OBJECTIVE: The mobility of tactical command centers and other key communication assets is a critical capability in future conflicts. To enable Soldier survivability, critical Command Post based assets will need to move freely and rapidly on the battlefield, increasing mission command capability. A VMECoP that can be expanded and torn down quickly would allow for short notice movement of the mission command capability, reduce vulnerabilities, and increase lethality. The expandable capability of this system is critical as non-expandable shelters provide limited square footage and reduce potential.

DESCRIPTION: U.S. Army’s high-level objectives dictate that timely movement of mission command and tactical intelligence assets shall be prioritized. Forward mission command and tactical intelligence assets shall be mobile, achieving operational maneuverability in all environments and at a high operational tempo. Future Command Posts must have greater tactical mobility to support mission command in the current Multi-Domain Battle. Specifically, the emplacement, erect/strike of the VMECoP must be completed in mere minutes.

Historically, the Army Standard Family International Standardization Organization (ASF ISO) expandable shelters have been utilized for a range of high value tactical functions, for example: Command/Control and Deployable Surgical Operating Theaters. These are transported to a site, off loaded with either 15K MHE or a special purpose vehicle. Once in position, the shelter is expanded, power is connected, and the desired mission performed. Tear down of the system would follow the reverse order of set up. Asset removal would again require a 15K MHE or special purpose vehicle. The process of moving an expandable shelter and its associated high value tactical system has historically been orchestrated with the coordination of 4 or more Warfighters, a 15K MHE or special purpose vehicle and careful coordination of all support equipment (power generation, power distribution, and environmental control units (ECUs)) which must be transported separately to support the capability.

The current ASF ISO Expandable Shelters conform to 8ft x 8ft x 20ft ISO shipping container envelope, as defined by ISO 668 Series 1 freight containers – Classification, dimensions and ratings. The current ASF ISO Expandable Shelters meet the structural requirements of ISO 1496-1 Series 1 freight containers – Specification and testing – Part 1: General cargo containers for general purposes. In the deployed configuration, the existing ASF ISO Expandable Shelter, 1 sided expandable provides 265 ft2 of interior space. Any proposed shelter would have to provide similar square footage. The common ISO interface of the existing shelters facilitates standardized material handling, transportation methods, and equipment integration, and would be required on any proposed design.

The proposed VMECoP solution shall meet the threshold requirements as shown in Table 1 below:

Table 1: Performance Metrics for Vehicle Mounted Expandable Command Posts - TABLE WILL BE UPLOADED WITH TOPIC

It is imperative that the proposed designs take into account both speed and Warfighter safety during deployment. Additionally, the stability of the expanded floor sections while in the deployed configuration is critical. If a powered assist is used to deploy the shelter, designs must consider the source to provide this power and its impact on the time required to achieve the basic deployment of the design. The current ASF ISO Expandable Shelters one side expandable should be considered as the baseline technology for this effort to improve upon.

The current Expandable ASF ISO Shelters can be shipped by road, rail, internal and external air transport, sea and moved via common MHE. Additionally the current Expandable AFS ISO Shelter can operate in conditions ranging -40F to 120F and survive exposure to temperatures from -70F to 160F. The one sided ASF Expandable Tactical Shelter provides a power/data entry panel and removable panels for a ducted ECU, but is not integrated with power generation assets nor ECU capability. Offers should consider proposing solutions incorporating power generation and ECUs systems as well. Innovation is encouraged when accounting for interfacing with, transporting and or integrating power generation and ECU equipment.

U.S. Army high-level objectives dictate that timely mission command and tactical intelligence shall be prioritized. Forward mission command and tactical intelligence assets shall be highly mobile, achieving operational maneuverability in all environments and at a
high operational tempo. Command Posts must provide greater capabilities to support Warfighters in the current Multi-Domain Battlefield. Smaller, highly mobile, command posts are easier to conceal and move and, therefore, more survivable. A mobile, command post remains essential to command and control in future dispersed, decentralized, multi domain operations. It is also required to enable command from any location, assess the situation firsthand, make decisions rapidly, and influence people and operations to maintain or regain the initiative on a lethal battlefield.

As the objective is to increase Command Post capabilities, the proposed MMECoP design should exhibit the following characteristics:

• Shall meet or exceed the Threshold metrics established in Table 1.
• Shall be operationally deployable within an 8’ x 8’ x 20’ ISO 1C freight container envelope and requirements as defined by ISO 668.
• Shall meet CSC transportation requirements as defined by ISO 1496-1.
• Shall meet system weight objective values in Table 1.
• Shall have a pay load as stated in Table 1.
• Shall mitigate unsafe or hazardous conditions when shelter is deployed (set-up) while mounted on a vehicle.
• Shall exhibit mechanical stability of the expandable components when deployed.
• Shall not cause or shall mitigate unsafe of hazardous conditions when power generation and ECU equipment are in operation while the shelter is mounted on a vehicle.
• Shall minimize the logistical burden on the supply chain, and not require the transportation of unsafe or hazardous materials/chemicals.
• Shall interface with military power connectors. Current ASF ISO Expandable Shelters interface with 100A or 60A Class-L 208V 3-phase power connector (MIL-DTL-22992).
• Shall provide an interface for external data and communication systems on fixed end wall.
• Shall have an overall heat transfer coefficient less than or equal to 0.26 Btu/(h*ft²*°F) in the operational configuration. It is desired the overall heat transfer coefficient be less than or equal to 0.22 Btu/(h*ft²*°F) in the operational configuration.
• Shall interface with a logistically supported ECU: ducted 60K IECU and 60K FDECU.
• Designs solutions are not required to be an entirely rigid walled shelter system. Innovative approaches to fast deployment and strike are encouraged.
• Shall be deployed and struck at a minimum of 50 times without loss of functionality of component failure
• It is desired that the system perform fully in extreme environmental conditions from -60F to 120F
• Shall have an estimated production price of $150,000 or less.
• Shall be compatible for use with military vehicles. The following vehicles are listed as examples: M939 5 Ton Truck, Army Medium Tactical Vehicle Truck (MTV), and the Heavy Expanded Mobility Tactical Truck (HEMTT)
• Shall withstand a roof load of 40 psf.
• Desired: provide environmental control to the inhabitants of the shelter
• Desired: provide on board power generation
• Desired: capability to complex to other VMECoP or Army tent systems.

PHASE I: The Phase I awardee shall develop/prototype a VMECoP design addressing the aforementioned requirements. The awardee shall report monthly on their progress, in the form of a technical report indicating accomplishments, technical drawings, project progress against proposed schedule (manage to budget), tables, graphics, and any other associated test data. Deliverables:• Six monthly reports, with each report containing the following: o Technical progress to date, against proposed requirements and schedule. o Technical achievement highlights, as well as problems or decision-points reached. o Draft of Interoperability analysis for VMECoP transport o Draft of analysis and visualization of the VMECoP expansion and striking sequence. The analysis of expansion and striking sequence should include a discussion of recommended safety features and potential safety hazards. o Draft of recommended testing to include at a minimum: dimensional, environmental, and transportation. o Expenditure to date, against proposed schedule. o Within first two reports, present market research of all existing and future expandable shelters and their applicability to a military deployment. • Final Technical Report suitable for publishing on to the Defense Technical Information Center (unclassified) that describes the project, the work performed and recommendations. • A Final Concept Package shall be submitted containing the following: o A system model. The system model should be a small scale model, physical or virtual, that would convey confidence in the system would meet deployment and set up times listed in the objective and description sections. o Analysis and visualization of the shelter’s expansion and collapse while both vehicle mounted and emplaced on the ground. The analysis of expansion and striking sequence should include a discussion of recommended safety features and potential safety hazards. o Demonstration of the erect/strike capabilities of the system demonstrator model o Finite Element Model demonstrating structural integrity of proposed design and structural capability to withstand deployment/strike loads of 50 cycles. o Small samples of materials representing the floors, walls, and structural/mechanical components of the shelter shall be provided that would demonstrate confidence that the system would meet the required characteristics and properties listed. o Concept level technical drawings, showing the shelter expanded and collapsed. o
High resolution graphics of the proposed concept. A concept for interfacing with power generation, power distribution assets, and ECU equipment. Interoperability analysis for transport, loading, unloading. Analysis and visualization of the shelter’s expansion and collapse. The analysis of expansion and striking sequence should include a discussion of recommended safety features and potential safety hazards. The proposer shall construct a list of recommended testing to include at a minimum: dimensional, environmental, and transportation. Transportation testing should include appropriate tests for movement via rail, ground, internal and external air, and transport via common MHE. At a minimum this list of tests should include: • ISO compliance testing, • Convention for Safe Container (CSC) • Environmental Testing • Road Transportation testing. A cost analysis of the systems life cycle, including the cost of maintenance items and consumables, as well as the initial capital cost of procuring the system – over 5 years.

PHASE II: Phase II is a significant R&D effort resulting in a fully functional, full scale VMECoP prototype. Additionally, the prototype developed shall at a minimum meet the threshold requirements listed in the Description section of this document. The Phase II effort will focus on prototype development, validation of function and demonstration. Required Phase II tasks and deliverables will include: • “Monthly” and “Final” reporting, as detailed in Phase I, to cover the 24 month Phase II “Period of Performance” • Deliver technical drawings of VMECoP. • Deliver editable 2-D CAD files or 3-D model of the VMECoP, Solidworks format desired. • Deliver high resolution graphics of the final prototype. • Deliver user manual for the prototype. • Modifications and improvements to FEA models developed in Phase I to represent the full scale, final design, including analysis of erect/strike loading. • Devise maintenance plan, and indicate all supplies needed, including cost, quantity, and frequency of replacement thereof. • Transportation testing reports, required transportation testing per agreed upon list produced as part of Phase I. • Deliver a complete VMECoP prototype exhibiting the desirable performance characteristics listed in the description section above. Delivery should be to Base Camp Integration Lab, Fort Devens, MA or mutually agreed upon alternative venue. • Demonstrate each of the performance characteristics of the VMECoP as listed in the description section above. • Demonstrate interoperability with a vehicle. • Vendor to provide a commercial flatbed vehicle for demonstration purposes. In addition to a commercial flatbed vehicle, the Government may provide a military vehicle for demonstration purposes, pending availability of such vehicle. The following vehicles are listed as examples: M939 5 Ton Truck, Army Medium Tactical Vehicle Truck (MTV), and the Heavy Expanded Mobility Tactical Truck (HEMTT). • An updated cost analysis of the systems life cycle, including the cost of maintenance items and consumables, as well as the initial capital cost of procuring the system – over 5 years. • A final report suitable for publishing onto the Defense Technical Information Center (unclassified) that describes the project and the work performed. An addendum shall also be provided which provides full detail and test results of the system developed, the system performance and the method by which the performance characteristics in the Description section were achieved.

PHASE III DUAL-USE APPLICATIONS: The initial use of this technology is for highly mobile military tactical capabilities, but we foresee an extension of the technology to other governmental organizations and commercial industry. For example, the following areas have been identified as commercial markets requiring improvements in the mobility of tactical shelters:

- Mobile environmentally controlled space, required for:
  - humanitarian medical efforts,
  - disaster response,
- And commercial construction applications.

The potential for Dual Use applications of the Dynamic Expandable VMECop, would grow rapidly once power generation and HVAC assets are integrated into the structure itself.

REFERENCES:

2. Test Operations Procedure (TOP) 10-2-175 Tents and Shelters, UA Army Aberdeen Test Center; dtic.mil/dtic/tr/fulltext/u2/a548259.pdf
5. TECHNICAL MANUAL, OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL MAINTENANCE FOR SHELTER, TACTICAL, EXPANDABLE, ONE-SIDED; liw.logsa.army.mil/etmapp/api/general/search/059982/0/pdf


11. Table 1: Performance Metrics for Vehicle Mounted Expandable Command Posts (UPLOADED IN SITIS 12/10/19)

Reference Document

KEYWORDS: Command Post, Shelter, Expandable, ISO, Vehicle, Tactical, Mobile