Use of Mockups to aid design of the USCG SENTINEL Class patrol boat
Agenda

1. Introduction
2. Methodology
3. Results
4. Recommendations
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1. Introduction

USCGC Fast Response Cutter (FRC) SENTINEL Class Patrol Boat

- **Characteristics**
  - Number Planned: Up to 58
  - Length: 154ft.
  - Beam: 25ft.
  - Max Sustained Speed: >28kts.
  - Endurance: >5 days
  - Stern Launch: One cutter boat
  - Crew: 3 officers, 20 crew

- **Features**
  - Enhanced Coast Guard response time with a minimum top speed of 28 knots
  - Conduct all missions through Sea State 4 at speeds up to transit speed for 8 hours on all headings
  - Survive through Sea State 6 at speeds up to loiter speed for 8 hours on all headings
  - Armed with a stabilized 25mm machine gun mount and 4 non-stabilized, crew-served .50 caliber machine guns
  - Fully interoperable C4ISR system with Coast Guard’s existing and future assets, and the DoD
1. Introduction

USCGC Fast Response Cutter (FRC) SENTINEL Class Patrol Boat

• Replace the aging 110’ ISLAND Class Patrol Boats
• Help to meet the service’s need for additional patrol boats
• Increased capability in interoperability
• Acquisition began in 2007
• Lead cutter scheduled for delivery spring of 2011
• 8 cutters currently on contract (of the 58 planned)
• Mock-ups of the pilothouse, galley and mess deck were required in the acquisition documentation
• Validate operational suitability and assess how well HFE has been addressed in the design
1. Introduction

Scope of the HFE technical assessment:

• Ensure that the SENTINEL’s pilothouse, galley, and mess deck mock-ups meet the requirements set forth by the Circular Of Requirements (COR):
  – The FRC-B design shall provide operational and maintenance workplaces, equipment, controls, and displays in accordance with ASTM F1166, the ABS Guide for Crew Habitability on Ships, and OPNAVINST 9640.1A (Contract HSCG23-08-C-2FR125, Section 088-1.2).

• This requirement was assessed in terms of the following:
  – General Design (088-1)
  – Communications (088-2)
  – Accessibility (088-3)
  – Maintainability (088-4)
  – Controls, Displays, and Alarms (088-5)
  – Error-Tolerant Design (088-6)
  – Workstation Design (088-7)
  – Labeling (088-8)
1. Introduction

Objectives of the HFE technical assessment:

- Identify accomplishments
- Identify opportunities for improvement

Goal of the HFE technical assessment:

- Obtain the data necessary to determine whether the proposed design provides the users with the tools and capabilities required to safely and efficiently conduct their tasks, and meet mission requirements.
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2. Methodology

3 Phase Approach:

• Phase 1: Planning
  – Review all FRC acquisition documentation, particularly those with HFE implications
  – Legacy familiarization on 87’ Coastal Patrol Boat (CPB)
  – Scenario development for use by the SMEs during mockup evaluations
  – Develop data collection tools

• Phase 2: Data Collection
  – Heuristic
  – Scenario based

• Phase 3: Analysis
  – Heuristic assessment
  – Usability assessment
  – Link analysis
2. Methodology

Data collection tools

- **Heuristic assessment checklist**
  - ASTM F1166 (2007),
  - Applicable sections of the ABS Habitability Guidance Notes

- **Usability assessment checklist**
  - Task descriptions and human performance-related characteristics and parameters to be observed

- **Link analysis tool**
  - Aspects of the tasks conducted that focus on the types, strengths and other characteristics of relationships between people or people and equipment could be collected
2. Methodology

Mockup evaluation scenarios

- **Pilothouse**
  - Search and Rescue (SAR)
  - Counter Narcotics / Go-Fast
  - Alien Migrant Interdiction Operations (AMIO)
  - Living Marine Resources
  - Maritime Domain Awareness
  - General Defense Operations
  - Damage Control for Main Space Fire

- **Galley and Mess Deck**
  - Loading Stores
  - Preparing Meal for Crew
  - Serving Meal to Crew
  - Clean-up After Meal
  - Training on Mess Deck
  - Crew Injuries Medical Procedures
2. Methodology

Data Collection

- Pilothouse mockup
  - Crew from 87’ CPB
- Galley and mess deck mockup
  - Experienced Food Service (FS) SMEs
2. Methodology

Analysis and Reporting

• Compile accomplishments as well as opportunities for improvement into a matrix

• Include observations, trace to requirements, standards, test area

• Analyze link analysis data
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### 3. Results

#### Opportunities for Improvement by COR HFE Section

<table>
<thead>
<tr>
<th>COR HFE Section Number</th>
<th>COR HFE Section Name</th>
<th>Items Noted in Pilothouse</th>
<th>Items Noted in Galley / Mess</th>
<th>Total Items Noted</th>
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</thead>
<tbody>
<tr>
<td>088-1</td>
<td>General Design</td>
<td>3</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>088-2</td>
<td>Communications</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>088-3</td>
<td>Accessibility</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>088-4</td>
<td>Maintainability</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
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<td>088-5</td>
<td>Controls, Displays, and Alarms</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>088-6</td>
<td>Error-Tolerant Design</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>088-7</td>
<td>Workstation Design</td>
<td>21</td>
<td>15</td>
<td>36</td>
</tr>
<tr>
<td>088-8</td>
<td>Labeling</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total Items Noted By Location</strong></td>
<td></td>
<td><strong>44</strong></td>
<td><strong>47</strong></td>
<td><strong>91</strong></td>
</tr>
</tbody>
</table>
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4. Recommendations

Example pilothouse recommendations

<table>
<thead>
<tr>
<th>Issue</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are not adequate hand grabs at the bridge forward console.</td>
<td>Install additional overhead hand grab rail at the forward main console, just aft of the console, and forward of the chairs.</td>
</tr>
<tr>
<td>The only SIPERnet Chat ability available on the bridge is at the CO console. Chat option is needed at Chart Table (or another secondary location) for the Navigator/QMOW</td>
<td>Provide SIPERnet Chat capability at the chart table or another secondary location for the NAV or QMOW to utilize. This is significantly improve information flow and operational tempo in emergency conditions and critical evolutions.</td>
</tr>
</tbody>
</table>
4. Recommendations

Example galley and mess deck recommendation

<table>
<thead>
<tr>
<th>Issue</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently the only means for filling mop buckets to clean the galley and mess spaces is down the stairs on the lower level.</td>
<td>Install faucet in cleaning locker that is mounted at 24” from the deck for ease of filling cleaning buckets and increased safety.</td>
</tr>
<tr>
<td>There currently is no means for allowing access to the galley during off hours and maintaining security of the dry stores.</td>
<td>If dry stores are required to be secured, install accordion style door aft of the freezer to the port bulkhead that secures on the starboard bulkhead.</td>
</tr>
</tbody>
</table>
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5. Conclusions

- Many recommendations already implemented
- Working with Sponsor and Program to implement more
- Mockup assessments featured in Acquisition Directorate publication
- “The mock-up review identified some necessary changes that were incorporated into the bridge design.”
Questions / Discussion

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