**General Information**

**Name:** U.S. Army Subterranean and Dense Urban Environment MATDEV CoP Future Materiel Experiment (MATEx) Planning: Dense Urban Materiel Concepts and Capabilities

**Notice Type:** Request for Information

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The U.S. Army Contracting Command – New Jersey, in support of U.S. Army Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ is currently seeking information in support of the Army Subterranean and Dense Urban Environment Materiel Developer Community of Practice (SbT/DUE MATDEV CoP) future planning of Materiel Experiment (MATEx) for materiel concepts and capabilities.

THIS IS A REQUEST FOR INFORMATION (RFI) ONLY – This RFI is issued solely for information and planning purposes – it does not constitute a Request for Proposal (RFP) or a promise to issue an RFP in the future. Solicitations are not available at this time. Requests for a solicitation will not receive a response. This notice does not constitute a commitment by the United States Government to contract for any supply or service whatsoever. All information submitted in response to this announcement is voluntary; the United States Government will not pay for information requested nor will it compensate any respondent for any cost incurred in developing information provided to the United States Government. Not responding to this RFI does not preclude participation in any future RFP, if any is issued. If a solicitation is released, it will be synopsized on the Federal Business Opportunities (FedBizOps) website: www.fbo.gov. It is the responsibility of the potential offerors to monitor this site for additional information pertaining to this requirement.

**Background:** The Army Materiel Command/Research, Development and Engineering Command (AMC/RDECOM) leads the Army for Subterranean and Dense Urban Environment (DUE) materiel solutions via a Community of Practice with Army Science and Technology (S&T), Army Program Executive Offices (PEOs), other Department of Defense (DoD), and other government agencies (OGAs). RDECOM Armaments is the designated lead for the CoP.

The SbT/DUE MATDEV CoP has, in partnership with TRADOC G2 and TRADOC Analysis Center sponsored a series of Measurement Space Workshops gaining insights into the dominant problems, conditions and potential solution concepts for dense urban environments employing participants from the joint, interagency and multinational capability developers (CAPDEV) and materiel developer (MATDEV) communities. A series of MATEx’s will be planned focusing on the capabilities identified from the workshop series to begin quantifying promising capability enhancements in relevant dense urban environments.

REQUEST FOR INFORMATION (RFI): The purpose of this RFI is to discover technologies from government, industry and academia for planning and inclusion in future capability experiments focused on emerging challenges presented by dense urban and subterranean environments.

PLANNED EXPERIMENT EVENTS: The U.S. Army SbT/DUE MATDEV CoP will sponsor and execute a series of a materiel experiments (MATEx) in late 2019/2020 and beyond at the tactical and operational (limited) level to identify and verify near and mid-term readiness of new and future concepts and capabilities across warfighting functions in relevant dense urban environments informing priority investments. The MATEx’s will be conducted in the United States in metropolitan cities and/or other locations that replicate the unique conditions of the environment providing a realistic venue to demonstrate capabilities. The venues will seek to provide various dense urban stressors within the multi-domains / dimensions to provide conditions and challenges. This will provide the technology developer an opportunity to interact with Department of Defense (and other federal and state organizations) operational and technical personnel and gain their insights/feedback on how systems/capabilities may support Warfighter needs. The MATEx seeks to stress existing or new materiel capabilities to inform future requirements and identify new gaps by demonstrating their operational value in relation to emerging complex environments and threats.

**RFI Considerations:**

**1. Review of Information:** Technology analysis will include criteria based upon the CoP’s operational and technical subject matter expert guidance against tasks, conditions and standards within the operational vignettes and excursions.

Technologies should identify essential elements for analysis (e.g. specific research questions and measurables) for assessment in dense urban conditions (physical and human terrain, infrastructure and information layers).

**2. Overarching Considerations for Planning of Future Experiments:**

* Technology acceptance will be determined by applicability to the concept and capability area(s), operational vignettes and approval for use at each site location
* Incorporate Institutional Review Board, Human Research Protection Program for applicable human factors data collection approvals and or opportunities where applicable prior to conducting any demonstration activity.
* Inclusion of safety office(s) processes and procedures in coordination with site location authorities
* Coordination with demonstration site authorities’ processes and procedures for access requirements and capacity issues

**3. Timeline:**

* 21 Feb 2019: RFI responses due
* 25 Feb - 15 Mar 2019: MATDEV CoP review submissions
* 25 Mar - 1 Jun 2019: Respondent notified of MATDEV CoP interest and follow-on discussions leading to agreements to support for future experimentation

**4. Materiel Concepts, Capability Areas and Objectives:** Concepts and capabilities should focus at the tactical level (Brigade Combat Team Company and below) to address the following topics, capability attributes and evaluation areas:

**Interior/Exterior Geospatial Intelligence (GEOINT)**

* Capability for a suite of remote, augmented, semi or full autonomous man-portable and configurable small unmanned aircraft systems and or small unmanned ground vehicles with maneuver and navigation behaviors in denied / degraded communication and GPS to map in and around exterior / interiors of high rise structures, dense urban canyons and subterranean spaces
* Capability to conduct collaborative missions by swarming and cooperation (e.g., multiple small UAS and or small UGVs) with sense and avoid (density of buildings, population, obstacles, internal and external to buildings and subterranean spaces) behaviors throughout dense urban environments
* Capability can accompany or replace the unit to conduct the mission
* Capability rapidly creates a map in and around buildings and within subterranean spaces and provides measurement of area, volume and density estimates with images and full motion video of the space
* Capability provides scalable resolution to address speed of data transmission / receiving
* Capability has a multi-sensor payload and or the ability to integrate different sensor payloads for additional sensing and detection collection (e.g., threats, personnel, hazards, air contaminates, etc.)
* Capability counts and localizes personnel existing within, entering and exiting the area (e.g., patterns of life, population / personnel flows) and provides friendly and enemy location data, to include the vertical axis
* Capability to transmit collected data within and throughout denied / degraded communications and GPS environments, such as multistory high rise structures and/or subterranean spaces and to an internal/external base of operations, ground / air vehicles or Soldier for immediate (near-real or real time) analysis
* Capability to provide sensor coverage of multi-floor / multi-room spaces with a high degree of vertical and horizontal separation
* Capability to transmit and receive sensor data to smart glasses / goggles or heads-up display to enable Soldiers to visualize information on a mini-display in front of their eye to allow receiving information within and external to denied / degraded communication and GPS environments
* Capability can receive and transmit assured positioning, navigation, and timing (PNT) information, and serve as pseudo satellites (e.g., pseudolites) of the unit and or robots within and external to denied/degraded communication and GPS environments
* Desired capability will also transmit mapping data visualized on a holographic display (e.g., smartphone, laptop, tabletop)
* Capability has artificial intelligence ability to allow the maneuver commander increased freedom of maneuver and situational understanding

**Persistent Situational Understanding**

* Capability that maintains continuous surveillance within enclosed / confined spaces with denied/degraded communication and GPS environments (buildings and subterranean)
* Capability for a suite of remote, augmented, semi or full autonomous man-portable and configurable small unmanned aircraft systems and or small unmanned ground vehicles with maneuver and navigation behaviors in denied / degraded communication and GPS in and around exterior / interiors of high rise structures, dense urban canyons and subterranean spaces
* Capability to conduct collaborative missions by swarming and cooperation (e.g., multiple small UAS and or small UGVs) with sense and avoid (density of buildings, population, obstacles, internal and external to buildings and subterranean spaces) behaviors throughout dense urban environments
* Capability can accompany or replace the unit to conduct the mission
* Capability is lightweight, compact, and expendable
* Capability provides continuous surveillance, object / personnel tracking, environment sensing and/or pattern of life data within the dense urban environment (within and external to denied/degraded communication and GPS environments)
* Capability counts and localizes personnel existing within, entering and exiting the area (e.g., patterns of life, population / personnel flows) and provides friendly and enemy location data, to include the vertical axis
* Capability can be deployed through a variety of means: aerial, ground, thrown, dropped (e.g., leave behind) etc.
* Capability provides system health status information to operator
* Capability is triggered by motion with continuous or episodic sensing
* Capability to transmit collected data within and throughout denied / degraded communications and GPS environments, such as multistory high rise structures and/or subterranean spaces and to an internal/external base of operations, ground / air vehicles or Soldier for immediate (near-real or real time) analysis
* Capability to provide sensor coverage of multi-floor / multi-room spaces with a high degree of vertical and horizontal separation
* Capability to transmit and receive sensor data to smart glasses / goggles or heads-up display to enable Soldiers to visualize information on a mini-display in front of their eye to allow receiving information within and external to denied / degraded communication and GPS environments
* Capability can receive and transmit assured positioning, navigation, and timing (PNT) information, and serve as pseudo satellites (e.g., pseudolites) of the unit and or robots within and external to denied/degraded communication and GPS environments
* Capability has artificial intelligence ability to allow the maneuver commander increased freedom of maneuver and situational understanding

**Manned/Unmanned Networked Aerial Suite of Scalable Effects**

* Focus is on the intelligence, surveillance, target acquisition and reconnaissance (ISTAR) and scalable effect(s) once delivered by modern artillery means
* Providesasuite of capabilities to conduct ISTAR and deliver lethal/non-lethal effects via various modern artillery means (cannon, rocket, mortar, man-portable, etc.)
* Capability for a suite of remote, augmented, semi or full autonomous man-portable and configurable small unmanned aircraft systems and or small unmanned ground vehicles with maneuver and navigation behaviors in denied / degraded communication and GPS in and around interiors of high rise structures, dense urban canyons and subterranean spaces
* Capability to conduct collaborative missions by swarming and cooperation (e.g., multiple small UAS and or small UGVs) with sense and avoid (density of buildings, population, obstacles, internal and external to buildings and subterranean spaces) behaviors throughout dense urban environments
* Capability to provide scalable and precise lethal / non-lethal effects in an environment with problem of scale (e.g., dense high rise structures, dense ubiquitous civilian population, booby traps, snipers, hazards, UXO, too many routes to cover (ground, UAVs, maritime), inability to distinguish from population, unobservable routes, narrow streets, tight buildings, alleys; urban environment layout)
* Provided effects are layered to deliver at a distance or close-in
* Common to the modern artillery delivery methods are the suite of sensors
* Capability to deploy expendable small UAS’/UGVs that deliver a suite of effects, primarily to soft targets, including multi-sensor 3D mapping, sensing whether individuals are armed, discrimination (identification - friend or foe, disposition of individuals, facial recognition, micro-expressions), scalable lethal (e.g., electable kill/incapacitation, defeat hard targets) and non-lethal effects (scalable electromagnetic pulse, stun / incapacitate targets, crowd dispersal, etc.)
* Capability for the air delivery method provides a “mothership” UAS capable of autonomously hovering around a location or perching on a building
* Capability to transmit collected data within and throughout denied / degraded communications and GPS environments, such as multistory high rise structures and/or subterranean spaces and to an internal/external base of operations, ground / air vehicles or Soldier for immediate (near-real or real time) analysis
* Capability to transmit and receive sensor data to smart glasses / goggles or heads-up display to enable Soldiers to visualize information on a mini-display in front of their eye to allow receiving information within and external to denied / degraded communication and GPS environments
* Capability can receive and transmit assured positioning, navigation, and timing (PNT) information, and serve as pseudo satellites (e.g., pseudolites) of the unit and or robots within and external to denied/degraded communication and GPS environments
* Capability for the modern artillery delivered method provides organic ISTAR, broadcasting targetable data over a contested network to multiple formations at multiple echelons dispersed and or isolated with dense urban terrain

**Sense through the Urban Wall/Ground**

* Capability to overcome the inability to see within and through urban walls/roofs, ground and subterranean surfaces with sufficient detail for situational understanding and positive threat identification
* Capability to sense the presence of occupants, objects, and building systems (power, water, sanitation, communications, etc.) within and through urban structures.
* Capability should identify targets within structures built across the full range of conventional building techniques and materials and anticipate emerging construction technologies.
* Capability to sense infrastructure (conduit, pipes, wires, cables, etc.) within urban walls, floors, ceilings, and urban ground (concrete / asphalt).
* Capability for a suite of remote, augmented, semi or full autonomous man-portable and configurable small unmanned aircraft systems and or small unmanned ground vehicles with maneuver and navigation behaviors in denied / degraded communication and GPS in and around interiors of high rise structures, dense urban canyons and subterranean spaces
* Capability to conduct collaborative missions by swarming and cooperation (e.g., multiple small UAS and or small UGVs) with sense and avoid (density of buildings, population, obstacles, internal and external to buildings and subterranean spaces) behaviors throughout dense urban environments
* Capability to transmit collected data within and throughout denied / degraded communications and GPS environments, such as multistory high rise structures and/or subterranean spaces and to an internal/external base of operations, ground / air vehicles or Soldier for immediate (near-real or real time) analysis
* Capability can accompany or replace the unit to conduct the mission
* Capability to transmit and receive sensor data to smart glasses / goggles or heads-up display to enable Soldiers to visualize information on a mini-display in front of their eye to allow receiving information within and external to denied / degraded communication and GPS environments
* Capability can receive and transmit assured positioning, navigation, and timing (PNT) information, and serve as pseudo satellites (e.g., pseudolites) of the unit and or robots within and external to denied/degraded communication and GPS environments
* Capability must have pan/tilt motion
* Capability has artificial intelligence ability to allow the maneuver commander increased freedom of maneuver and situational understanding

**Soldier-level Situational Understanding**

* Capability to provide Soldiers the ability to filter, analyze, visualize, manage and communicate (e.g., receive and transmit) essential operational information
* Capability integrates data from other topic areas (Interior/Exterior Geospatial Intelligence (GEOINT); Persistent Situational Understanding; Manned/Unmanned Networked Aerial Suite of Scalable Effects; Sense through the Urban Wall/Ground; Assured Mobility – Robotic and Autonomous Breach; Protection: Detect and Discriminate UAS/UGV; Protection: Neutralize Non-friendly UAS/UGV; Autonomous Repeaters; Mission Command 05 [MC05]: Autonomous Light Weight Aerial Sensors)
* Capability provides detailed information in degraded, denied, contested and or confined spaces to enhance survivability and ability to understand what the enemy knows and sees in dense urban environments
* Ability to immerse the Soldier within dense populations, terrain and information to understand how to operate in the environment
* Capability collects intelligence at the tactical level for processing, exploitation and dissemination (PED) of dynamic information, managing and disseminating orders and intelligenceacross all levels of command
* Capability has smart glasses / goggles or heads-up display to enable Soldiers to visualize information on a mini-display in front of their eye to allow receiving information, such as maps, images, video, friendly/enemy positions, etc. from complementary manned/unmanned teaming assets
* Provides high-resolution cameras (e.g., body or combat helmet mounted) to send operational environment images (e.g., terrain, hazards, warnings, positions) to separated/isolated units
* Smart glasses / goggles or heads-up display capability that provides assured positioning, navigation, and timing (PNT) information of the unit within and external to denied/degraded communication and GPS environments
* Provides individual and collective-level improved situation understanding, increased common operating picture and user defined information, provides route planning, building plans, service corridors behind walls, air ducts, electrical, subterranean and sewer systems, friendly force (real time) and enemy force (marked by self or other units)
* Capability to provide a unique platform that integrates protective equipment with a Soldier-borne system (e.g., combat helmet/uniform) that incorporates communications, sensors, common operating picture imagery, computing and artificial intelligence-enhanced), user defined filters to provide desired information from a large source of existing (e.g., open source) and processed data for rapid decision making
* Capability address the complex three-dimensional dense urban environment that increases the cognitive load of the Soldier
* Capability provides increased Soldier performance for greater mobility and maneuver for sustainability, lethality and survivability in dense urban terrain allowing increased freedom of action
* Provides an integrated networked system for enabling increased performance both physically and cognitively to enable increased situational understanding and momentum during operations in dense urban environments
* Capability has flexible power options (re-charge from existing civilian infrastructure, solar, motion, vehicle, etc.)
* Capability provides light weight ballistic and blast protection
* Provides buoyancy and allows the Soldier to traverse/swim through flooded infrastructure (e.g., subterranean, sewers, etc.)
* Capability to integrate weapons as part of the Soldier-level situational understanding system to provide scalable lethal/non-lethal effects
* Provides the ability to integrate sensors on, or within the Soldier system to provide both the Soldier and higher echelon forces with increased situational understanding as every Soldier is a ubiquitous multi-mode sensor
* Capability torapidly access and understand sensor input, information and data feeds at the Soldier level in order to execute missions in a sensor rich (existing and or introduced) dense urban environment
* Provides an integrated Soldier-level (e.g., wearables) system that provides smart glasses (e.g., heads-up display) for real-time information, health monitoring, woven lightweight body armor, integrated microphone (communications), and kinetic power harvesting as part of the Soldier’s uniform and gear
* Capability provides the Soldier with real-time, relevant information of their surroundings; from a person’s (non-combatant, enemy, etc.) intent to available networks (existing within the city), to ingress/egress routes (e.g., route planning).
* Capabilityenables decentralized or isolated execution of all missions through increased and rapid situational understanding and decision making
* Capability has an individual Soldier mode and leader mode. In the leader mode the Soldier-level system provides the same information, plus the ability to “tune in” to an individual (e.g., specific) Soldier’s display in order to see what they see along with a sense of the Soldier’s well-being (e.g., health status))
* Desired capability will display mapping data visualized on a holographic display (e.g., smartphone, laptop, tabletop)
* Capability has artificial intelligence ability to allow the maneuver commander increased freedom of maneuver and situational understanding

**Assured Mobility – Robotic and Autonomous Breach**

* Capability to detect, reduce, clear, breach or search and rescue in the complex and confined spaces (e.g., subterranean, street, building interiors/exteriors/rooftops) within dense urban terrain to enable mobility and maneuver
* Capability for a suite of remote, augmented, semi or full autonomous man-portable and configurable small unmanned aircraft systems and or small unmanned ground vehicles with maneuver and navigation behaviors in denied / degraded communication and GPS
* Capability to conduct collaborative missions by swarming and cooperation (e.g., multiple small UAS and or small UGVs) with sense and avoid (density of buildings, population, obstacles, internal and external to buildings and subterranean spaces) behaviors throughout dense urban environments
* Capability to transmit collected data within and throughout denied / degraded communications and GPS environments, such as multistory high rise structures and/or subterranean spaces and to an internal/external base of operations, ground / air vehicles or Soldier for immediate (near-real or real time) analysis
* Capability can accompany or replace the unit to conduct the mission
* Capability to transmit and receive sensor data to smart glasses / goggles or heads-up display to enable Soldiers to visualize information on a mini-display in front of their eye to allow receiving information within and external to denied / degraded communication and GPS environments
* Capability can receive and transmit assured positioning, navigation, and timing (PNT) information, and serve as pseudo satellites (e.g., pseudolites) of the unit and or robots within and external to denied/degraded communication and GPS environments
* Capability has multiple appendages and or breaching techniques to conduct ballistic, mechanical, thermal and or explosive breach during operations on avenues of approach that exceed manpower capabilities, denied Soldier or vehicle access and reduces the unit’s exposure to deny, block and deter allowing for mobility/counter mobility capability to effectively operate in dense urban terrain
* Capability provides or receives GEOINT collection (refer to ‘Interior Geospatial Intelligence (GEOINT)’ area )environmental (e.g., oxygen, chemical, contaminates, obstacles), and structural (e.g., optimal breach point, structural integrity pre/post breach) assessments
* Provides mechanical obstacle creation in confined spaces, such as dig, plow, scrape, push, or roll over
* Capability has a multi-sensor payload and or the ability to integrate different sensor payloads for additional sensing and detection collection (e.g., threats, personnel, hazards, air contaminates, etc.)
* Small UAS/UGV suite may have assets that are expendable or non-expendable (but easily repairable for predictable appendages)
* Provides ability to drop-off or attach / emplace thermal or explosive payload on target to breach, creating ingress/egress points for other swarming small UAS’UGVs
* Capability to traverse high rise building stairs, rubble, water (e.g., sewers)
* Capability to conduct vertical exterior breach on high rise structures (e.g., windows, walls, rooftops)
* Ability to receive or have sense through the wall capability (refer to ‘Sense through the Urban Wall/Ground’ area)
* Capability has artificial intelligence ability to allow the maneuver commander increased freedom of maneuver and situational understanding

**Soldier Family of Robotic Systems**

* Capability provides a family of robotic and autonomous systems for enabling tactical operations in multiple, restricted and denied spaces (e.g., high rise buildings, subterranean, canalized streets, etc.) in which humans cannot, or do not, want to operate
* Capability is complementary to and integrates with other topic areas (Interior/Exterior Geospatial Intelligence (GEOINT); Persistent Situational Understanding; Manned/Unmanned Networked Aerial Suite of Scalable Effects; Sense through the Urban Wall/Ground; Assured Mobility – Robotic and Autonomous Breach; Protection: Detect and Discriminate UAS/UGV; Protection: Neutralize Non-friendly UAS/UGV; Autonomous Repeaters; Mission Command 05 [MC05]: Autonomous Light Weight Aerial Sensors)
* Capability for a suite of remote, augmented, semi or full autonomous man-portable and configurable small unmanned aircraft systems and or small unmanned ground vehicles with maneuver and navigation behaviors in denied / degraded communication and GPS to map in and around interiors of high rise structures, dense urban canyons and subterranean spaces
* Capability to conduct collaborative missions by swarming and cooperation (e.g., multiple small UAS and or small UGVs) with sense and avoid (density of buildings, population, obstacles, internal and external to buildings and subterranean spaces) behaviors throughout dense urban environments
* Capability for air and or ground-based identification - friend or foe of air and ground targets (e.g., small UAS/UGVs, humans) and threat discernment with scalable non-lethal / lethal weapons systems within the dense population and terrain
* Provides line of sight and non-line of sight capability
* The family of systems provides communications, ISTAR and scalable effects (e.g., non-lethal/lethal) to extend the reach of the small unit in isolated and confined spaces reducing exposure and allowing commanders to focus manned combat power on critical areas
* Capability has a multi-sensor payload and or the ability to integrate different sensor payloads
* Capability has artificial intelligence ability to allow the maneuver commander increased freedom of maneuver and situational understanding
* Provides small-scale robotic systems with future lethal systems to create access and stand-off in maneuver-restricted and complex three dimensional spaces
* Creates a distributed sensor network with dense urban environments.

**Detect and Discriminate UAS/UGV**

* Suite of Team-level autonomous UAS’/UGVs with the ability to detect both armed (e.g., weaponized) and unarmed threat UAS’/UGVs within dense urban terrain
* Capability for a suite of remote, augmented, semi or full autonomous man-portable and configurable small unmanned aircraft systems and or small unmanned ground vehicles with maneuver and navigation behaviors in denied / degraded communication and GPS in and around interiors of high rise structures, dense urban canyons and subterranean spaces
* Capability to conduct collaborative missions by swarming and cooperation (e.g., multiple small UAS and or small UGVs) with sense and avoid (density of buildings, population, obstacles, internal and external to buildings and subterranean spaces) behaviors throughout dense urban environments
* Capability can accompany or replace the unit to conduct the mission
* Capability provides identification – friend or foe for friendly, commercial or threat UAS’/UGVs, within the highly cluttered dense urban terrain
* Ability to determine what capabilities the threat UAS/UGV possess
* Capability has a multi-sensor payload and or the ability to integrate different sensor payloads for detection and discrimination at standoff
* Capability provides detection, classification, recognize and identify technologies that can yield and disseminate likely intent of UAS/UGV
* Capability to identify the composition, features, size, weight, speed, direction, etc.
* Artificial intelligence and machine learning analytics to aid in determining the scope andscale of threat
* Capability to transmit collected data within and throughout denied / degraded communications and GPS environments, such as multistory high rise structures and/or subterranean spaces and to an internal/external base of operations, ground / air vehicles or Soldier for immediate (near-real or real time) analysis
* Capability to transmit and receive sensor data to smart glasses / goggles or heads-up display to enable Soldiers to visualize information on a mini-display in front of their eye to allow receiving information within and external to denied / degraded communication and GPS environments
* Detection technologies that are scalable and networked into a layered, multi-platform (UAS/UGV mountable, Soldier packable, mule mountable, static) means
* UAS mounted detection on random flight patterns to keep the adversary guessing
* Ability to discriminate unconventional payloads and other anomalies on friendly or enemy UAS/UGV. Discrimination allows probability of UAS threat, classification of UAS payload threat, and potential severity of that threat
* Capability has artificial intelligence ability to allow the maneuver commander increased freedom of maneuver and situational understanding

**Neutralize Non-friendly UAS/UGV**

* Ability to neutralize UAS/UGV threats and micro/swarm UAS via scalable lethal/non-lethal means in dense urban terrain
* Capability provides Soldier-level, vehicle, UAS/UGV, or tripod-mounted scalable lethal/non-lethal engagement of threat UAS’ and UGVs within and around dense populations, high rise buildings and subterranean spaces.
* The vehicle and tripod mounted systems are operated through enhanced AI, which assist in limiting collateral damage.
* Effective in confined spaces (interiors and subsurface) and dense urban canyons to neutralize threats
* Capability has artificial intelligence ability to allow the maneuver commander increased freedom of maneuver and situational understanding

**Autonomous Repeaters**

* Capability to provide an autonomous unmanned ground vehicle and or unmanned aircraft system radio frequency repeater suite that follows the unit to optimize and provide continuous and uninterrupted communications and data links within dense urban terrain
* Capability for a suite of remote, augmented, semi or full autonomous man-portable and configurable small unmanned aircraft systems and or small unmanned ground vehicles with maneuver and navigation behaviors in denied / degraded communication and GPS in and around interiors of high rise structures, dense urban canyons and subterranean spaces
* Capability to conduct collaborative missions by swarming and cooperation (e.g., multiple small UAS and or small UGVs) with sense and avoid (density of buildings, population, obstacles, internal and external to buildings and subterranean spaces) behaviors throughout dense urban environments
* Provides an intelligent command and control and communication repeater node suite to determine signal strength and when to nodes must move
* Capability to transmit collected data within and throughout denied / degraded communications and GPS environments, such as multistory high rise structures and/or subterranean spaces and to an internal/external base of operations, ground / air vehicles or Soldier for immediate (near-real or real time) analysis
* Capability can receive and transmit assured positioning, navigation, and timing (PNT) information, and serve as pseudo satellites (e.g., pseudolites) of the unit and or robots within and external to denied/degraded communication and GPS environments
* Integrated Soldier-level systems (refer to ‘Soldier-level Situational Understanding’ area) are part of intelligent autonomous repeater suite
* Capability has the ability to perch, land, attach and remain static for a period of time on or within high rise and subterranean structures
* Capability has the ability to traverse (e.g., crawl up building exterior) high rise building exteriors and remain static for a period of time
* The repeater suite is man and or ground vehicle portable and deployed on a UAS’/UGVs, ground vehicles and or Soldiers to allow units to rapidly create a command and control and communication network within a dense vertical urban terrain and underground environments
* UAS/UGV may carry additional communication nodes to drop and leave in place (e.g., street, subterranean, inside buildings, rooftops, etc.)
* Capability will move (e.g., air, ground) as the unit moves through and within dense urban terrain (e.g., subterranean, street, high rise buildings), keeping command and control and communication lines open, mitigating non-line of sight issues
* Capability has artificial intelligence ability to allow the maneuver commander increased freedom of maneuver and situational understanding

**Autonomous Light Weight Aerial Sensors**

* Capability mitigates the limited and restricted field of view and line of site issues with fixed or emplaced ISTAR sensors in dense urban terrain
* Provides autonomous ISTAR sensors on UAS/UGVs that determines their optimal sensor deployment to provide continuous ISTAR and tracking of identified threats within dense urban terrain
* Capability for a suite of remote, augmented, semi or full autonomous man-portable and configurable small unmanned aircraft systems and or small unmanned ground vehicles with maneuver and navigation behaviors in denied / degraded communication and GPS to map in and around interiors of high rise structures, dense urban canyons and subterranean spaces
* Capability to conduct collaborative missions by swarming and cooperation (e.g., multiple small UAS and or small UGVs) with sense and avoid (density of buildings, population, obstacles, internal and external to buildings and subterranean spaces) behaviors throughout dense urban environments
* Capability to transmit collected data within and throughout denied / degraded communications and GPS environments, such as multistory high rise structures and/or subterranean spaces and to an internal/external base of operations, ground / air vehicles or Soldier for immediate (near-real or real time) analysis
* Small UAS sensor suite mobility maintains ISTAR, threat tracking and sensor handoff for engagement throughout complex and or confined terrain, to include line of sight obstacles, both within and around high rise buildings and subterranean spaces.
* Capability will mitigate fragmented ISTAR of fixed, or emplaced sensors with dynamic and optimized sensor distribution throughout dense urban terrain
* Capability of UAS suite allows units to maintain continuous ISTAR via optimal sensor deployment and tracking of identified threats within the dense urban environment
* Capability has the ability to perch, land, attach and remain static for a period of time on or within high rise and subterranean structures
* Capability has the ability to traverse (e.g., crawl up building exterior) high rise building exteriors and remain static for a period of time
* Capability has a multi-sensor payload and or the ability to integrate different sensor payloads for additional sensing and detection collection (e.g., threats, personnel, hazards, air contaminates, etc.)
* Capability to transmit and receive sensor data to smart glasses / goggles or heads-up display to enable Soldiers to visualize information on a mini-display in front of their eye to allow receiving information within and external to denied / degraded communication and GPS environment
* Capability can receive and transmit assured positioning, navigation, and timing (PNT) information, and serve as pseudo satellites (e.g., pseudolites) of the unit and or robots within and external to denied/degraded communication and GPS environments
* Autonomous capability enables the suite to move as the unit moves through dense urban terrain and is unaffected by jamming or spoofing efforts
* Creates a distributed sensor network with dense urban environments
* Capability has artificial intelligence ability to allow the maneuver commander increased freedom of maneuver and situational understanding

For planning purposes, materiel brought to future events for experimentation are expected to be at a Technology Readiness Level (TRL) of 4 or greater. (DoD TRL definitions: <http://acqnotes.com/acqnote/tasks/technology-readiness-level>).

**SUBMISSION INFORMATION:** Responses to this RFI must be submitted using the prescribed attached formats in Annexes 1 and 2 (Information Paper and Quad Chart).

All Information Papers shall be submitted in Microsoft-Word file format and shall be less than two (2) MB in size. All Quad Charts shall be submitted in Microsoft-Power Point file format and shall be less than four (4) MB is size.

All responses shall be submitted via email to Christopher Wester, Contract Specialist at Email [christopher.m.wester.civ@mail.mil](mailto:christopher.m.wester.civ@mail.mil), **no later than 5:00 PM EST on Thursday 21 February 2019** and reference the synopsis number in subject line of e-mail, and on all enclosed documents. Information and materials submitted in response to this RFI WILL NOT be returned. You will receive an email verifying your submission was received. Each submission must address only one capability. However, multiple submissions addressing different capabilities may be submitted.

TELEPHONE INQUIRIES WILL NOT BE ACCEPTED. The Government will accept questions via email ONLY to [christopher.m.wester.civ@mail.mil](mailto:christopher.m.wester.civ@mail.mil).

DO NOT SUBMIT CLASSIFIED INFORMATION. The RFI is at the unclassified level. Respondents that intend to submit classified material must first submit an unclassified submission and request instructions for submission of classified material. Submission information may be For Official Use Only (FOUO). It is incumbent on the demonstrators to ensure that these restrictions are outlined in their submission.

DO NOT SUBMIT ACQUISITION PROPOSALS. Submit information papers only, in the prescribed format outlined in Annexes 1 and 2. No contracts will be awarded based solely on this announcement. Submission does not guarantee an invitation to participate in future experiments.

The submission of proprietary information is strongly discouraged, however technology developers shall assure that all proprietary information, documentation, and equipment are appropriately and clearly marked. Be advised that submission information will be disseminated within the Government to the appropriate Army SbT/DUE MATDEV CoP supporting orgainzations. If necessary, technology developers may be requested to provide additional information that will be used for consideration in future experiment planning.

**Basis to Participate in MATEx Technology Events:** Submissions will be reviewed by the Army SbT/DUE MATEDV CoP and their appropriate supporting Government organizations.

Consideration of submissions to participate in the experiments shall be based on the extent to which the technology meets the following considerations by the MATDEV CoP functional subject matter experts as defined above:

• Relevance to dense urban operations needs

* Relevance to objective concepts and capability and evaluation areas

• Technical maturity

• Relevance of or adaptability to military operations/missions

**FEDERAL ACQUISITION REGULATION (FAR) 52.215-3**: Per FAR 52.215-3 Request for Information or Solicitation for Planning Purposes (Oct 1997):

* The Government does not intend to award a contract on the basis of this RFI notice or to otherwise pay for the information.
* Although "proposal" and "technology developer" are used in this RFI, your responses will be treated as information only. It shall not be used as proposal content.
* In accordance with FAR 15.209(c), the purpose of this RFI is to request information from R&D organizations, private industry, and academia for planning and consideration in future MATEx technology events sponsored by ARDEC.

**Attachments:**

* Army\_Subterranean\_DenseUrbanCoP\_Materiel\_RFI\_Annex1\_InfoPaper\_20190107.docx
* Army\_Subterranean\_DenseUrbanCoP\_Materiel\_RFI\_Annex2\_QuadTemplate\_20190107.pptx