Flitter:
The Foldable Litter
Flitter in Action
Customer Need

• In U.S. annually: 139 climbing accidents, 276 persons involved, 117 injuries, 23 fatalities

• 84 Mountain Rescue Teams in the US, 20+ personnel / team

“I’ve often had to go out with a litter rescue team with a skeleton crew of just myself and two others. Naturally, a rigid, full size litter becomes a burden.”

-Todd Remaley, Head Park Ranger
Appalachian Trail, National Parks and Services
10/14/2009

Source: American Alpine Club
# Product Contract

- **Product Description:** A modular rescue basket
- **Intended Customers:** Trained mountain rescue team
- **Market:** Emergency rescue equipment

<table>
<thead>
<tr>
<th>Customer Needs</th>
<th>Product Attributes</th>
<th>Engineering Specs</th>
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</thead>
<tbody>
<tr>
<td>Can be easily carried</td>
<td>Weight</td>
<td>&lt; 20 lbs</td>
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<tr>
<td>Can disassembled into pieces</td>
<td>Modularity</td>
<td>&gt; 4 pieces</td>
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<tr>
<td>User’s freedom of movement</td>
<td>Module Size</td>
<td>Each module can be carried as a backpack</td>
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<td>Rigid support for heavy weight</td>
<td>Rigidity of backboard</td>
<td>Withstand at least 220lbs (1 Meeker)</td>
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<tr>
<td>Competitive Price</td>
<td>Cost</td>
<td>&lt; $600</td>
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</tbody>
</table>
Risk 1: Lack of Rigidity

- Backboard buckling
- Joint Separation
Risk 2: Weight Inhibiting Rescuer Mobility

• Heavier than competitive models
  – Mockup: 43lbs
  – Modular weight: 25lb, 9lb, 9lb

• Handlebars on all sides
Evolution of Design
Stress Calculations

100 kg (220lb) Load:

- Max. Stress as % of Yield Stress
  - Plywood: 2%
  - Honeycomb: 58%

\[
M = \frac{wL^2}{8}
\]

\[
\sigma_{\text{core}} = \frac{Mh_2 E_2}{E_1 I_1 + E_2 I_2}
\]

\[
\sigma_{\text{plywood}} = \frac{M(h_1 + h_2) E_1}{E_1 I_1 + E_2 I_2}
\]