Solicitation Number:
RFI-JIFX 15-4_Request_For_Information
Notice Type:
Special Notice

A. INTRODUCTION

The Naval Postgraduate School (NPS) will be hosting quarterly Joint Interagency Field Experimentation (JIFX) events (www.nps.edu/fx) throughout the 2015 fiscal year (FY15). These events will focus on exploring the potential of new capabilities to address challenges faced by the United States' Combatant Commanders (AFRICOM, CENTCOM, EUCOM, NORTHCOM, PACOM, SOCOM, SOUTHCOM, STRATCOM, TRANSCOM) and the federal entities that support (or are supported by) the COCOMs. The Department of Defense is the sponsoring entity for this event. This event is modeled on the successful US Special Operations Command – Naval Postgraduate School's TNT/CBE events and is being conducted to provide the benefits of a multi institutional semi-structured learning environment for the conventional forces community. Companies, educational institutions, laboratories and other organizations are invited to submit Experiment Proposals that may lead to an invitation to participate in the 10-14 August JIFX 15-4 event to be conducted at the Naval Postgraduate School Field Laboratory located at Camp Roberts, CA.

B. OBJECTIVES

(1) Background: NPS will conduct JIFX events in cooperation with S&T and operational representatives from the Unified Combatant Commands (COCOMs) and interagency partners 4 times in FY15. This cooperative JIFX event will be conducted with representatives from Government R&D organizations, academia, private industry and non-government/non-profit organizations. JIFX events provide an opportunity for technology developers to interact with operational personnel to determine how their technology development efforts and ideas may support or enhance USG/DoD capability needs. The environment facilitates a collaborative working relationship between Government, academia, industry and NGOs to promote the identification and assessment of emerging and maturing technologies. These events enable the identification of key performance attributes and parameters, associated with the development of new technologies, which can inform future government activities.

(2) Event Focus: JIFX 15-4 (10-14 August 2015) will be located at Camp Roberts, CA. This event will be hosted in a field environment supporting unmanned flight operations, a controlled radio frequency environment, and with access to a mock urban environment. Applications will be accepted that relate to any of the RFI areas of interest, however the following areas are of greatest interest:

- Distributed systems and sensors that collect and report information in sparse and intermittent network environments
- Systems that support mesh and peer-to-peer network connectivity
- Systems that do, or can be modified to, send information using the COT (Cursor-on-Target, AKA Community Object Tracking) protocol.

JIFX 15-4 will include 4 days of experimentation including a facilitated scenario that will integrate all participating experiments into a common contextual framework. This framework will consist of a basic scenario including uniformed role players exploring a fictitious situation that will require the fusing of Intelligence, Surveillance &

Reconnaissance (ISR) technologies as well as an element of Command and Control (C2). Event staff will work with the invited experiments to design the scenario to maximize exploration of each technology. The purpose of this scenario will not be to achieve a desired end state in order to "score" or "rate" the experiments, but instead seeks to provide context to the experiments in order for event stakeholders and uniformed end users to better understand and learn from the experiments.

The overall focus of JIFX will be to explore technologies that have the potential of rapidly increasing military & first responder capability, reducing the cost of current capabilities, providing options for reducing force structure associated with a capability, or providing a means to work and share more with partner nations and other organizations.

General areas of interest for JIFX include:

Command, Control, Communication, Computers / Situational Awareness (C4/SA) · Intelligence, Surveillance, and Reconnaissance (ISR) · Cyber Security / Computer Network Security · Information Sharing · Crowdsourcing Tools · Transportation Logistics; Biometric Collection and Sharing Systems · Electronic Warfare · Combating Weapons of Mass Destruction · Irregular Warfare · Energy Systems · Humanitarian Assistance & Disaster Relief · and other technologies that address a current or anticipated operational need.

Specific areas of interest for JIFX include:

a. **Intelligence, Surveillance, and Reconnaissance (ISR)**
    1. *Integrated Undersea Surveillance System (IUSS).* Provide wide-area maritime surveillance and timely, accurate Anti-Submarine Warfare (ASW) reporting persistent with long-range mobile, deployable and fixed sea-based systems. Potential solutions may incorporate the following areas: high voltage branching for increased sensor capacity and increased reliability; low profile sensors for improved deployment and handling capability; vertical beam arrays for improved acoustic performance; dynamic network topology that is self-configuring, self-healing, robust, and scalable; low probability of intercept/low probability of detection (LPI/LPD) high bandwidth communications (ACOMMS/RF/Laser); and a low cost, highly reliable fiber optic replacement arrays.
    2. *Undersea Mine & IED Mitigation.* Potential solutions would be capable of detection and characterization of a threat, possess the ability to operate with stability in underwater and surface conditions exceeding 3 knots, and may provide an interdiction ability that would neutralize the threat with minimal collateral damage.
    3. *Small Vessel Cooperative Identification and Tracking (SVCT) and Non-Cooperative Vessel Imaging and Tracking (NVIT).* Maritime ISR that works in conjunction with other wide area detection systems to obtain additional detailed information about a specific target. System with the ability to query, identify, and/or track craft smaller than 300 tons that have a Small Vessel Cooperative Identification and Tracking (SVCT) device installed. Desired characteristics include:
        - Ability to query a maritime platform with a unique identifier (UID) corresponding to an observed (radar or visual) vessel. UID must be omnidirectional. Acoustics, active beacons, and other methods are all considered viable approaches.
        - Provide 3D laser radar (LADAR) imaging of a target surface vessel for profiling against know target database libraries.

- Provide laser Doppler vibrometer characterization data of surface vessels
- Utilize multi-functional hardware to fulfill basic functionality (i.e. leverage hardware that already exists in maritime ISR or would be multipurpose if deployed on a given platform).

4. **Maritime Technologies.** Technologies that contribute to maritime spatial understanding, resilience, and awareness. Technologies that contribute to improving command, control, computers, intelligence, surveillance and reconnaissance (C4ISR) capabilities and enhanced information collection. Technologies that improve effectiveness and efficiency of maritime sensor communication capabilities and other platforms. Underwater ISR capable of detecting human divers and/or UUVs.

5. **SUAS with Multispectral and Hyperspectral Sensing Capabilities.** Seeking Small (25lbs or less) Unmanned Aerial Systems (SUAS) and sensors including multispectral and hyperspectral sensors and synthetic aperture radars (SARs).

6. **Persistent ISR Assets.** Two areas are of interest: (1) Persistent, low observable, long endurance (30 day) Unmanned Aerial Systems; (2) Persistent/long-dwell (21 days) rapidly deployable ISR capable assets to provide 24/7 persistent stare.

7. **Social Media for Situational Awareness.** Seeking social media technologies that conduct aggregation and search with the ability to search based on geographic location, keyword, and/or a set of scenario-specific parameters, using natural language processing (NLP) and inferred context; identify and establish baseline monitoring and detect events and applicable trends, based on user-generated thresholds and mission-specific operational requirements; assign relationships for aggregation purposes and to assign location based on inference or other method; and identify and assign meaning and context to shared content (versus original), including consideration for distance and time from point of event. Provides authentication and filtering to integrate crowdsourcing efforts and to provide a means for manual verification and/or comparison of crowd-sourcing results; simple GUI to enable user-generated filtering parameters; and to filter and remove publically identifiable information. Technologies that perform analysis with the ability to integrate the results with pre-existing data sets and sensor data, to establish meaningful relationships and context between social media data and other information sources (automated and user-generated); predict and model potential outcomes based on relationships identified through integration of social media and other data points (automated and user-generated); and assign tags or metadata (or similar solution), and to produce notification and/or alerts, for the purposes of routing verified information, based on mission objectives and responsibilities, to the appropriate entity. Additional capabilities being considered also include the ability to share results of aggregation, filtering, and/or analysis across third party platforms and technologies, regardless of format; and produce visualization that is meaningful and applicable to mission objectives, as identified by end user; and integrate within external visualization environments, regardless of format.

8. **Digital Characterization/Classification of Maritime Vessels.** Identify a site surveying and Computer Aided Design (CAD) modeling system for the purpose of creating Building Information Model's (BIM) like models of existing maritime vessels. There are three components to the desired system:
- Surveying/data collection of an existing vessel's physical layout.
- Creation of a CAD model of the surveyed site using the collected data and previously available vessel data.
- Publishing of the BIM like model into various print formats and the ability to export the complete BIM like model for exploitation in 3rd party geospatial analysis software.

b. **Command, Control, Communication, Computers / Situation Awareness (C4/SA)**

1. ***Near Real-time In-transit Visibility (ITV).*** Near real time asset visibility assessable through a suite of devices that harness the capabilities of existing and future communications technology (e.g. open mesh, 3G/4G LTE, etc.). Information would be accessible throughout the distribution pipeline and on the battlefield. Global supply chain management solution utilizing open source architecture, standards-based methodology, with the ability to support visibility data being sent to DoD enterprise ITV and applicable business IT systems. Desired characteristics include:

    *   Ability to report identification information, global positioning system (GPS) location (X, Y, & Z planes), and environmental conditions (temperature, humidity, barometric pressure) of intermodal freight containers.
    *   ITV system with ability to support other ad-hoc sensor data (i.e. light, motion...etc).
    *   Devices which interconnect or network that have secure, self-forming, self-healing and power conservation capabilities.
    *   ITV system that allows for integration between future and existing backhaul communications capabilities available throughout the Department of Defense Distribution Enterprise.
    *   Ability to access and share time sensitive, sensor-based logistics alerts detected on combat and support vehicles that affect mission capability, as well as the off-load of health and usage data post-mission for logistics analysis at tactical and national echelons.   This data needs to be shared over secure, and in many cases, classified networks.

2. ***Maritime Domain Awareness.*** Although still in development stages as a governance and technological tool, coastal and marine spatial modeling and analysis possesses the potential to predict conflicts and security risks and may contribute to their management. Advancements in maritime intelligence integration, information sharing, and domain awareness to foster greater unity of effort among stakeholders. New cost-effective analytical approaches and technologies for coastal and marine modeling and analysis, governance frameworks and regimes for information and intelligence integration, and cost effective technologies to address the harsh conditions in the Arctic.

3. ***Maritime Risk, Threat, Analysis and Resilience.*** Cost-effective analytical approaches and technologies to better understand maritime risk, threats and resilience on both specific and general scales including ports, waterways, islands, the Arctic, coasts and coastal infrastructure. Technologies to identify and address human-caused risk that will either generate new data on which to base future predictions, or obviate the need for collecting such data.

4. ***Secure Communication and Data.*** Potential solutions will focus on minimizing networks and equipment, secure handheld devices, wirelessly accessing multiple domains through COTS mobile devices using thin-client apps in the enterprise and thick-client solutions in expeditionary environments. Also of interest are solutions addressing multi-level, multi-domain secure interfaces capable of displaying on one device without having to toggle between the domains, using COTS mobile devices, for enterprise and tactical users. Provide access from mobile devices to multiple domains through various communication transports in enterprise and expeditionary environments. Uses NSA commercial cryptography and no Controlled Cryptographic Item (CCI). Delivers an enhanced dismounted mobile capability using a hardware sleeve providing tactical waveforms providing necessary security, governance, system maintenance and auditing

capabilities for access to classified communication networks to enable command and control, intelligence and logistics battlefield functions.

5. ***Scalable, Mobile and OTH Digital Communication Networks.*** Develop network-centric technologies that enable operators to securely and reliably communicate digital data, audio, audio/video, and high-resolution imagery over the horizon and on the move, with each other and to interoperate with other maritime/joint/combined forces and headquarters. Technologies should support distributed and coordinated maneuver, leverage joint fires, and provide searchable, real-time information to operators conducting surface, subsurface, land, and airborne special operations.

6. ***Communication with Unresponsive Aircraft in Restricted Airspace.*** Solutions are sought with the ability to achieve one-way emergency communications with manned aircraft of all types and classes. Included in the capability should be an ability to alert and gain the pilots attention and then provide specific and unambiguous direction. The proposed solution should provide focused communications to minimize collateral effects and function at operationally relevant ranges that will enable the safe and effective communications with subject aircraft. Proposed capabilities are anticipated to include audio, visual and data systems but the submission of other methodologies is encouraged as well.

7. ***Network Security for Hastily Formed and Mobile Ad Hoc Networks.*** Potential solutions would include aspects of intrusion detection, behavior analysis, automated responses, and be capable of being fed into a common operating picture / situational awareness tool.

8. ***First Responder Location, Tracking and Communication Technologies.*** The first responder community is seeking technology solutions and threads with the ability to locate, track and communicate with appropriate response personnel during an emergency incident, including the tracking of vehicles, logistical resources, response personnel/capabilities, key equipment and dangerous conditions from sensor, warning devices or manually input threats from the operational environment. While tracking personnel, it is preferred that the system be able to monitor distances (and provide appropriate alerts) from the team leader or provide some other geofencing-like capability as designated by the team leader or incident commander. Candidate systems should be able to ingest and display data layers from sensors or other responders (through prearranged governance/data exchange agreements/integrating technologies). This threat data should be tagged with access to relevant data about the threat. Candidate systems should also have the ability for field based responders to locate, annotate and provide scripted details for other first responders and the incident commander. It is preferred that such a system provide some means of warnings or alerts when a sensor or other manually entered threat/danger is detected. It should also be able to warn the field responder when they are entering or nearing the danger to include information from a plotted plume model. The technology should integrate easily within the Incident Command System through open source/open standards communication and provide the incident commander with the ability to locate personnel and assets, provide dynamic/agile notifications and warnings while functioning as a decision support tool. Additionally, such a technology or set of technologies must be able to automatically report conflicts (such as a responder in distress, out of communications range, in proximity to a danger) and provide the ability for manual supervisor conflict resolution. It is preferred that candidate systems operate on multiple operating platforms or be made to operate on multiple operating platforms, wireless devices and handhelds such as tablets, handsets and smartphones.

9. ***Heads-Up Display Situational Awareness/Tracking/Physiological Monitoring Technologies.*** The first responder community is seeking a heads-up display device that can be integrated with other sensors and

communications systems. The device should be able to communicate over multiple paths (including cellular, WiFi), integrate with common first responder radio communication devices, provide personnel tracking, situational awareness and personal physiological data to include responder heartbeat, body temperature, respiration, and breathing. The device should also be capable of displaying the temperature of the area surrounding the first responder and warn of temperatures that exceed normal operating conditions. The device should easily integrate with current SCBA and Level I and II Hazardous Materials Suits. Any voice communications system integrated with the HUD should have the ability to filter out unwanted noise from the surrounding environment thus enabling clear communications.

10. ***Technologies that provide communication in any environmental condition (including through barriers, inside buildings, and underground).*** The capability should be able to clearly transmit and receive voice and data, particularly with digital systems, inside buildings, tunnels, underground spaces and over long distances. Previous research has focused on the use of repeater stations to include the range and clarity of radio communications and the dedication of radio frequencies (i.e. D-Block) to public safety in order to improve interoperability.   New and emerging capabilities will require technological advances in range, penetration, and clarity to enable effective voice communications in all incident conditions.

11. ***Improved Situational Awareness and Collaborative Tools/Applications for Synchronized Execution.*** Develop appropriate cognitive technologies, intelligent agent technologies, information management and other relevant technologies to enable distributed units to effectively utilize the future network of converged disparate information. Develop technologies to appropriately access tailored information to automatically provide relevant information to the specific echelon, joint, or combined force in the battlespace. Provide for incorporation of information and data from existing systems in the emerging architecture. Develop intuitive decision aids and collaborative planning tools tailored for multiple networks, missions, locations and echelons; and appropriate for the distributed MARSOC battlespace.

12. ***Mobility Management Solutions.*** Seeking scalable enterprise-level mobility management solutions addressing use-cases ranging from administrative, law enforcement sensitive and homeland security screening operations. Solutions should provide Mobile Device Management (MDM), Mobile Application Management (MAM), Identity and Access Management (IAM) and Data Storage that meet applicable Federal security standards.

13. ***Tactical IT architectures.*** Prototype network and tactical "enterprise" IT architectures (and systems) that support timely distributed, contextual sharing of data among man and unmanned systems for collaborative/semi-autonomous tasks and work processes in low/intermittent bandwidth environments and on systems with limited computational power/storage. Architectures should address distributed peer-to-peer database design, data distribution standards, open protocols, shared applications, and security relevant to this dynamic environment.

14. ***Fusion and Distribution of Data.*** Develop technologies that fuse the results of multi-source persistent surveillance and all- source data through a federation of tactical data bases, permit the movement of intelligence across multiple levels of security, and enable the distribution of actionable intelligence data across the network in near real time. Included within this objective:

- Develop algorithms that can queue sensors, translate useful tactical sensor data across all nodes/INTs and security domains in an AOR to tactical understanding (unusual, interesting) and generate automated indications and warnings.

- Depict normal activity and perform statistical determination of entity to event relationships.
- Create algorithms to relate data and entities to aggregates. Facilitate integration of data and ontology development to understand entity and aggregate activity.
- Continually assess the relative suspicion level associated with data, entities and entity aggregates.
- Identify technology research requirements supporting distribution requirements, including video streaming to tactical level required to support Distributed Operations.

15. ***Agile network Architectures.*** Explore potential air/ground peer-to-peer mesh networking technologies, capable of scaling from 100's to 1,000's of nodes in topographically extreme environments (i.e, Non line of site (NLOS) conditions due to terrain (natural/urban), high multi-path, & high Doppler). Mesh networking devices should be capable of adjusting to physical as well as data layer changes. "Cognitive" -like radios" should consider the cognitive requirements of the operators using them and be responsive to the data and application demands placed upon them.

16. ***Distributed spectrum management.*** Potential solutions address inexpensive distributed, networked frequency sensors (capable of monitoring Blue as well as Red transmissions) that can then be dynamically displayed in a GUI providing a geographical heat map correlated to frequencies and power (dBm) available to a decision maker. Ideal technologies would be able to identify transmitters by position, freq. characteristics, and known unit identification. Data derived would be exportable in real time to other web/SOA based systems via open standards & protocols.

17. ***Tracking solutions for GPS denied environments.*** Accurate position, navigation, and timing solutions for dismounted troops in GPS denied environments.

18. ***Command and Control Optimization, Modeling and Simulation.*** Technologies that support the sharing of information and services across security boundaries that maintains information assurance and system integrity. Technologies that ease the development cycle on source systems for web services and make best use of geographically distributed server environments. Improved processes for managing virtualized environments and service based architectures. Technologies that facilitate the transfer of data from a government web site in the public domain to a sensitive/unclassified government data system

19. ***Global Access Technologies.*** Air/Land/Sea technologies that provide timely capability to deliver cargo to dangerous (i.e. anti-access/austere) locations across a complex, distributed battlefield without jeopardizing warfighter safety.

20. ***Information Exchange and Communication between Disparate Organizations****. Explore means to improve and secure the communication infrastructure and information exchange capability during HADR missions, provide metrics in order to test and evaluate exploration efforts and, pending results, consider maturing the capabilities for use with other government agencies, non-government organizations, and international organizations. One specific area of interest would be an interface that could pull from a variety of existing databases.

21. ***Non-combatant Evacuation Operations (NEO)****. Provide real time accountability of third country national (TCN) evacuees by enabling operators to create and maintain a database of information (bar code) for each evacuee (to include pets) as they enter, proceed through, and finally exit the NEO process at a repatriation site or other exit point. Presently the existing NEO Tracking System (NTS) provides visibility of evacuees throughout the evacuation site. The limitation of the current NTS application is that it is "site specific". Recommend exploring the establishment of a global NTS interface with a centrally managed server. This

global interface would expand the Site Specific visibility of current systems to larger command and control operations (for DOD we should establish an interface with DOD ITV systems and Pacific Disaster Center's Risk Assessment, Planning, and Decision Support (RAPIDS) System). Include C2 facilities in a disaster response hub to evaluate the efficacy of the NEO response and look for opportunities to improve interface between disaster relief providers, forces, and resources (use GCC TPPs and DOS access and agreement annexes to validate usefulness).

22. ***Interoperable Communication Solutions in Network Denied Disaster Response Environments***. Federal disaster response agencies are seeking technologies that provide clear and reliable communications between an array of disparate organizations. Additionally, network solutions are sought to establish private networks and strong backhauls to the open internet during times when commercially provided connects have failed. These solutions may include cellular, satellite, or point-to-point RF solutions.

23. ***Maritime Common Operating Picture*** that enables communication/information transfer between operators (to include combat swimmers), host craft, ISR assets – bring in as many disparate feeds as we can for a complete common operating picture.

24. ***Untethered, underwater communication systems.*** Wireless, untethered through-water transmissions, resistant to compromise, attenuation, deflection or distortion (due to turbid water, ship hulls, underwater structures or formations, etc.). Range sufficient to support swimmer-to-swimmer and swimmer-to-host communication. Host capable of collecting and pushing off-board information throughout a mission, to include full duplex communications for voice, data, swimmer vitals and position, and streaming video. Communication link does not have to be continuous, but must be near real-time. Objective to include swimmer and/or host ability to collect and push off-board information to/from airborne and ground assets.

25. ***Signature Reductions and Management.*** Reducing the signature of vehicles/boats/people in the maritime environment.

26. ***Improved Power and Antennas for Unmanned Aerial Systems (UAS).*** Antenna mounting solutions that minimize the number of antennas necessary on UAS. Smart antennas (analogous to software-defined radios) that allows users to remotely tune the antenna to selected frequencies in real-time. Lightweight, rapidly rechargeable UAS power sources for both vehicle propulsion and mission payloads.

27. ***Air to Ground Communication Hardware.*** Provide wireless high-bandwidth communications, which will enable applications such as streaming video, simultaneous voice and data feeds, and collaborative chat. Desired capability would provide voice, video, and wideband data communications for air to ground data links. Desired characteristics include:

    - Hardware solutions only. Must be able to tie into existing software and connecting internet entry point.
      - Less than 15lbs, including battery
      - Range: 25 miles surface to air, simplex or half-duplex
      - Power requirements: rechargeable battery, battery charger must run on commercial power, power should last 6 hours under continuous use.
    - Low cost, software defined radio capable of wideband transmission of full motion video (FMV), global positioning system (GIS) information, voice, and data from aircraft to ground station, aircraft to aircraft (relay), and from ground to aircraft.
    - Capable of networking multiple stations together, acting as a network node while retransmitting the signal to another node.

28. ***Technologies Supporting Swarm and Counter-Swarm Unmanned and Autonomous Systems (UAS).*** Hardware systems and the software solutions that enable the autonomous "swarm" application of UAVs. Also of interest would be new and emerging technologies that would counter aerial swarms.

c. **Situational Awareness During Disaster Response**

1. ***Mobile Data Collection during Disaster Response Operations****.* Solutions are sought to enable domestic disaster response teams to quickly and securely collect information on individuals from the affected population. Potential solutions that are sought would be implemented through a tablet interface. Potential solutions would also provide an ability to operate in areas that have lost network connectivity.

2. ***Cellular Strength Mapping in Disaster Environments****.* Solutions of interest would be capable of mapping, in real-time, cellular strength (at a local, regional, and potentially national level) to include strength indexing and location of breaks in coverage.

d. **Electronic Warfare (EW)**

1. ***Exploitation of Data Links****.* Solutions are sought that may spoof, disrupt, or disable data links that support command & control functions, Air to Ground functions, and Air to Air functions of C4I networks. The type of data links being used in this category are HF links, UHF links, and links that utilize TDMA, CDMA and support spread spectrum encoding and cyclic code shift keying. All data links will assume to be encrypted to some degree.

2. ***Electromagnetic Battle Management (EMBM).*** A joint capability that includes the functionality resident within Improved Many-on-Many (IMOM) family of Electronic Warfare (EW) analysis software tools, the Electromagnetic Propagation Integrated Resource Environment (EMPIRE) software toolkit (IMOM-Planner, IMOM-Engineer, IMOM-On-the-Web, Communications and Radar Electronic Attack Planning Effectiveness Reference (CREAPER), and Joint Broadcast and Analysis Tool (J-BAT)), GPS Interference and Navigation Tool (GIANT), and SPECTRUM XXI. The capability must also be compatible with service specific tools, such as the U.S. Army EW Planning and Management Tool (EWPMT) and the USMC MAGTF EW. This EMBM capability must be able to conduct EMS management, EMS modeling and simulation (M&S), decision support aid generation, analysis and planning services, and measurement of EW effects analysis.

3. ***Lightweight, Active, Selective Jamming Payloads for Unmanned Systems.*** Payloads that allow users to remotely program jamming frequencies and notch filers to de-conflict with other onboard sensors.

e. **Deployable Infrastructure, Power & Water**

1. ***Deployed Infrastructure Building and Maintenance.*** Support building partnership and Stability operating through building infrastructure capabilities. Ability to reduced time and money spent increasing safety and operational capacity. Areas of interest include solutions that can assist in Dust Abatement, FOB maintenance with roads, runways, tarmacs construction & repair, Expeditionary Shelter Support and efforts addressing fortification and ballistics. Using non specialized equipment needed for most applications, rapidly deployable and customizable to the region of operations as needed.

2. ***Deployable Lighting Technologies.*** LEDs are preferred. Potential solutions would be blackout capable and would be easily camouflaged for stealthy day or night operations. Would need to be ruggedized for all weather use and minimize energy requirements.

3. ***Energy efficiencies.*** Solutions sought will explore renewable energy sources for mobile and austere environments; reductions in fossil fuel consumption; fused sources including diesel, wind, solar, etc.; energy saving technologies for shelter, transportation, and portable IT systems (to include DC systems, chill water

cooling, ambient cooling, cloud computing); alternative shelters and HVAC (heating, ventilation & air conditioning) systems that address a reduction in energy needs, deployable field feeding systems that take into account weight, size, and avoid fuel-fired cooking appliances; deployable self-sustaining waste-to-energy systems capable of handling approximately 1 ton per day, fit into a 1/3 of a 20ft ISO container, and with no hazardous emissions.

4. ***Water Generation and Purification Systems.*** Seeking solutions other than commercially procured bottled water and current Reverse Osmosis Water Purification Units (ROWPUs). Potential solutions might include atmospheric water solutions, black & gray water re-use systems, and new reverse osmosis technologies that incorporate reductions in energy demand.

5. ***Safe (non-propagation/non-flammable) Lithium batteries*** or any related technologies (underwater submersible or like type platforms).

f. **Detection and measurement of chemical or biological agents in aerial plumes.** Potential solutions would be able to accurately identify and quantify chemical or biological agents contained in an effluent plume released into open air. Current solutions are subject to the variability of local winds, types and placement of sensors, and are limited by the ratio of the air sampled, to the total plume volume; a number which may be less than 10^-6. These factors create severe challenges in fully understanding and accurately modeling chemical or biological agents present in a specific plume. An acceptable solution would provide the means and methodology for a capability to accurately characterize the content of effluent plumes from sub-scale tests, in lieu of full scale tests, or to fully characterize full-scale tests. Quantitatively, an improved capability should be able to accurately estimate greater than 70% of the released effluent mass with a greater than 60% confidence in these measurements.

g. **Equipment for Dismounted Personnel**

1. ***Targeting Technologies for Faster, More Precise Engagements*** Develop highly portable technologies that enable operators to locate, discriminate, and provide target location information in order to facilitate immediate target engagement by either direct or indirect fires. Systems should be lightweight, man-portable (i.e. target weight of systems should be less than 5lbs), provide 360 degree coverage, and be capable of discriminating targets with high accuracy (i.e., 10 digit grid location) at night and in adverse weather conditions at extended ranges.

2. ***Integrated Personal Protective Equipment.*** Hands-free communications, ergonomically-optimized protective/communications/health and situational awareness solutions that are integrated or used in conjunction with personal protective equipment. Ability to evaluate the resiliency or health status of the individual responder to ensure that they are still able to perform in the face of acute and chronic stressors. The incident commander or emergency medical services staff should also be able to monitor and evaluate the mental and physical status.

3. ***Warfighter Performance Enhancements***. Develop technologies that provide protective equipment, communications equipment, weapons, ammunition, sensors, and optics for the mounted and dismounted Marine that are multifunctional, lighter, and provide greater capability. Technologies, such as exoskeletons, are needed to enhance the performance of the operator by improving load carrying capacity and speed and distance of movement.

h. **Improved Life-Support during Patient Evacuation.** Develop systems lightweight, man-portable systems that improve life expectancy from time of injury until evacuated to a medical facility. Desired technologies include:

1. Advanced means of reducing the immediate effects of shock and blood loss.

2. Autonomous diagnosis/treatment of severe injuries, illness, and disease under austere conditions and in remote sites.

3. Medical reach-back.

4. Remote physiological monitoring of individual operator.

5. Lighter, smaller, more durable and versatile versions of existing lifesaving devices (such as the oxygen concentrator, mobile ventilator, and multifunctional monitoring devices) that are better suited for air and ground vehicle patient movement.

i. **Small Unit Support Vehicles/Vessels**

1. *Light Aerial Combat Vehicle.* Innovative mobility for small units in support of stability, force protection, and logistics operations. Small unit combat mobility platform with the ability to be multi mission/multi-use, able to accommodate a variety of payloads/configurations and small unit owned/operated. Minimum payload should be greater than 200lbs, 500lbs is preferred.

2. *Next generation Combat Rubber Raiding Craft (CRRC).* New technologies providing improvements to the current CRRC capabilities, to including reduced signature management characteristics and greater maneuverability in high surf conditions.

j. **Non-Lethal/Scalable Effects Engagement.** Today's warfighters must be able of apply scaled effects through the application of multi-layered, active and passive, lethal and nonlethal measures, within the air, land, sea, and space domains, across a wide range of military operations. These include simple to use, yet robust weapons systems which will overmatch adversaries restrict adversaries from employing capabilities that would prevent the warfighters from taking decisive actions. An Escalation of Force (EoF) continuum provides warfighters with the necessary flexible and scalable options to apply only the minimal force necessary to achieve their desired effects, while precluding collateral damage and casualties to noncombatants.

This specific area of interest includes technologies and system platforms that perform Non-Lethal/Scalable Effects in the two core capability areas, Counter-Personnel and Counter-Material, within the following parameters:

- Capabilities that are explicitly designed and primarily employed to incapacitate targeted personnel or materiel, while minimizing fatalities, permanent injury to personnel and undesired collateral damage in the target area or environment

- Capabilities that deliver a level of force that achieves immediate target response

- Capabilities that are intended to provide predictable and reversible effects

1. *Land domain Non-Lethal/Scalable Effects Engagement.*

- Counter-Personnel:
  - Personnel Incapacitation Technologies. Refer to capabilities that revolve around effects such as blunt trauma and electro-muscular that subdue and/or incapacitate single or multiple targets in closed and open environments
  - Sound and Light Technologies. Long range (500 -3000m) acoustic and light/laser technologies that support hailing and warning, moving, or suppression of individuals or groups
    - Optic aid detection. Safely targets individuals using optical augmentation with lasers
      - Reduce laser power when binoculars or other visual augmentation are detected in use by target personnel
      - Identify methods that prevent target personnel from using optical augmentation

- Acoustic Driver size, weight and power (SwaP) and range improvements
  - Technology that improves SwaP of acoustic drivers
  - Technology that improves range of acoustic drivers
- Stabilization and tracking
  - Handheld systems
  - Mounted systems
- System Integration. Integration of sound and light into existing or future systems.
- Small arms integration
  - Surveillance system integration
  - Other system integration
- Laser safety systems
  - Vary intensity/power to increase minimum range effectiveness. (Reduce Nominal Ocular Hazard Range)
  - Reduce laser power to prevent unintended laser exposure on non-targeted personnel (incursions into beam)
- Counter-Material:
  - Vehicle Stopping Technologies that stop vehicles with minimal or no harm to the vehicle occupants. Stop and/or disable a moving vehicle, up to high rates of speed, without harming vehicle occupants (kinetic technologies are not excluded)

2. *Maritime domain Non-Lethal/Scalable Effects Engagement.* To disable and/or stop large surface vessels (>300 tons), semi-submersible vessels, and go-fasts using:
- Counter-Personnel: Non-Lethal/Scalable Effects to incapacitate crew members and occupants, deny access to areas within the vessel environment, and identifying intent by providing non-lethal capability to unambiguously warn vessel they are penetrating a "no-go" area.
- Counter-Material: Non-Lethal/Scalable Effects on propulsion, navigation, communication, and weapons control (electrical/mechanical) systems and sub-systems.

3. *Air domain Non-Lethal/Scalable Effects Engagement.*
- Counter-Material: Non-Lethal/Scalable Effects interest areas include stop aircraft or disable aircraft on the ground, divert aircraft in the air by affecting aircraft power, navigation/guidance/telemetry and/or communication systems and sub-systems.

4. *Canine Deterrent.* Canine control or distraction technologies and delivery methods (close proximity or standoff).

k. **Pandemic Response Technologies**. Technologies and processes are sought which are relevant to current and future pandemic prevention, preparedness, and response. The following areas of interest seek relevant technologies and processes to prevent, prepare for, and respond to pandemics. JIFX venues cannot accommodate hazardous biological agents and as such experiments which require handling such materials cannot be accepted.

1. *Wearable Sensor Technologies.* Wearable technology that can monitor key health parameters (such as body temperature) of high-risk individuals and sense changes in physiology associated with infection. All of the data collected must have the ability to be turned into actionable outcomes. This includes the, ability to transmit or communicate an individual's temperature when they have a fever as well as location or other

data to enable HCWs to facilitate outreach and contact for treatment in a timely manner. An "optimum" approach has not been identified, but the following are a few ideas.

- Data Collection (New approaches and ideas are welcome, especially if the approach is complementary of the infrastructure in West Africa, specifically Liberia, Sierra Leone, and Guinea):
  - o Cell phone tower triangulation
  - o "Receiving station" or platform that collects data
  - o Geographic Information Systems (GIS), or mapping abilities
  - o Notification abilities
  - o Unique identification/contact information associated with each device
- Required characteristics of the wearable sensor include:
  - o Wearable (with independent power source) for minimum of 21 days
  - o Discreet appearance / physically unobtrusive. Should be "out of mind" for the wearer and easily unnoticed by those around the wearer
  - o Waterproof
  - o Low cost
  - o Accurate
  - o Must measure body temperature
- Desired characteristics of the wearable sensor include:
  - o Does not retain bodily fluids that can serve as a source of infection
  - o Easy to monitor remotely
  - o Reliable
  - o Can be personally identified, but still secure against electronic hack/attack
  - o Rate of manufacture increase
  - o Ease of manufacture
  - o Data retention capability
  - o Measure: heart rate, heart rate variability, respiratory rate, blood oxygen saturation, blood pressure, blood pressure trends, and/or level or physical activity of the wearer.

2. ***Improved re-usable barrier material to compliment or replace current Personal Protective Equipment (PPE).*** Seeking PPE that is safely reusable and either compliments currently deployed PPE or can easily be worked into the current regiment of PPE. Solutions may, but are not required to be in the following areas:

- Adapting current fan technology, which pressurizes hazmat suits to keep them from becoming contaminated, to work with deployable buildings and structures
- Hotbox or inflatable decontamination showers to aid in preserving PPE. These solutions may allow sterile access via gloves that are accessible from outside the chamber.

4. ***Rapid Body Temperature Detection.*** Technologies of interest include both individual, wearable solutions (i.e. handheld, thermal glasses, etc.) and mass surveillance systems (i.e. elevated camera & sensor systems for scanning large crowds).

5. ***Networking Technologies that Support "Cloud Hubs".*** Technologies should aid in reducing the need for field hospitals, potentially in austere environments, to have wireless access to larger cloud networks.

6. ***Code-based Reporting System for Transmitting Information Across a Wide Range of Outlets.*** Solutions sought akin to the US-based "AMBER Alert" system that utilizes a brevity, code-based reporting

system to quickly transmit information across a number of platforms including radio, television, mobile devices, etc.

7. ***Rapid Virus Testing.*** Solutions are sought that leverage (relatively) inexpensive testing methods that safely and accurately produce same-day results.

8. ***Anti-Viral Sterilizing Technologies.*** Solutions may utilize chemical, ultraviolet, or other approaches to quickly and safely sterilize surfaces that may be contaminated with Ebola Virus Disease.

9. ***Technologies Augmenting Current Distributed Health and Preparedness Training.*** Solutions sought may include:

   - Material solutions to augment traditional communication and outreach methods to increase engagement, ensure rapid dissemination of important information, and build enduring host nation capacity and capability.

   - Mobile solutions to distribute content on a variety of topics, provide checklists, "how to" videos, multi-media training courses, interactive knowledge challenges, role-playing games, etc. Ability to communicate across language barriers is a bonus, as is ability to leverage multiple languages (i.e. English, French, West African Bantu dialects).

(3) Security Requirements: Participants should not submit classified information.

(4) Other Special Requirements: DO NOT SUBMIT PROPOSALS FOR FUNDING. SUBMIT EXPERIMENT PROPOSALS. Experiment Proposal submission deadliness may be found on the JIFX website (www.nps.edu/fx). No contracts will be awarded based on this announcement or any subsequent supplemental RFI announcements.

C. SUBMISSION INSTRUCTIONS

The submission process will be entirely through the Naval Postgraduate School JIFX website. Based on a review of submitted proposals select respondents will be invited to participate in the JIFX event. NPS shall provide venue, supporting infrastructure, and assessment (operational and technical) personnel at no cost to invited respondent(s). Respondent's travel costs and technology experiments will be at the respondent's expense. The JIFX venue will only supply basic venue infrastructure including frequency allocation, portable power, network access, and TOC/collaboration space. Invited respondents should prepare to be self-sufficient during experimentation and not dependent on venue resources for success. Please visit the JIFX website (www.nps.edu/fx) if you wish to submit an Experiment Proposal. Multiple Experiment Proposals, each addressing a different technology, may be submitted by each respondent. Submissions will be reviewed by COCOM representatives, service subject matter experts (SME), JIFX personnel, support contractors, and NPS faculty, staff, or students (as appropriate). Each Experiment Proposal must address only one experiment.

D. BASIS FOR SELECTION TO PARTICIPATE

Selection of respondents to participate will be based on the extent to which the technology represents a particular class or level of capability that meets the purpose of the event.

Other considerations include:
   - Relevance of or adaptability to missions
   - Relevance to current operational needs

- Novelty or uniqueness of approach

E. ADDITIONAL INFORMATION

Lessons learned by NPS from these experiments may be broadly disseminated. If selected for participation in JIFX experimentation, participants may be requested to provide additional information in a questionnaire that will be used in preparation for the experiments.

F. USE OF INFORMATION

The purpose of this notice is to gain information leading to Government/NGO/IO/Industry interaction regarding the potential of emerging technological capabilities and to identify the key attributes of these capabilities. Proprietary information should not be included in the Experiment Proposal. This information is being collected to enable participants, government representatives and NPS students/faculty to learn more about potential capabilities for application to joint and interagency challenges.

G. SPECIAL NOTICE

Respondent's attention is directed to the fact that Federally Funded Research and Development Centers (FFRDCs) or contractor consultant/advisors in the government may review and provide support during evaluation of submittals. The government shall take into consideration requirements for avoiding conflicts of interest and ensure advisors comply with safeguarding proprietary data. Submission in response to this RFI constitutes approval to release the submittal to government support contractors.

H. REGULATION

In accordance with Federal Acquisition Regulation (FAR) 52.215-3 Request for Information or Solicitation for Planning Purposes (Oct 1997):

1) The government does not intend to award a contract on the basis of this RFI notice or to otherwise pay for the information.
2) Although "proposal" and "respondent" are used in this RFI, your responses will be treated as information only. It shall not be used as a proposal for funding.
3) In accordance with FAR Clause 52.209(c), the purpose of this RFI is to solicit technology experimentation candidates from R&D organizations, private industry, and academia for inclusion in future experimentation events coordinated by the Naval Postgraduate School.