Super Energy Efficient Containerized Living Unit (SuperCLU) Technology Design and Development

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Approved for public release; distribution is unlimited
**Super Energy Efficient Containerized Living Unit (SuperCLU) Technology Design and Development**

Super Energy Efficient Containerized Living Unit (SuperCLU) Project

Two Phases:

• Modify Existing CLUs at Camp Lemonnier
• Design/Build SuperCLU Prototype
Mission: Conduct operations in the East Africa region to build partner nation capacity in order to promote regional security and stability, prevent conflict, and protect US and coalition interests.
Camp Lemonnier, Djibouti

• Harsh Environment
  – Average Daytime Temperature (77 to 111 °F in 2010), can reach 125 °F during the day
  – High Humidity (Average Dew point was 72 °F in 2010)
  – Average wind flow 8 mph (gusts up to 34 mph)

• Personnel are Quartered in Containerized Living Units (CLUs)

• Increasing Population
  – Personnel at times Outnumbers available CLUs
• Energy Production comes from Diesel Power Generators
  – Generators run 24/7 (8 x 1.3 MW Caterpillars, 6 x 0.8 MW MUSE, 130-140 smaller generators)
  – Approximately 11,000 gallons of diesel fuel is required to run the generators daily (2010)
  – Estimated monthly cost for fuel is $600K-1000K ($3 per gallon)
CLUs Current Condition uses 40% of Estimated Base Load
CLU's Current Condition
• Poor Air Distribution
• Large Difference in Air Temperature down length of CLU
• Oversized ACUs Cycle On and Off every 3-4 Minutes
SuperCLU Program Goals

• Reduce Energy Load for CLU
• Easy Set Up and Tear Down (One Day/2 Person)
• Maintain Ability to be transported as a ISO container
• Create Private Resting Space
CLU Constraints

• Limited downtime during repair
• No displacement of occupants
  – Work should only be done that can be completed during the day,
  – While occupants are away from CLUs,
  – Should not disrupt sleeping hours.
• Modifications should not limit CLU mobility in the camp
  – System installed needs to be able to be broken down fairly quickly
SuperCLU Energy Reduction Innovation Areas

- **Layout**
  - Increase People Housed per CLU
  - Reduce Cubic Feet of Conditioned Air
  - Enhance Individual Space (Individual Berthing Spaces)

- **Air Conditioning**
  - Type
  - Distribution

- **Insulation Material (Walls, Floor, and Ceiling)**

- **Rigid Building Material**

- **Building Component Connections**
  - No Heat Loss

- **Coatings**

- **Interior Design Improvement**
SuperCLU Concept
# Testing/Prototype Schedule

<table>
<thead>
<tr>
<th>Technical Test Event</th>
<th>Location</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation Component</td>
<td>TBD, RFI</td>
<td>3-4Q12</td>
</tr>
<tr>
<td>• Thermal performance, durability, flame</td>
<td></td>
<td></td>
</tr>
<tr>
<td>resistance, physical properties</td>
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<tr>
<td>Building Component Seal (Thermal)</td>
<td>TBD, RFI</td>
<td>3-4Q12</td>
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<tr>
<td>Building Layout Design</td>
<td>NFESC, Port Hueneme</td>
<td>3-4Q12</td>
</tr>
<tr>
<td>HVAC Computer Model</td>
<td>NFESC, Port Hueneme</td>
<td>3-4Q12</td>
</tr>
<tr>
<td>Build Prototypes</td>
<td>TBD, RFI</td>
<td>2-3Q13</td>
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<table>
<thead>
<tr>
<th>Relevant Environment Test Event</th>
<th>Location</th>
<th>Timeframe</th>
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<tbody>
<tr>
<td>Various Trial SuperCLU Field Tests</td>
<td>WARTEC, 29 Palms CA</td>
<td>3-4Q13</td>
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<tr>
<td>(Energy, Temperature, Human Factors)</td>
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<tr>
<td>SuperCLU Field Test OCONUS (Energy,</td>
<td>Camp Lemonier, Djibouti</td>
<td>2Q14</td>
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<tr>
<td>Temperature, Human Factors)</td>
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</tbody>
</table>
SuperCLU Innovation Areas

• Layout
  – Increase People Housed per CLU
  – Reduce Cubic Feet of Conditioned Air
  – Enhance Individual Space (Individual Berthing Spaces)
  – Flexible Design
    • Different Size Space Options
SuperCLU Innovation Areas

- **Air Conditioning**
  - Type is Dependant on Layout
    - Split System
    - Individual AC Units
  - **Distribution**
    - Ducted
    - Dustless
SuperCLU Innovation Areas

- Insulation Material
  - Walls
  - Floor
  - Ceiling
  - High “R” Value
SuperCLU Innovation Areas

- Rigid Building Material
- Incorporate Insulation
SuperCLU Innovation Areas

• Building Component Connections
  – Reduce Thermal Infiltration and Loss
SuperCLU Innovation Areas

- Coatings
  - External
  - Internal
SuperCLU Innovation Areas

- Interior Design Improvement
  - Individual Sleeping Space
  - Storage
  - Work Space
Team Members

• NAVFAC Engineering Service Center
  – Dave Chavez, Team Lead
  – Robert Schoff
  – Lawrence Batch
  – Lisa Rotty
  – Chris Leksono

• Camp Lemonnier Public Works
  – CEC USN LT. Michelle Caponigro
  – CEC (SCW/SW) Rajon Martin
The BAA page on the NAVFAC portal (see below link) has been updated to reflect the FY12 Solicitation (#N62583-12-R-0716).


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QUESTIONS?