

# Expeditionary Basing and Collective Protection Directorate

## Fabric Structures Team

JOCOTAS May 19, 2015



**FST Goal:** Advance technologies related to fabric shelter systems, energy reduction and base camp equipment.

**Technologies:**

Advanced fabric structures including airbeam shelters:

- Maintenance Shelters
- Mobile Warehouses
- Large Command Posts
- CB Medical
- Backpackable

**The Team:**

- Kristian Donahue - Chemical Engineer
- Robin Szczuka – Chemical Engineer
- Liz Swisher – Electrical Engineer (Team Leader)
- Chris Aall – Mechanical Engineer
- Allyson Stoye – Chemical Engineer
- Patti Cummings – Administrative Support

**Textiles**

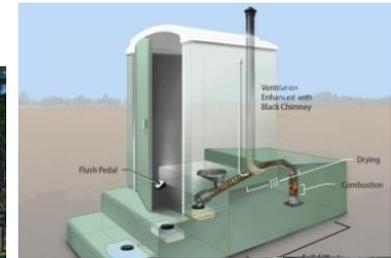
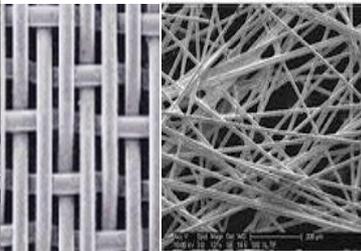
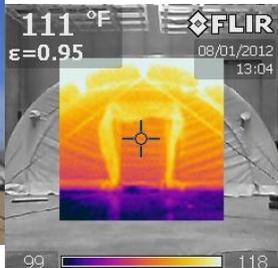
- Energy Saving Insulation
- Radiant Floor Heating

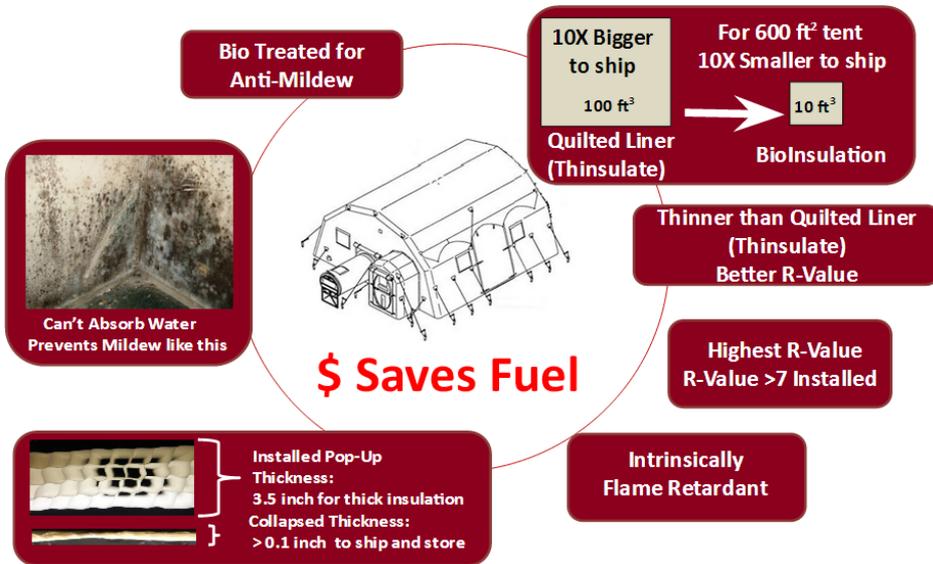
**Collective Protection – CB Defense:**

- Overpressure/Negative Pressure Shelters
- CB Fabrics
- Reactive Airlocks
- Self-Decontaminating Fabrics

**Life Support Systems:**

- Water Demand Reduction
- Black Waste Treatment





## Purpose:

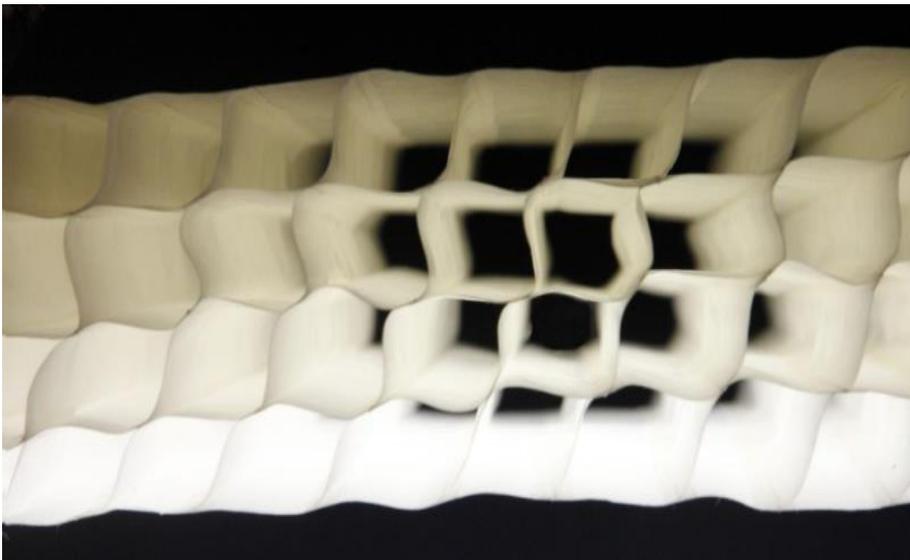
- To reduce fuel and logistics costs by fielding lighter, more compact collective protection liners with high R-value, 10 times smaller packing volume than other high R-value liners. Improves health with a safe, proven biocidal surface treatment for pathogen inactivation and mold/mildew prevention for PM Force Sustainment Systems, mobile medical and peacekeeping shelters.

## Products:

- High >7 R-value with 10X smaller packing volume of same class insulation
- Modular, easy-to-install liner panels
- Intrinsically fire-retardant liner
- Rechargeable chloramine surface prevents mildew and reduces infection

## Payoff:

- Reduces fuel costs, packing volume, logistic burden, mildew growth
- Biocidal protection easy to recharge
- Cost Benefit of \$148.1M with ROI of 60.1:1





**Purpose:** Investigate research advances by industry and academia in multi-functional nonwoven textiles. Evaluate cutting edge technologies that have progressed beyond basic research and determine their potential application within expeditionary basecamps. Optimize textile properties within the most promising identified substrates incorporating application specific requirements.

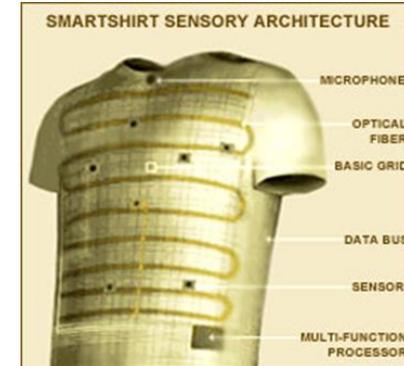
**Product(s):**

- Target nonwoven would reduce the weight, cube and/or cost by 20% compared to the current tentage materials.
- Nonwoven application to different areas of basecamps with emphasis on the flame resistance technology and durability.

**Payoff:**

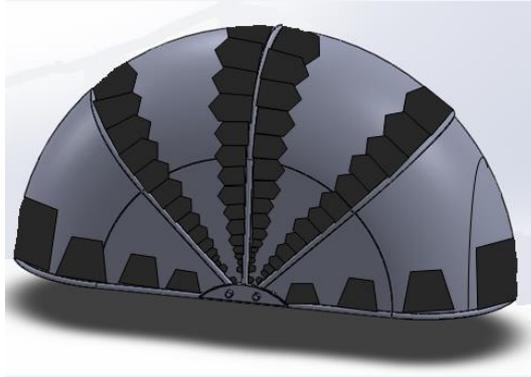
- Cost saving through simplified manufacturing
- Innovative applications with the potential to reduce weight of overall system

- Center of Excellence with extensive corporate interaction
- Applied research at premises with graduate and post grad students
- Proximity and agreement with one or more universities with Textile program
- Researchers from Academia and Industry coming together for short term projects
- Industry, Government and Academic experts on advisory boards and available for consultation to members
- Tie together network of DoD and other agency labs
- Robust training and retraining program
- Collaboratively share member facilities for projects



Images from Revolutionary Fibers and Textiles Institute

# Hands-Off Expeditionary Tent (HEXT) Frame Concepts



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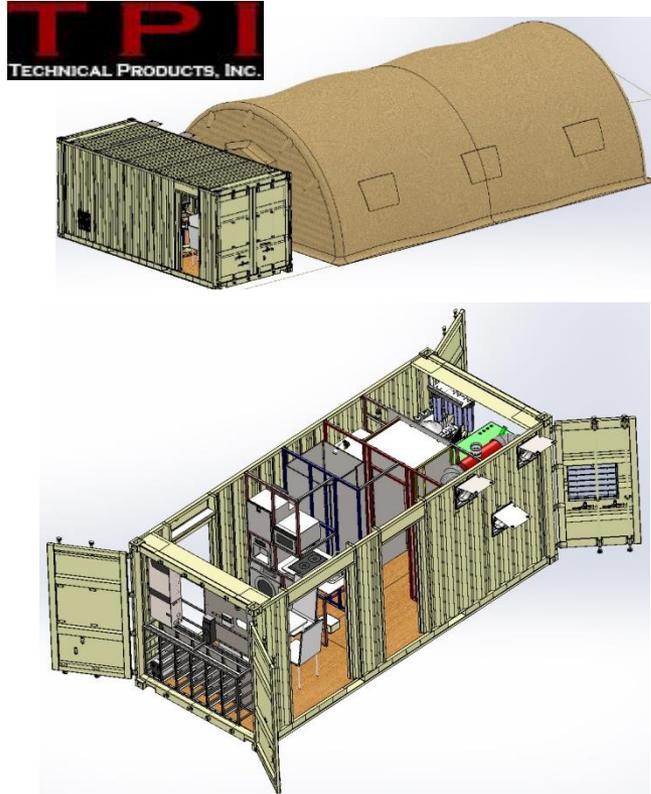
**Purpose:** Investigate non-traditional tent support systems that incorporate quick, self-deployable automated techniques such as hydraulics, robotics, electronic controls etc.

**Product(s):**

- Market investigation
- Student research project
- Concepts, designs and prototyping of non-inflatable rapidly deployable tent frame technology that is lightweight with a low packing volume for storage and transportability
- Final report documenting program initiatives and outcomes

**Payoff:**

- Reduction in the time and manpower required to deploy a tent system without sacrificing durability and shelter performance
- Maintaining affordability in comparison to current TEMPER airbeam systems

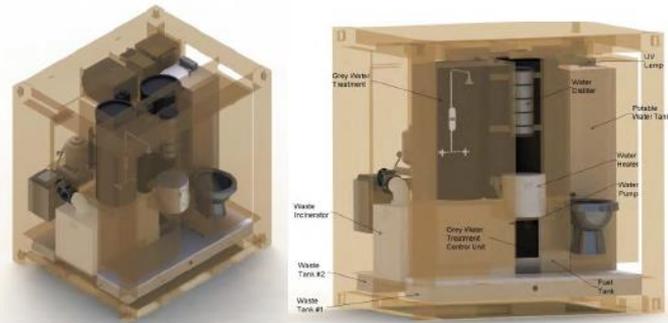


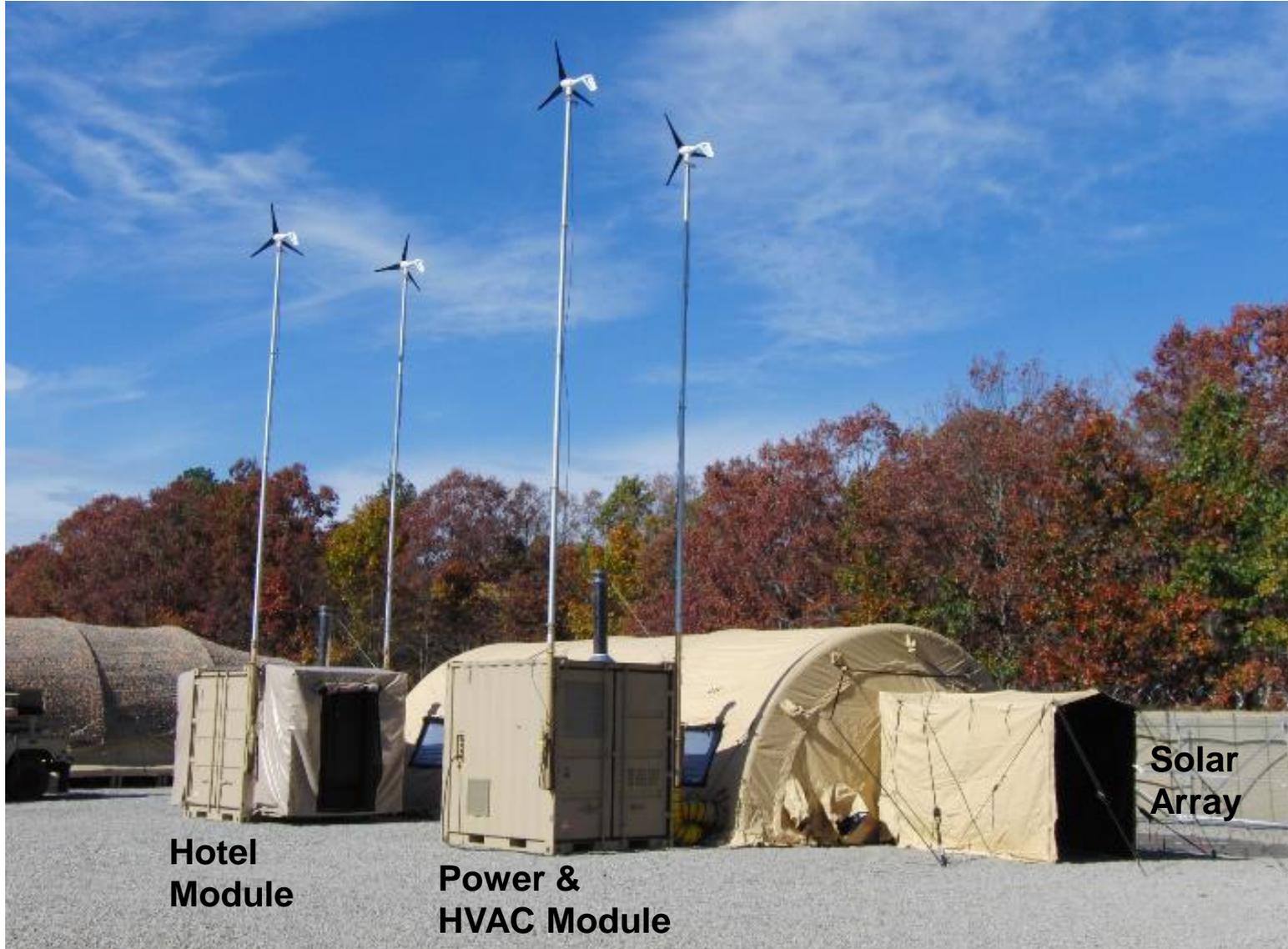
**Purpose:** Study and demonstrate interrelationships between expeditionary camp systems to minimize fuel & water demand while improving quality of life

• **Background:** Advanced through NSRDEC 6.2 S&T and follow-on Rapid Innovation Fund (RIF) investment with Industry partner Technical Products, Inc., Sterling, MA

• **Products:** Demonstration of prototype system(s) suitable to support 20 personnel

- 3 Module Tri-Con Concept: 1) Life Support 2) Energy 3) Billet Tent Transport & Storage
- 20 foot ISO that integrates with billeting tent





**Hotel  
Module**

**Power &  
HVAC Module**

**Solar  
Array**



## Schedule & Cost

MILESTONES	FY12	FY13	FY14	FY15
Concept Design & Breadboard Model	■			
Design Refinement		■		
Fabrication and Integration of Technologies		■	■	
Full System Validation and Review			■	
STO-D Demonstration			■	◆

Milestone Indicators: TRL or SRL: ◆ Milestone Timeline: ■

### Purpose:

- Study the complex Contingency Basing inter-relationships of habitation, life support and organizational equipment
- Design and fabricate a SLiM that provides life support functions for approximately 20 Warfighters into a global architecture with scalable infrastructure capabilities

### Results/Products:

- A SLiM (TRL 6) which will at a minimum:
  - Provide shelter/billeting, hygiene (shower/latrine), limited food preparation, waste management or repurposing, and laundering for around 20 personnel
  - Maintain habitable internal temperatures and living conditions
  - Be expeditionary in nature (regardless of environmental conditions/water exposure) - compactable for shipment/transport, air-droppable or vehicle carried/towed
  - Minimize manpower required for set-up, no MHE required
  - Interoperate with standard base camp utility structures
- SLiM Safety Assessment Report & User Guide
- Models and Verification Test Results
- SLB STO-D Sustainability and Logistics Basing transition in FY16

### Payoff:

- Increase efficiencies in power and water consumption, waste management.
- Decrease of operations and maintenance costs
- Increased Warfighter focus on mission operations vs. base camp establishment
- Self-sufficient means of providing life-support functions in the field

The SLiM Billeting Module will be demonstrated at NSRDEC during June 2015. On-site testing will be performed to determine overall energy requirements.

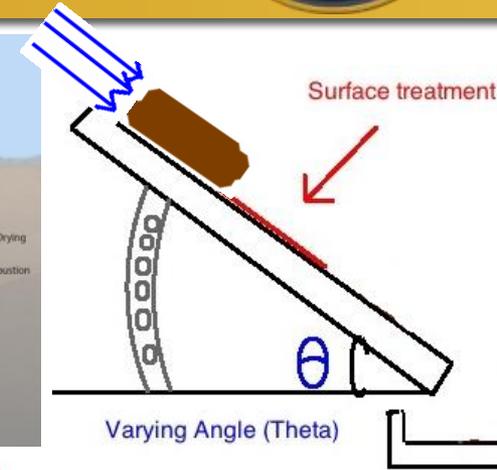
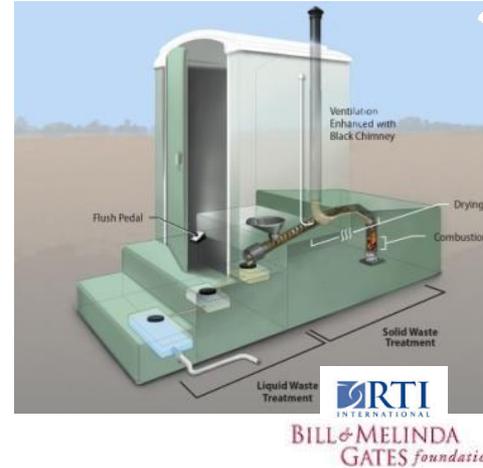


Technology is currently tracked to be included as part of the SLB STO-D integrated base camp demonstration during FY16.



## Latrines

- Established relationship with RTI and the Bill & Melinda Gates Foundation “Reinvent the Toilet” initiative
- Electrochemical urine disinfection module being evaluated
- Investigated hydrophobic super-slippery coatings



## Showers

- Quantitative test method developed and verified
- Beginning of second test iteration with TPI.



## Laundry

- Xeros pelletized laundry system



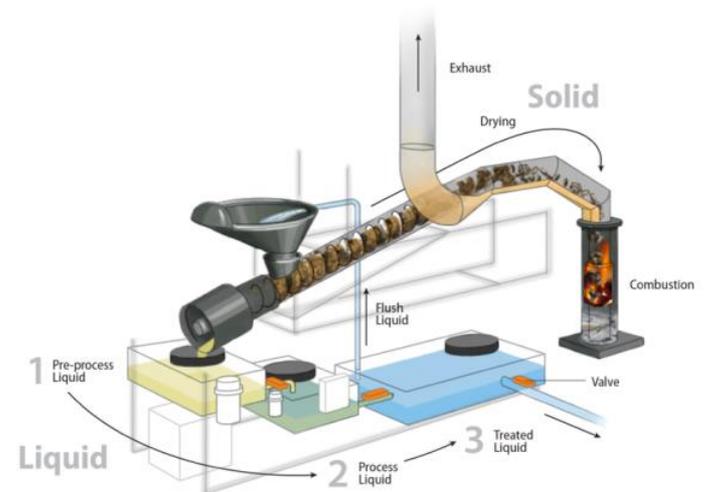
Description:

- Investigate integrated technology approaches for handling and treatment of black waste generated by latrines at expeditionary, forward located combat outposts

Characteristics that will be minimized include:

- Water use
- Power use
- Processing Time
- Odor
- Sound
- Cleaning/Maintenance
- Weight, cube & cost

- The design, if possible will minimize:
  - Biological or chemical materials that require special handling
  - Special bags or liners
  - High maintenance items like seals or flaps
- Technology approaches being investigated include:
  - Separation at source design
  - Gravity-driven filtration (or powered via renewable)
  - Electrochemical breakdown powered by renewable energy (solar and/or wind)
  - Precipitation
  - Ion-Exchange
  - Concentrated solar evaporation
  - Distillation
  - Reverse Osmosis
  - Dehydration



# *Questions?*