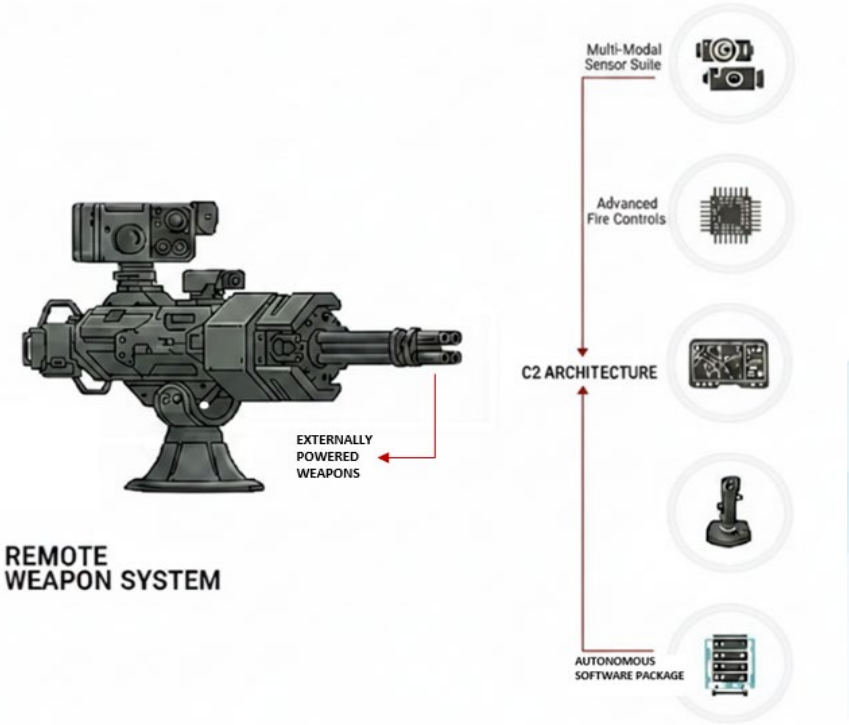
Technical Challenge

NSWC Crane seeks an **integrated RWS prototype** that combines multiple subsystems, autonomous software packages, and a networked cooperative firing system into a cohesive defense architecture.

The project seeks to evaluate prototype solutions, and if necessary, integrate solutions into a final prototype composed of:

- Remote Weapon System (RWS)
- Externally Powered Weapons
- Multi-Modal Sensor Suite
- Advanced Fire Controls
- Autonomous Software Package
- Command & Control (C2) Architecture



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Technology Area 1: Remote Weapon System

Proposed RWS configurations must support:

- **Dynamic Stabilization:** Multi-axis gimbal stabilization capable of maintaining aimpoint accuracy during high-speed maneuvers
- **Slew-to-Cue:** Support rapid, automated slew-to-cue utilizing targeting telemetry received from external sensors
- **Digital Status Monitoring:** Remote telemetry for Safe/Arm state, temperature, and round count.
- **C2 Integration:** Seamless data integration between the RWS Slew-to-Cue controls and the C2 network to support real-time engagement.

Suggested Key Performance Metrics:

Parameter	Specific Metric
Accuracy	Dispersion at fixed distances with static targets
System Lethality	Probability of Kill (Pk) with calculation model used
Slew Performance	Max. Velocity & Acceleration
Physical Attributes	Size, Weight, and Power [SWaP]
Capacity	Max. ammunition capacities for all weapon types

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Technology Area 2: Weapons

Proposed weapon configuration must support:

- **System Integration:** Seamless mechanical mounting and electrical compatibility with RWS platforms
- **Caliber Range:** Small to medium caliber weapon systems (7.62mm to 30mm)
- **Externally Powered:** Supports remote, automated jam-clearing and high operational reliability

Suggested Key Performance Metrics:

Parameter	Specific Metric
Weapon Reliability	Mean Rounds Before Failure [MRBF]
Rate of Fire	Cyclic Rate at Max Speed & Sustained Burst Limits
Weapon Range	Muzzle Velocity, Max. Effective Range
Weapon Durability	Barrel Life
Thermal Thresholds	Max. Chamber & Barrel Temperature Limits
Accuracy	Minute of Angle [MOA], Circular Error Probability [CEP], Mean Radius, & Extreme Spread

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Technology Area 3: Sensor Suite

Proposed sensor suite configurations must support:

- **Multi-Spectral Detection:** Integration of active and passive sensors (e.g. EO/IR, radar, LiDAR, acoustic, etc.) to eliminate blind spots
- **Sensor Data Fusion:** Ability to combine data streams from multiple sensors into a single, high-confidence target track.
- **Low-Latency Telemetry:** Real-time streaming of target range, bearing, elevation, and velocity to drive autonomous RWS Slew-to-Cue & C2 network

Suggested Key Performance Metrics:

Parameter	Specific Metric
Optical Range Limits	Detection, Recognition, & Identification [DRI] Metrics
Tracking Accuracy	Angular Accuracy & Range Resolution
Processing Latency	Sensor-to-output data latency
Refresh Rate	Target tracking update frequency
Radar Detection Limits	Radar Cross Sections

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Technology Area 4: Advanced Fire Controls

Proposed advanced fire controls must support:

- **1-to-Many Control Scaling**: Capable of hosting multiple networked RWS and shift from 1:1 operator-to-RWS control to a 1-to-many
- **Dynamic Ballistic Modeling**: Real-time calculation of bullet-drop, relative motion, target impact, and environmental factors
- **Closed-Loop Fire Control:** Real-time tracking of projectile tracers and impacts to execute automated, RWS slew-to-cue aimpoint adjustments during live-fire

Suggested Key Performance Metrics:

Parameter	Specific Metric
System Accuracy	Probability of P_h
Control Shift Latency	Time from 1:1 to 1-to-many shift scenario
Target Acquisition	System Detection Time (time from target entering sensor field of view to track generation)

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Technology Area 5: Autonomy Package

Proposed AI/ML software in this package must be capable of:

- **Individual & Multi-Threat Processing:** Capable of simultaneously tracking, classifying, and prioritizing individual threats and complex swarming profiles (e.g. 3 threats at least)
- **High-Clutter Background Filtering:** Demonstrate robust detection, tracking, and classification performance in high-clutter environments (e.g. foliage, heavy sea spray, bird activity, heavy foliage, and adverse weather conditions).

Suggested Key Performance Metrics:

Parameter	Specific Metric
Swarm Processing	Max. Quantity of Simultaneous Target Tracks
Reliability	False Alarm/Positive Rate (FAR) & False Negative Rate (FNR)
Model Accuracy	F1-Score
Computational Footprint	Required processing hardware (CPU/GPU/TPU) and memory bandwidth
Sensor Data Requirements	List sensor data necessary for algorithm operation

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Technology Area 5: Autonomy Package (cont.)

The overall autonomy package can be divided into 5 distinct modules:

Automatic Target Detection (ATD)

- Scans sensor feeds to find anomalies or potential objects of interest against high-clutter backgrounds

Automatic Target Recognition (ATR)

- Classifies, identifies, and tracks detected objects to establish positive threat identification (PID)

Automatic Fire Correction (AFC)

- Employs real-time, closed-loop tracking of projectile trajectories to automatically adjust and correct aiming deviations during live-fire.

Target Engagement Prioritization (TEP)

- Analyzes target behavior and tracks to dynamically rank and sequence threats for optimal weapon-pairing and engagement solutions.

Battle Damage Assessment (BDA)

- Evaluates post-engagement effects to verify target neutralization and inform follow-on firing decisions.

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Technology Area 6: C2 Architecture

Proposed C2 architecture must support:

- **Real-Time Data Fusion:** Multi-directional integration of sensor data and software to provide real-time data from sensor suites and software packages to drive precise fire control commands to integrated RWS' weapons.
- **Fail-Safe Design:** Network architecture to support "degraded-mode" operations in the event of partial system combat damage.

Suggested Key Performance Metrics:

Parameter	Specific Metric
Data Throughput	Max. bandwidth consumption & network overhead
Data Fusion Speed	Track Correlation Latency (time required to fuse senor inputs, autonomy outputs, etc. into one track)
System Latency	Data Transmission Speed & End-to-End Response (elapsed time from sensor detection to weapon fire command)
Network Resilience	Cyber/EW Recovery Time (time to switch to degraded-mode)
Interoperability	MOSA Standard Compliance (adherence to FACE, SOSA, or standardized API frameworks)

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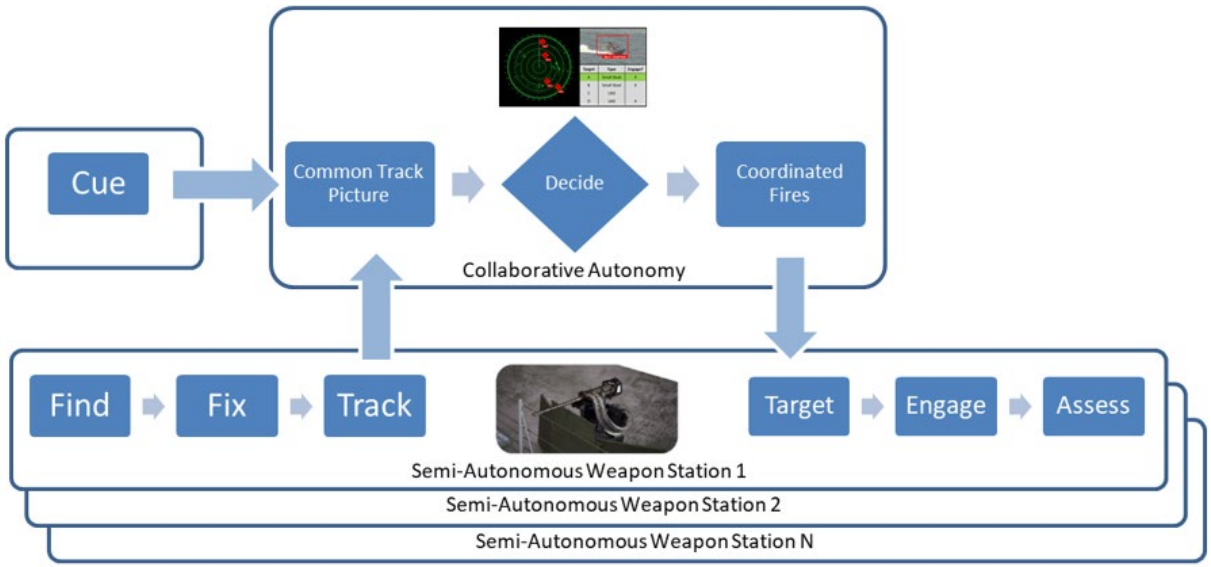
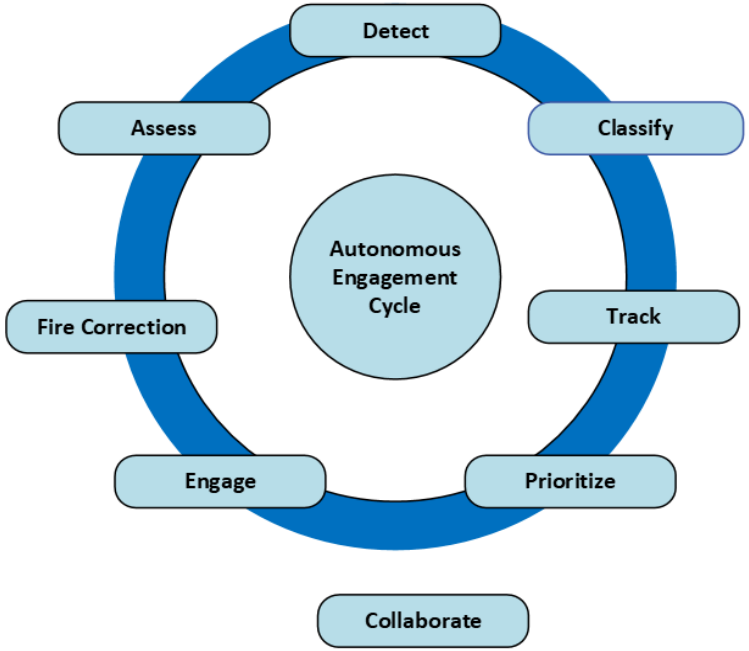
System-of-Systems Vision

It is recognized that achieving all 6 technology areas may require technology from multiple specialized companies. **Cross-vendor collaboration is highly encouraged** to integrate a system-of-systems solution that meets all the technology area objectives.





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RFI Timeline

Deadline	Timeframe (EST)	Event
2 July 2026	15:00 – 16:00	Industry Day Brief
15 July 2026	24:00	Quad Chart Submissions
21 July 2026	24:00	Government Selection for Reverse Industry Day
2 August 2026	24:00	Reverse Industry Day Submissions
3-4 August 2026	9:00 – 15:00	Reverse Industry Day
Mid August 2026		OTA Request for Statement

RFI Submission Email: emc.responses@ati.org

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RFI Quad Chart Content

The initial submission phase is open to all respondents and requires a single-slide Quad Chart PowerPoint template. Each quadrant shall address the following criteria:

- **Quadrant I - Technology Description**
  A concise summary of the technology, its primary purpose, and its operational mechanics.

- **Quadrant II - Operational Details**
  A description of the system architecture, identified host platforms, and tested counter threat profiles.

- **Quadrant III - Picture/Diagram/Other**
  An illustrative diagram, CAD model, or rendering of the technology, paired with its current Technology Readiness Level (TRL)

- **Quadrant IV - Cost & Deliverables**
  A Rough Order of Magnitude (ROM) cost projection for the end-to-end prototype, along with a list of key industry or defense collaborators.

Note: The government-furnished PowerPoint template contains embedded instructional guidelines. Respondents are encouraged to integrate key performance metrics directly into Quadrants I and II.

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RFI Slides Content

Selected participants shall be invited to deliver a ten (10) slide technical presentation. Slide 1 of the briefing package must consist of the identical Quad Chart submitted during the initial submission phase.

The subsequent nine (9) slides shall conform to the government-furnished PowerPoint template (containing embedded instructional guidelines). Its outline consists of:

- **Company Introduction (1 slide)**
- **Project Summary (1 slide)**
- **System Architecture & Integration (1-2 slides)**
- **Scenario Testing (1-2 slides)**
- **Key Performance Metrics (1-2 slides)**
- **Certifications & Standards (1 slide)**
  List all supported environmental, cyber, and open-architecture standards including MOSA, WOSA, and SOSA conformance)

- **Costs & Deliverables (1-2 slides)**

Presenters shall be allotted twelve (12) minutes for their technical briefing, followed by an eight (8) minute Question and Answer (Q&A) session with the evaluation panel.

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Questions?

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