

# Expeditionary Basing and Collective Protection Directorate

## Fabric Structures Team

Army Natick Soldier RD&E Center  
PAO U14-502  
JOCOTAS Nov 2014



# Fabric Structures Team Overview

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

**Technologies:**

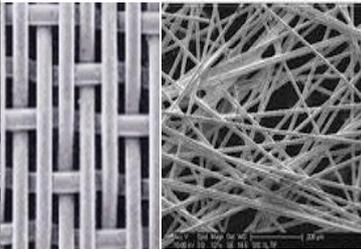
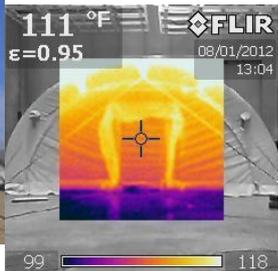
Advanced fabric structures including airbeam shelters :

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

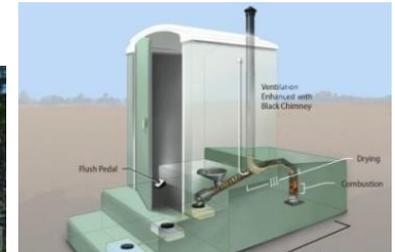
- Textiles
- Energy Saving Insulation
- Radiant Floor Heating

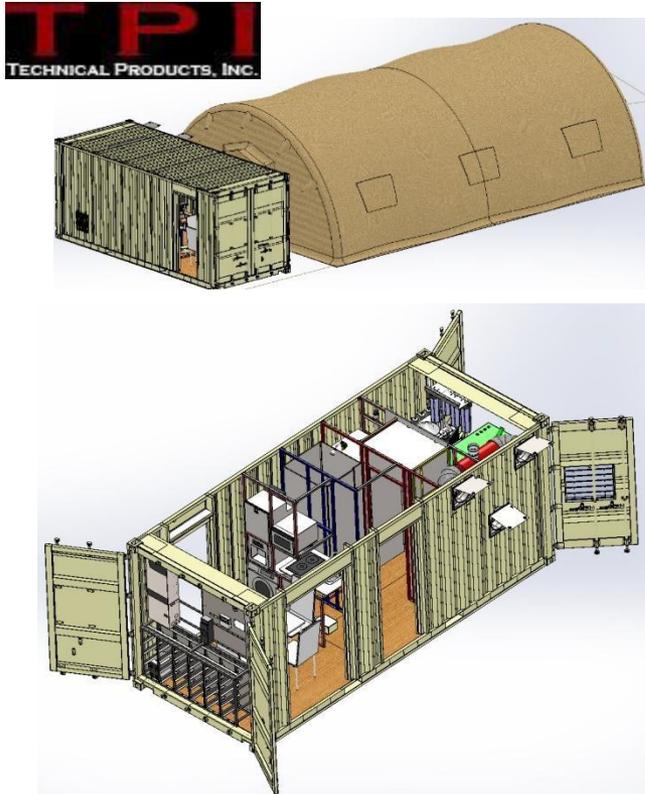
- Collective Protection – CB Defense:
  - Overpressure/Negative Pressure Shelters
  - CB Fabrics
  - Reactive Airlocks
  - Self-Decontaminating Fabrics

- Life Support Systems
- Water Demand Reduction
- Black Waste Treatment



Woven vs. Nonwoven

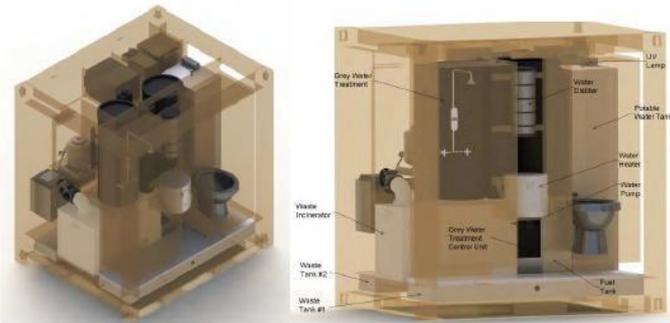




- **Goal:** Study and demonstrate interrelationships between expeditionary camp systems to minimize fuel & water demand while improving quality of life
- **Background:** Advanced through NSRDEC 6.2 S&T and follow-on Rapid Innovation Fund (RIF) investment with Industry partner Technical Products, Inc., Sterling, MA
- **Approach:** Demonstrate 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

• **Status:**

- Completed 1 year of 2
- Downselection to 1 concept
- Improved design and delivery of 1 concept





**Hotel  
Module**

**Power &  
HVAC Module**

**Solar  
Array**

**Latrine Technology: Net-Zero,  
No Water, Recycling**



**Laundry: High Efficiency  
Technologies**

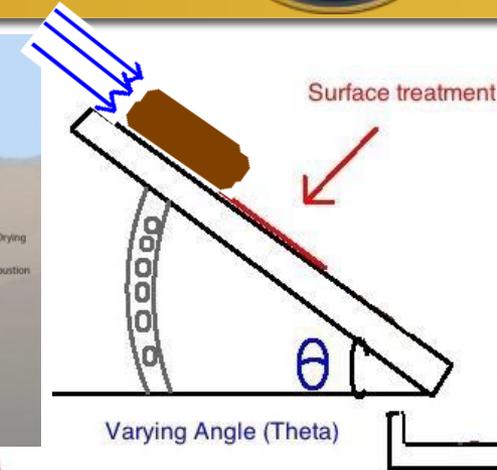
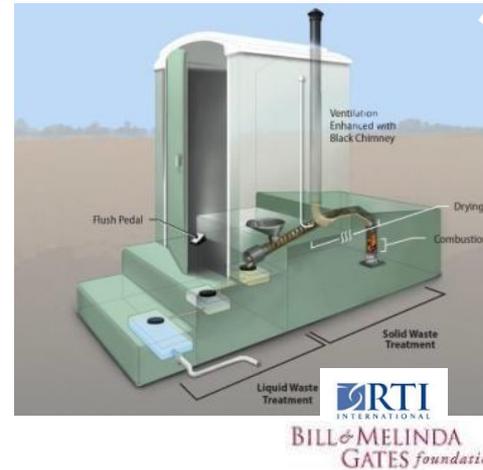
**Showers: Quantitative  
& QOL Performance**



- Investigation of current water demand reduction technologies.
- Assessment of technology net water reduction vs. energy consumption.
- Test and evaluation of proposed water demand reducing technologies.
- Prototype component/desktop-scale water demand reduction technology.
- End user qualitative feedback on prototype system.

## Latrines

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



## Showers

- Quantitative test method developed and verified



## Laundry

- Xeros pelletized laundry system



- ✓ Improve Sanitation
- ✓ Net zero water use
- ✓ Net zero power use



## Purpose:

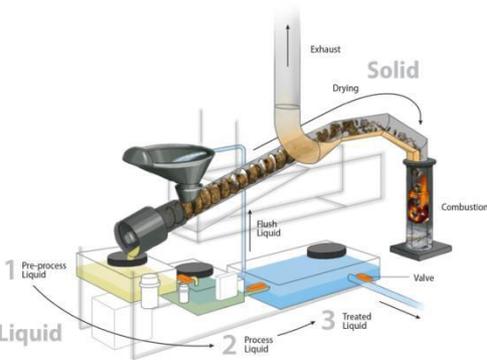
Develop a low maintenance net zero power and water black waste treatment system for expeditionary combat outposts that improves hygiene, habitability and lowers logistical burden through reductions in water, fuel and back haul of waste.

## Product:

- Final report documenting research conducted, technologies investigated, tests & demos
- Breadboard prototype(s) tailored to funding level - subscale and components
- Draft specification that captures the technology performance

## Payoff:

- Reduced waste effluent and backhaul of waste
- Lower source water demand from black water re-use
- Fuel savings resulting from decreased waste burning
- Improved Hygiene, Habitability and Soldier Health
- Potential reduction in personnel involved in maintenance, removal and disposal of waste



- The most effective black waste treatment system will utilize a combination of technical approaches to maximize breakdown speed and effectiveness of contents which in addition to nitrogen and phosphorus includes pathogens, hormones, and pharmaceutical residues.
- Characteristics that will be minimized include:
  - Water use
  - Power use
  - Processing Time
  - Odor
  - Sound
  - Cleaning/Maintenance
  - Weight, cube & cost
- The design will minimize or eliminate the following where possible:
  - No special biological or chemical materials
  - No special bags or liners
  - No high maintenance items like seals or flaps
- Technology approaches to investigate 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

