Deployable Work Station

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Introduction

The Deployable Work Station (DWS) is a portable, collapsible surface that can be easily transported over rough terrain. The DWS was built for Doctors Without Walls, a local non-governmental organization that provides volunteer care to homeless people on the streets and in local parks and shelters in Downtown Santa Barbara. The DWS maximizes the efficiency of their services by providing a portable work station that is easily moved and deployed. Most importantly, the DWS provides this functionality from a package that is small enough to fit in the trunk of a compact car.

Benchmarking

A collapsible workstation previously created for Doctors Without Walls suffered from various problems, including ease of collapsibility and a large turning radius. With this in mind, our team went to Pershing Park to observe and benchmark the original prototype and develop a new design. In addition, an online survey was created for the members of Doctors Without Walls to better understand our end user’s needs. From that survey, these performance requirements were obtained:

<table>
<thead>
<tr>
<th>Benchmark Value</th>
<th>Turning Radius (ft)</th>
<th>Unloaded Weight (lbs)</th>
<th>Collapsed Size (ft)</th>
<th>Vertical Curb Clearance (in)</th>
<th>Combined Storage Space (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>30</td>
<td>3.7x2.2x1</td>
<td>2</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>Performance Requirement</td>
<td>&lt;6</td>
<td>&lt;40</td>
<td>&lt;4x3x1.5</td>
<td>&gt; 4</td>
<td>&gt; 3</td>
</tr>
</tbody>
</table>

Using these design decisions, a prototype was created for Doctors Without Walls for preliminary use. The model was made from commonly available stock metal, fasteners, wood, and a trolley. A CAD model of the DWS was created to verify spatial accuracy and collapsibility, as shown in Figure 3.

Design Process

The collapsible workstation has 3 key design features:

- **Base**: Rubbermaid 4400 Triple Trolley to ensure a lightweight and durable design.
- **Table**: Designed to hinge about the handle in order to retain the collapsibility of the DWS.
- **Wheels**: 18” bicycle wheels were used to allow for mobility around rough terrain (dirt, grass, vertical wall clearance, etc.)

To test the structural integrity of the workstation, moderate moments and shears were applied between the axle and the wheel. In addition, a 75 pound compressive force was applied to the table to check for buckling. These tests showed the DWS’s resistance to common modes of failure.

Analysis and Testing

A CAD model was created to verify that the DWS would collapse correctly. Both CAD model and prototype verified that the collapsed volume had dimensions less than $4 \times 3 \times 1.5 \text{ ft}^3$. The DWS satisfies all performance requirements and is adequately robust to all physical tests performed. Due to stringent performance requirements, not all design features were included; however, the highest prioritized design features were successfully integrated in a functional design.

Conclusion

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References

http://santabarbarastreetmedicine.org/
http://www.rubbermaidcommercial.com/