



Modular Assembly Shelter Kit (MASH Kit)

Problem

The military requires rapidly deployable, modular, rigid-walled modern sheltering systems that can meet the demands of full spectrum operations for forward deployed troops, from austere, platoon-sized bases to full, division-sized main bases. Current sheltering systems, such as tents and constructed B-huts, create challenging design, logistics, construction, and maintenance requirements that are sub-optimal to meet the demands of the current and future force. “Soft” infrastructure assets, i.e. tent camps, greatly decrease the effectiveness and efficiency of enduring operations, while “hard” and more permanent infrastructure assets constructed in “stick-built” modality take considerable time, logistics, and manpower to build.

Approach

The Modular Assembly Shelter (MASH) Kit (Patent # 10,612,233), developed by the Construction Engineering Research Laboratory (ERDC-CERL), is an innovative system designed to use lightweight materials for expeditionary shelters, and capitalize on the advantages of large scale 3D printing, or additive construction (AC), for repetitive manufacturing. The MASH Kit concept uses pre-engineered construction techniques to produce a kit-of-parts for rapid assembly of a rigid shelter that is **modular, portable, durable** and **reusable**. When fully developed, the AC process can be performed near the point of need producing an assembly-ready system that does not need cure time for full structural strength.

Each MASH Kit contains standardized building components that enable tool-free assembly of discrete 6’ to 8’ long by 6’ to 8’ wide by 8’ high shelters. Modularity allows multiple MASH Kits to be joined to create structures capable of meeting a range of functional, footprint, environmental, and user requirements for rapid shelters in austere locations. A single kit can be used for an individual shelter or multiple kits can be combined to expand the footprint and accommodate more people. Additionally, the system is anticipated to easily accommodate reconfiguration if the user needs to change the layout.

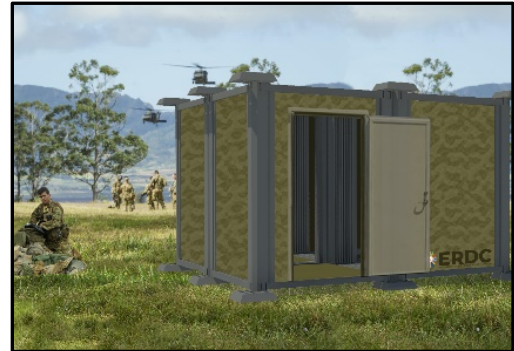


Figure 1. MASH Kit rendering with camouflage paneling

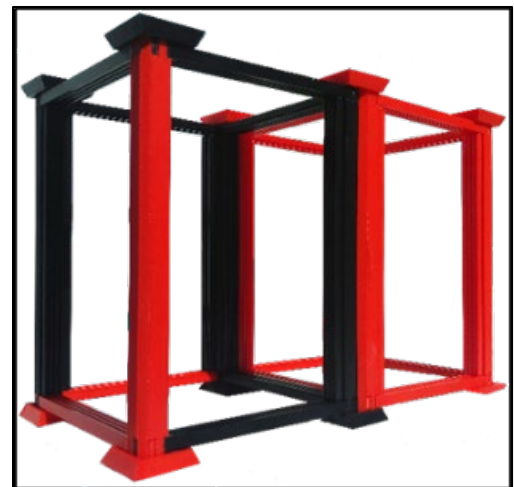


Figure 2. 3D printed model of two combined MASH Kits (bi-coloring not significant).

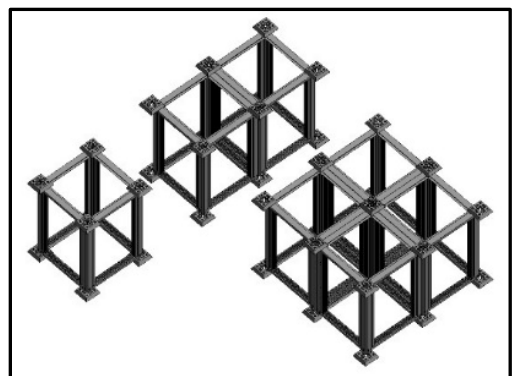


Figure 3. 1, 2 and 4 modular MASH Kits joined for increased square footage.

Benefits

MASh Kit Modularity enables:

- Plug-and-Play parts for low maintenance
- Easy replacement of damaged parts without manufacturing a whole new kit
- Rapid assembly--does not require bolts, fasteners or hinges
- Easy assembly—does not require heavy equipment or power tools

MASh Kit Design:

- Leverages interchangeable parts—e.g., floor and roof beams, as well as footers and headers share consistent shape and design
- Uncomplicated and efficient gravity loaded joinery techniques for easy assembly using non-skilled labor
- Enables repeated assembly/disassembly

MASh Kit Offers:

- Decreased logistics, design and contracting time
- Increased efficiencies for military and disaster relief operations
- Quick, onsite adaptation to mission requirements
- Rapid force projection with potential protection against hostile forces and hostile environments
- Increased mobility and rapid deployment comparable to soft sided shelters combined with rigidity and strength of stick-built shelters
- Enhanced construction logistics through easily constructed/destroyed units following mission completion

MASh Kit Additional Applications:

- Humanitarian disaster relief efforts
- Shelter for long term refugee and displaced persons
- Temporary on-base housing to accommodate troop fluctuations
- Consumer storage applications

Technical Readiness

Although the patent process granted exclusive rights to make and use the MASh Kit, this shelter has not yet been manufactured or tested at full scale. Full scale production is needed to facilitate research and testing of optimal material feedstock, component connection designs, structural integrity, and 3D printing setup. This testing is needed to ensure that the MASh Kit meets and/or exceeds JSB-ESBE requirements for expeditionary structures.

The MASh Kit also requires comparative analysis against existing military shelter systems in terms of ease of use, production timelines, logistics, and end user point-of-need adaptability.

MASH KIT...MOBILE, RAPID ASSEMBLY LIKE A TENT, RIGID AND STRONG LIKE A B-HUT!

Point of Contact

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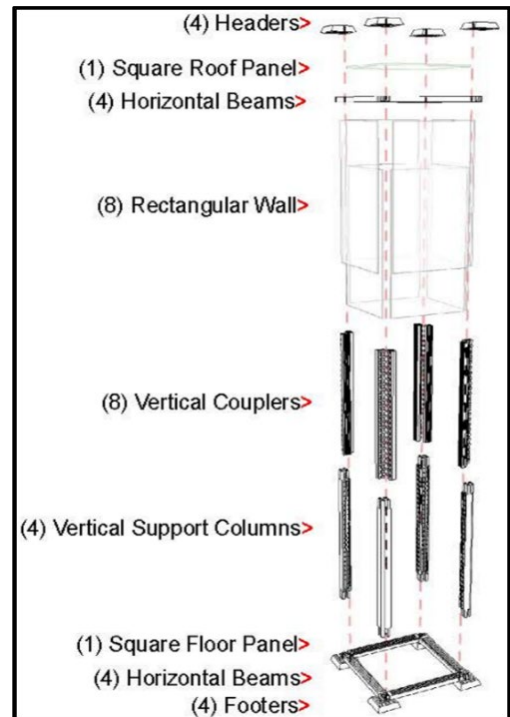


Figure 4. Joinery techniques shown in exploded axon.

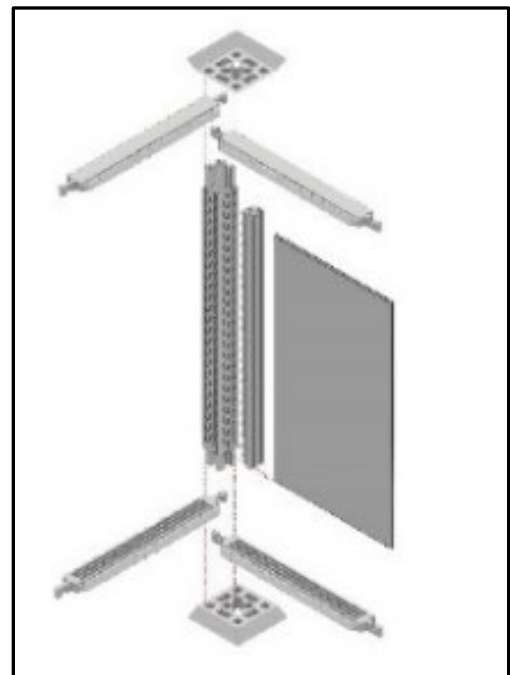


Figure 5. Joinery techniques shown in exploded axon.