Traditional Hooks

- Snag easily
- Cause injury
- Failure to catch and hold fish
TECHNOLOGY

Standard Mode

DELTA
HOOK TECHNOLOGY

Engage Mode
TECHNOLOGY OPERATION

1

2

3

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Team Structure

Team Leader: Shaad Zaidi

Business Team Leader:
Michael Sowards

Team Members:
Phillip Lozanowski
Shaad Zaidi
William O’Toole
Kyuho Shin

Product Team Leaders:
Alyssa Walther
Lucas Rodgers

Team Members:
Nathan Howard
Mathew Bednarz
Joseph Cicero
Bryan Benjamin
Westley Villabos
Andrew Bonesz
PRODUCT TEAM
Mock-Ups

Mock-up A
Sponsor Material
- Shank made from steel cable
- Movement is random / multi-directional
- Two piece design

Mock-up B
Sponsor Material
- Shank made from flat steel
- Movement is planar
- Two piece Design/ soldered connection

Mock-up C
Summer ’09
- Shank made from flat steel
- Two piece Design/
- Epoxy connection / bulky

Mock-up D
Fall ’09
- One piece design
- Flattened shank
- Planar motion

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Failure Analysis

Out of plane

Planar motion
Mock-Ups

Mock - up A
Sponsor Material
- Shank made from steel cable
- Movement is random / multi-directional
- Two piece design

Mock - up B
Sponsor Material
- Shank made from flat steel
- Movement is planar
- Two piece Design/
- Soldered connection

Mock - up C
Summer ‘09
- Shank made from flat steel
- Two piece Design/
- Epoxy connection / bulky

Mock - up D
Fall ‘09
- One piece design
- Flattened shank
- Planar motion

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DELTA Hook Technology
Design Requirements

- 2 - Flexible shaft
- 3 - Rigid arm and engaged section
- 4 - Acute angle
- Sharp hook point
- Corrosion resistant
Material Selection

- Properties
  - Flexible
  - High Tensile Strength
  - Corrosion Resistant
  - Cost Effective

- Materials
  - 1008 Steel (0.08% carbon content)
  - 1080 Spring Steel (0.80% carbon content)
  - Custom Alloys (silicon, molybdenum, vanadium)
Manufacturing

Step 1: Part 1 bent to create eye of hook


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Heat Treating
Tensile Testing

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## Test Results

<table>
<thead>
<tr>
<th>Name</th>
<th>Shank Shape</th>
<th>Category</th>
<th>Chord Length</th>
<th>Wire Diameter</th>
<th>Max Load (lbf)</th>
<th>Mode of Failure</th>
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<tbody>
<tr>
<td>Trokar J</td>
<td>Standard</td>
<td>2</td>
<td>1.09375</td>
<td>0.0602</td>
<td>44.64</td>
<td>Bend 90</td>
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<td>500C Sample 3</td>
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<td>500C Sample 4</td>
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<td>1.4375</td>
<td>0.0441</td>
<td>35.62</td>
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<td>500C Sample 5</td>
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<td>0.0441</td>
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<tr>
<td>Gamakatsu Worm Eye</td>
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<td>33.4</td>
<td>Bend 90</td>
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<tr>
<td>Bass Pro Worm Hook</td>
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<td>0.0747</td>
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<td>500C Sample 1</td>
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<td>1.03125</td>
<td>0.0747</td>
<td>25.19</td>
<td>Bend 90</td>
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<td>500C Sample 2</td>
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<td>3</td>
<td>1.125</td>
<td>0.0747</td>
<td>13.13</td>
<td>None (slip from vise)</td>
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<tr>
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<td>0.0441</td>
<td>11.93</td>
<td>Fracture</td>
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<tr>
<td>300C Sample 1</td>
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<td>1.34375</td>
<td>0.0441</td>
<td>11.41</td>
<td>Fracture</td>
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<td>U-Clamp</td>
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<td>0.0394</td>
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</tr>
</tbody>
</table>
Contacts

• Arcelor Mittal – Steel Production
  – Material selection
  – Custom alloy creation
  – Computer simulations of materials
  – Metallurgist guidance

• Master Wire and Spring – Wire Bender
  – Chicago company
  – Highly advanced automated wire bending
  – No minimum order size
  – Produce hooks for testing
Future

• Identify ways to produce inhomogeneous properties
• Finalize material selection and schematic design
• Continue to establish manufacturing contacts
  – Master Spring and Wire Form Co.
  – Arcelor Mittal
• Complete testing series
• Produce 10,000 - 100,000 units
• Unveil at ICAST 2010
Business Team
Business Team Objectives

- Create a profitable Business Model
- Support with business plan
  - Market Analysis
  - Financial Analysis
  - Competitor Analysis
  - Manufacturing Strategy
  - Packaging & Distribution Strategy
  - ICAST
Market Analysis

Accomplishments
- Surveys
- SWOT

Set Backs
- Turned from local retailers for Surveys
- No incentives to take surveys
Manufacturing

Accomplishments
- Master Spring
- Arcelor Mittal

Set Backs
- Competitive Rates
- Time Frame
- Reluctant to help small ventures
Packaging & Distribution

Accomplishments
- Sigma Services

Set Backs
- Alternative Option
• The International Convention of Allied Sportfishing Trades
• Las Vegas
• July 14-16
• Attendants (7,400 in 2009)
End Result

- Final Business Plan
- Manufacturing Strategy
- Supply Chain
- Showcasing at ICAST 2010
Questions
Finite Element Analysis (FEA)

**PRESSURE (Mpa)**
- 500 Mpa
- 480 Mpa
- 460 Mpa
- 440 Mpa
- 420 Mpa
- 400 Mpa
- 380 Mpa
- 360 Mpa
- 340 Mpa
- 320 Mpa

**STRESS CONCENTRATION**

**Applied Load: 200N**

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