



SPARROWHAWK™

DELTA 
HOOK TECHNOLOGY





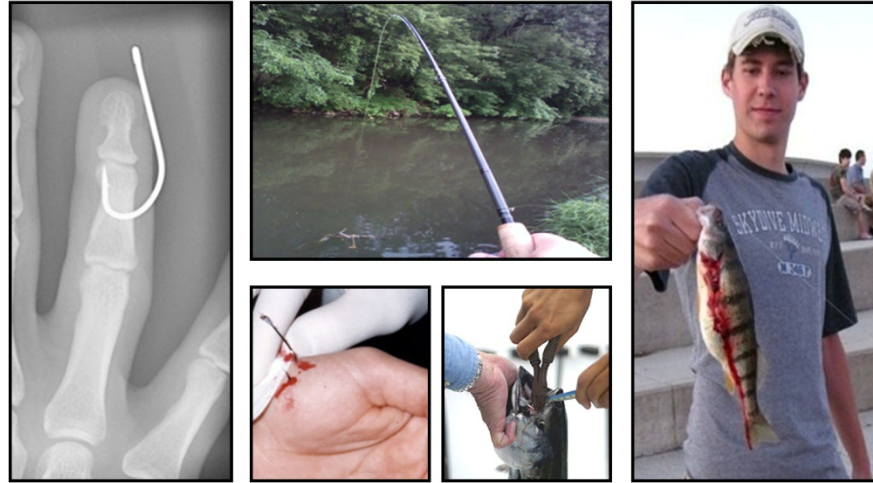
SPARROWHAWK™



Enpro 358



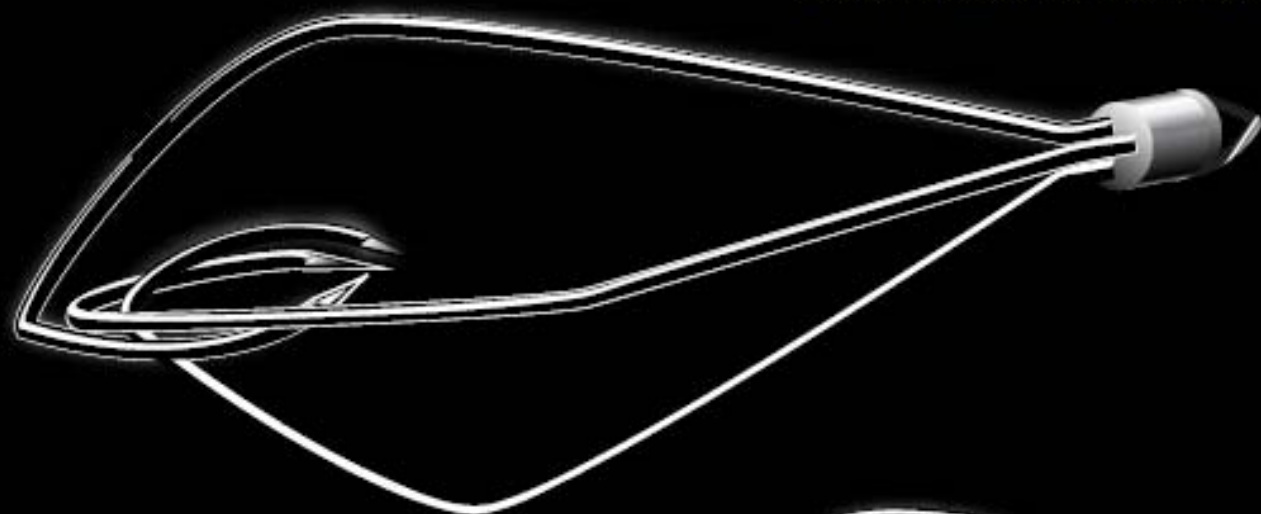
Traditional Hooks



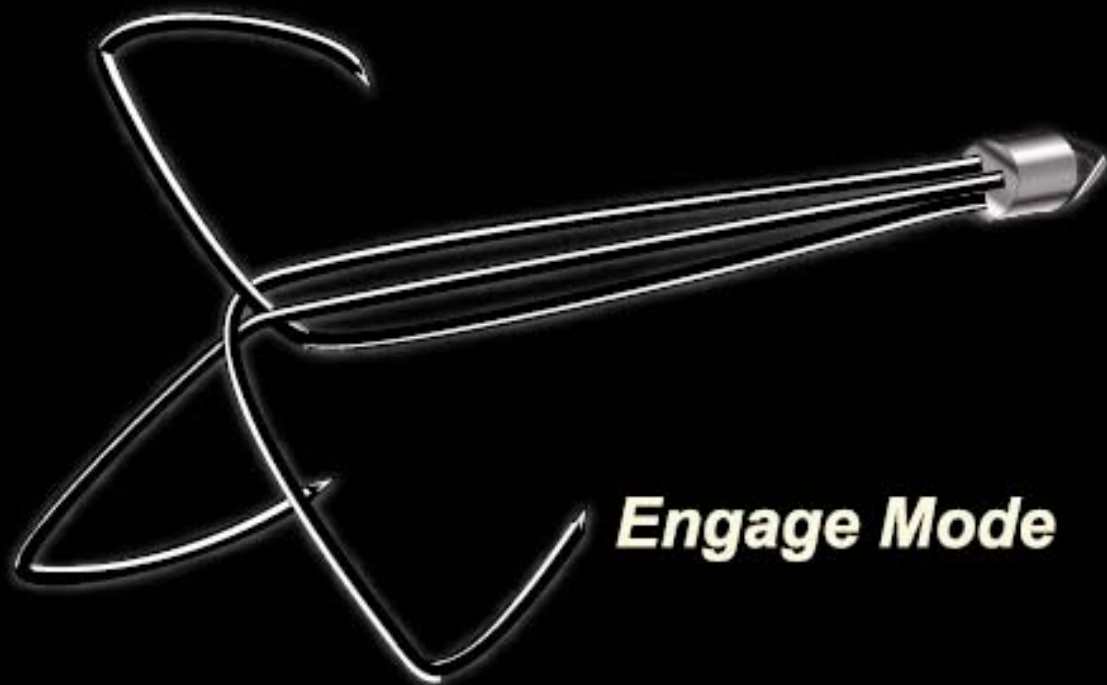
- Snag easily
- Cause injury
- Failure to catch and hold fish

TECHNOLOGY

Standard Mode

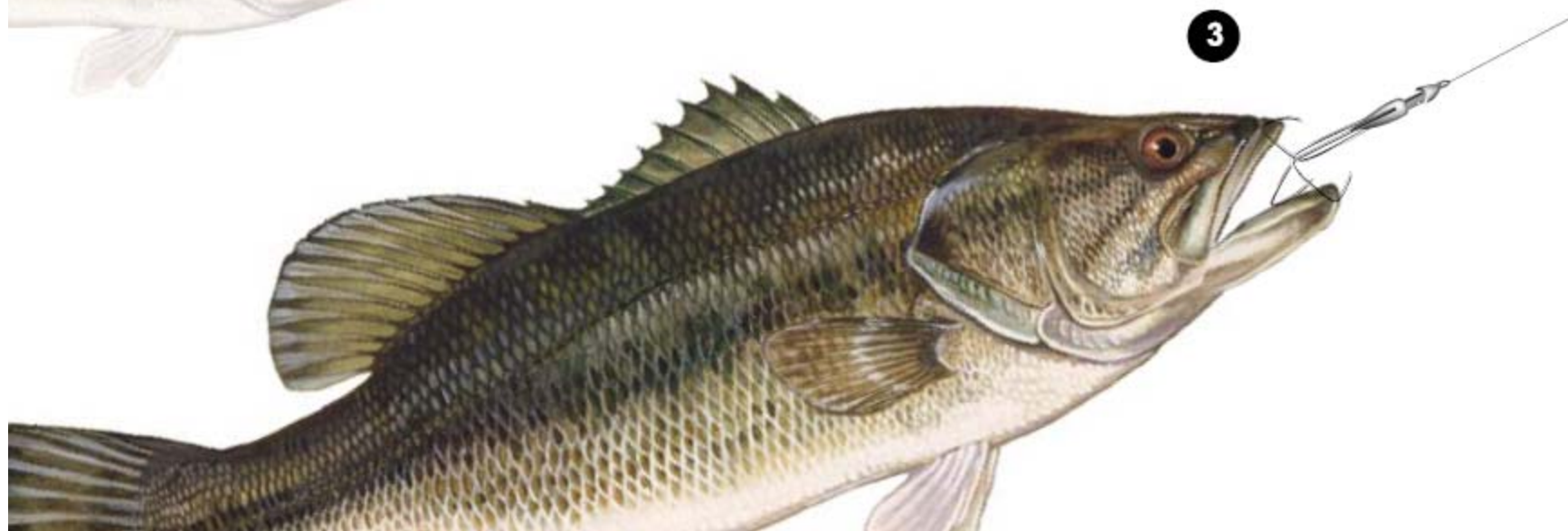
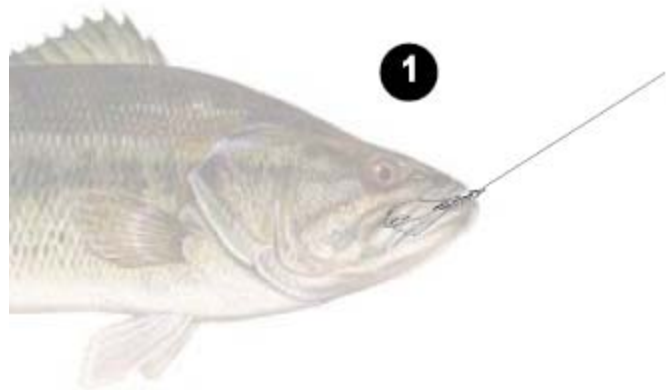


Engage Mode



DELTA
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TECHNOLOGY OPERATION



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DELTA
HOOK TECHNOLOGY

Team Structure

Team Leader: Shaad Zaidi

**Business Team
Leader:**
Michael Sowards

**Product Team
Leaders:**
Alyssa Walther
Lucas Rodgers

Team Members:
Phillip Lozanoski
Shaad Zaidi
William O'Toole
Kyuho Shin

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*



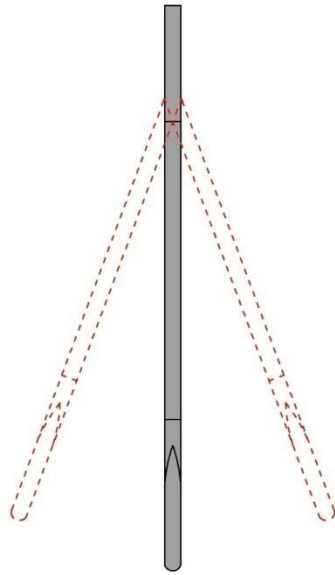
- . Shank made from flat steel*
- . Two piece Design/ Epoxy connection / bulky*

*Mock - up D
Fall '09*

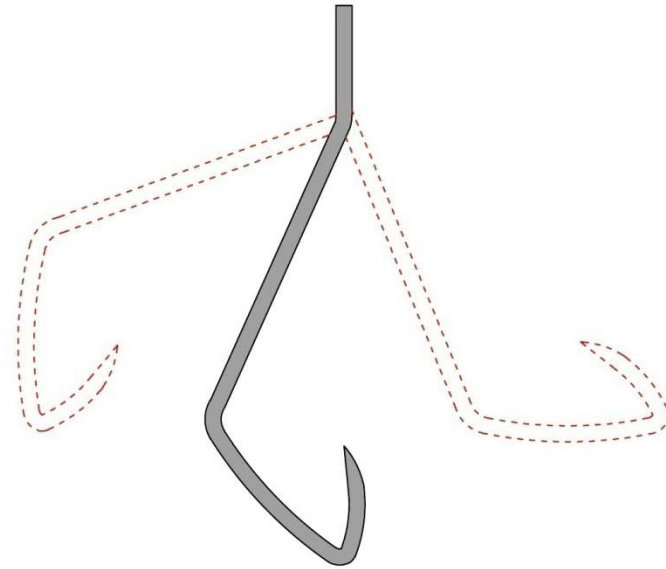


- . One piece design*
- . Flattened shank*
- . Planar motion*

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*

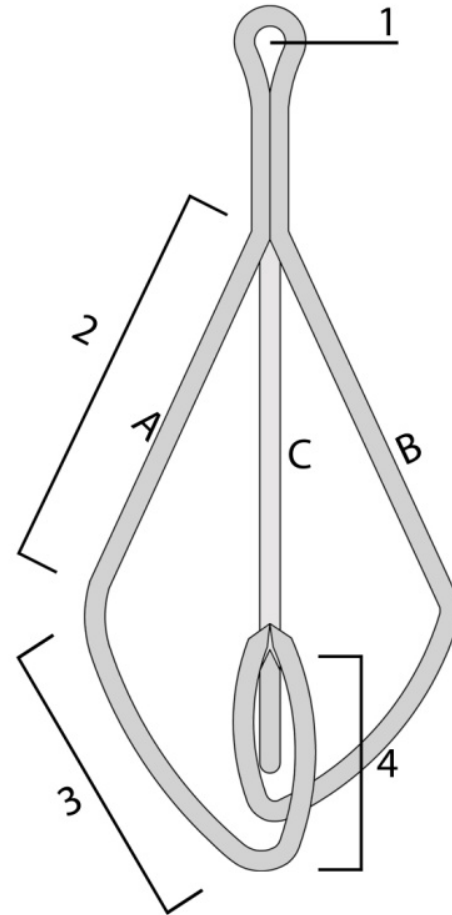
*Mock - up D
Fall '09*



- . One piece design*
- . Flattened shank*
- . Planar motion*

Design Requirements

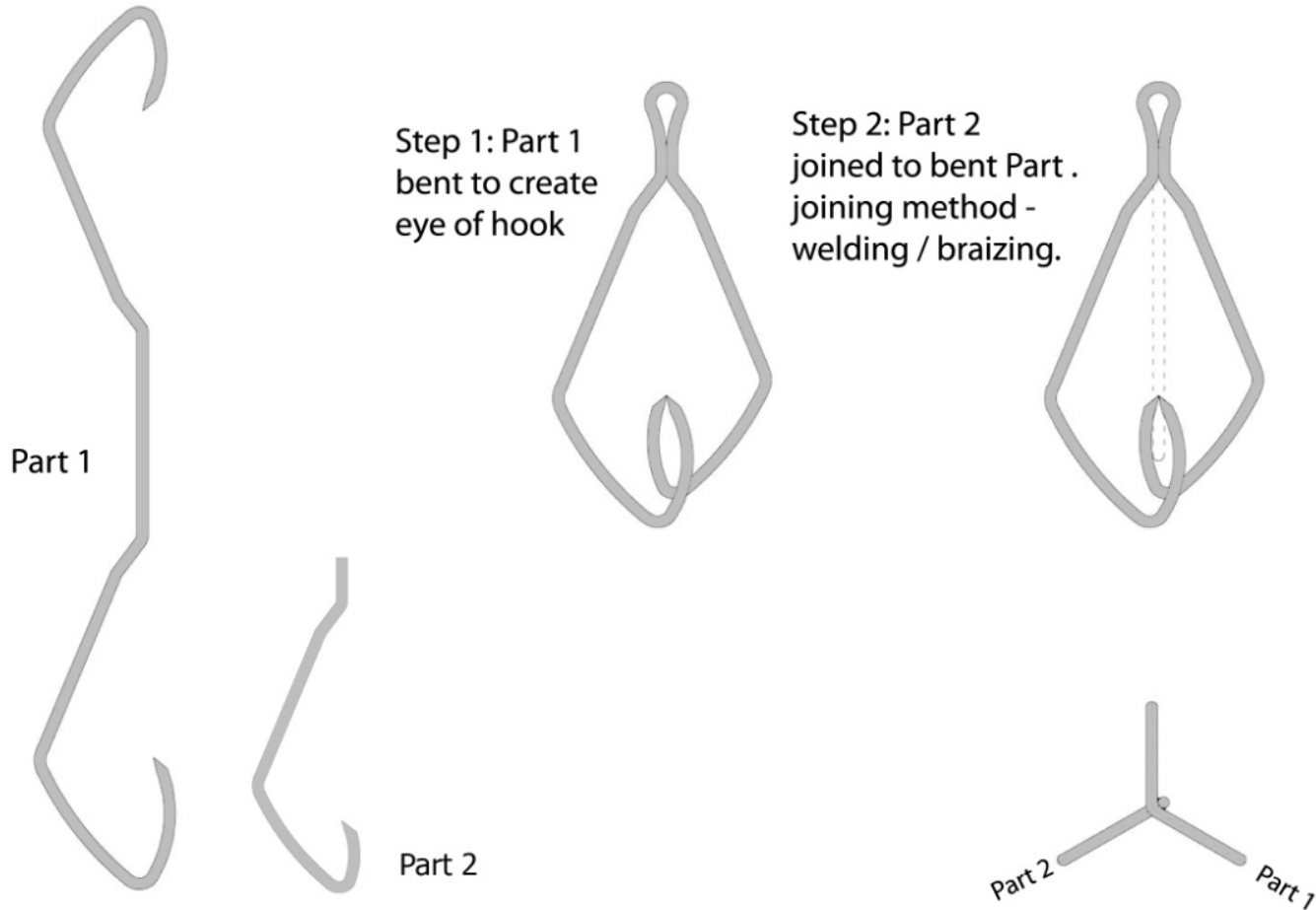
- 2 - Flexible shaft
- 3 - Rigid arm and engaged section
- 4 - Acute angle
- Sharp hook point
- Corrosion resistant



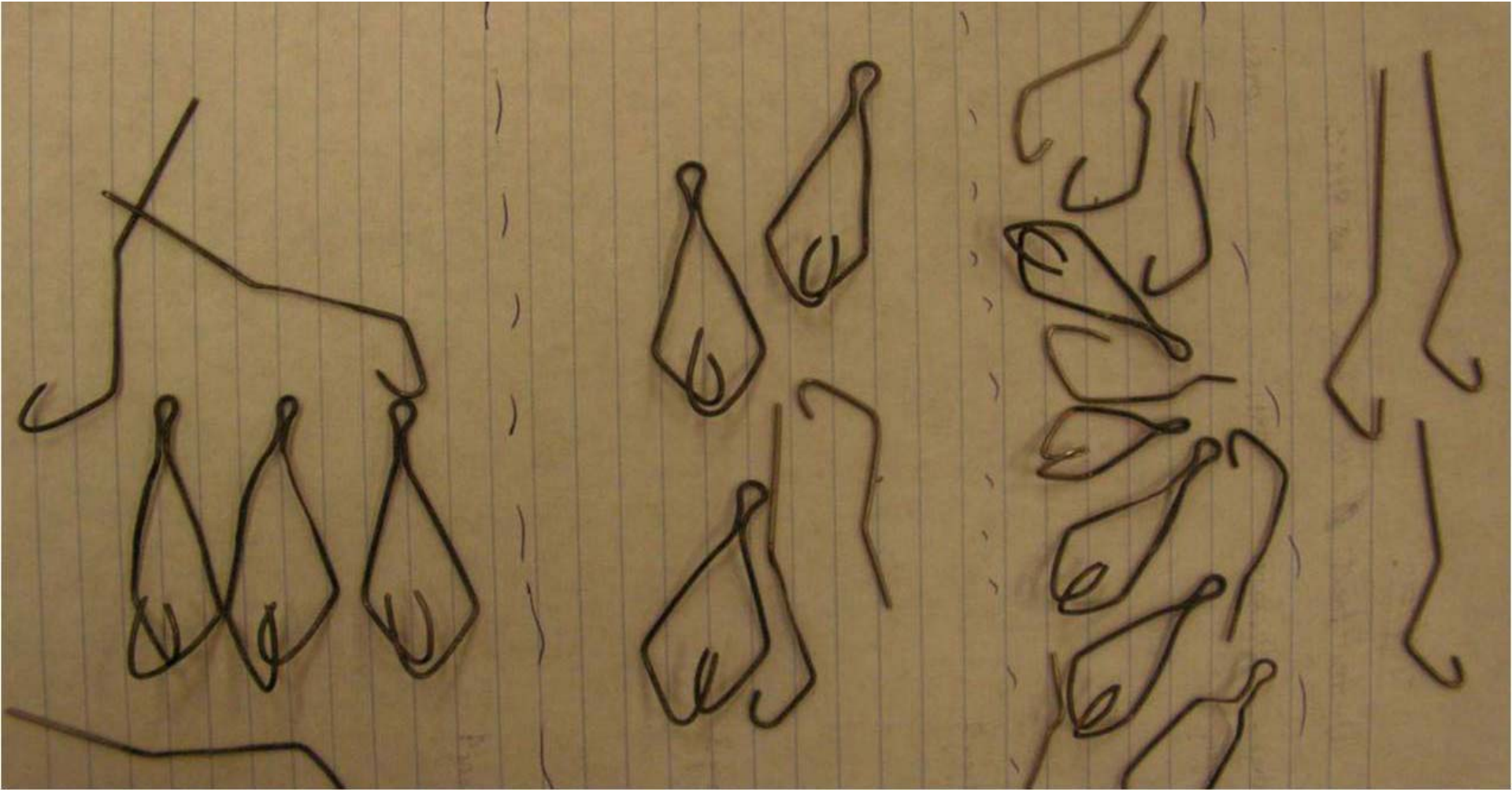
Material Selection

- Properties
 - Flexible
 - High Tensile Strength
 - Corrosion Resistant
 - Cost Effective
- Materials
 - 1008 Steel (.08% carbon content)
 - 1080 Spring Steel (.80% carbon content)
 - Custom Alloys (silicon, molybdenum, vanadium)

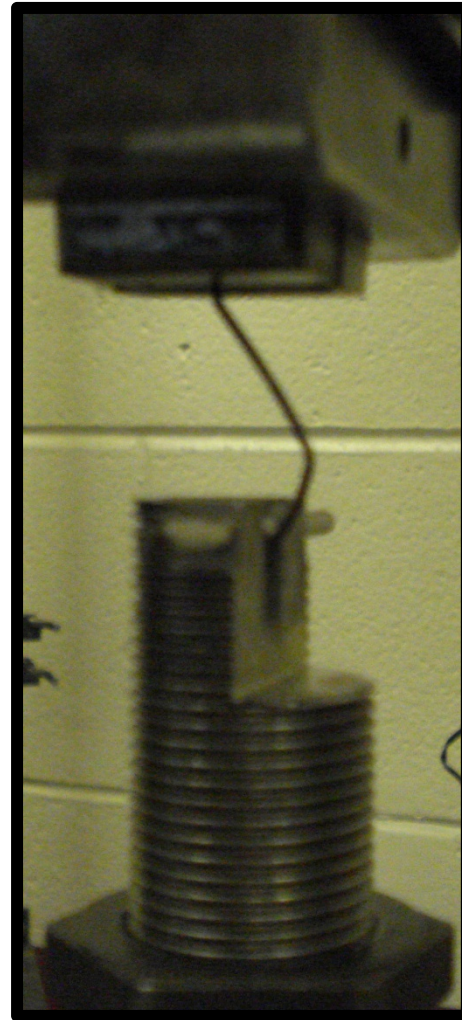
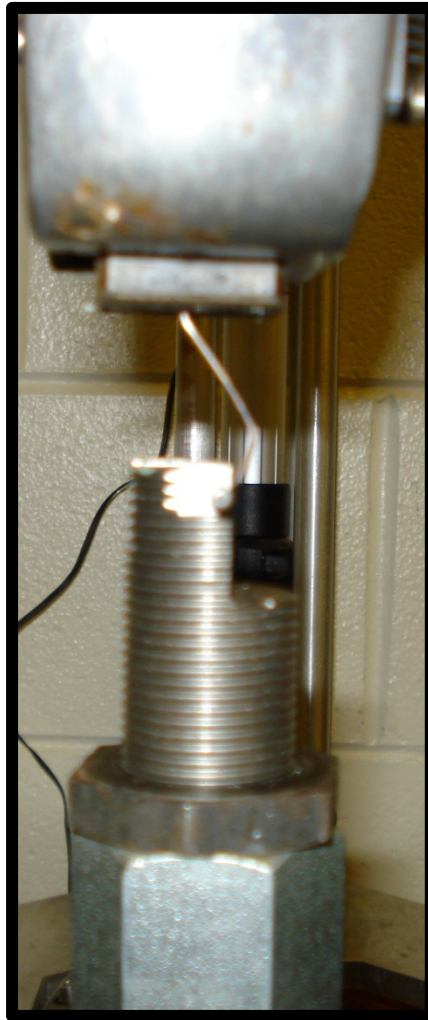
Manufacturing



Heat Treating

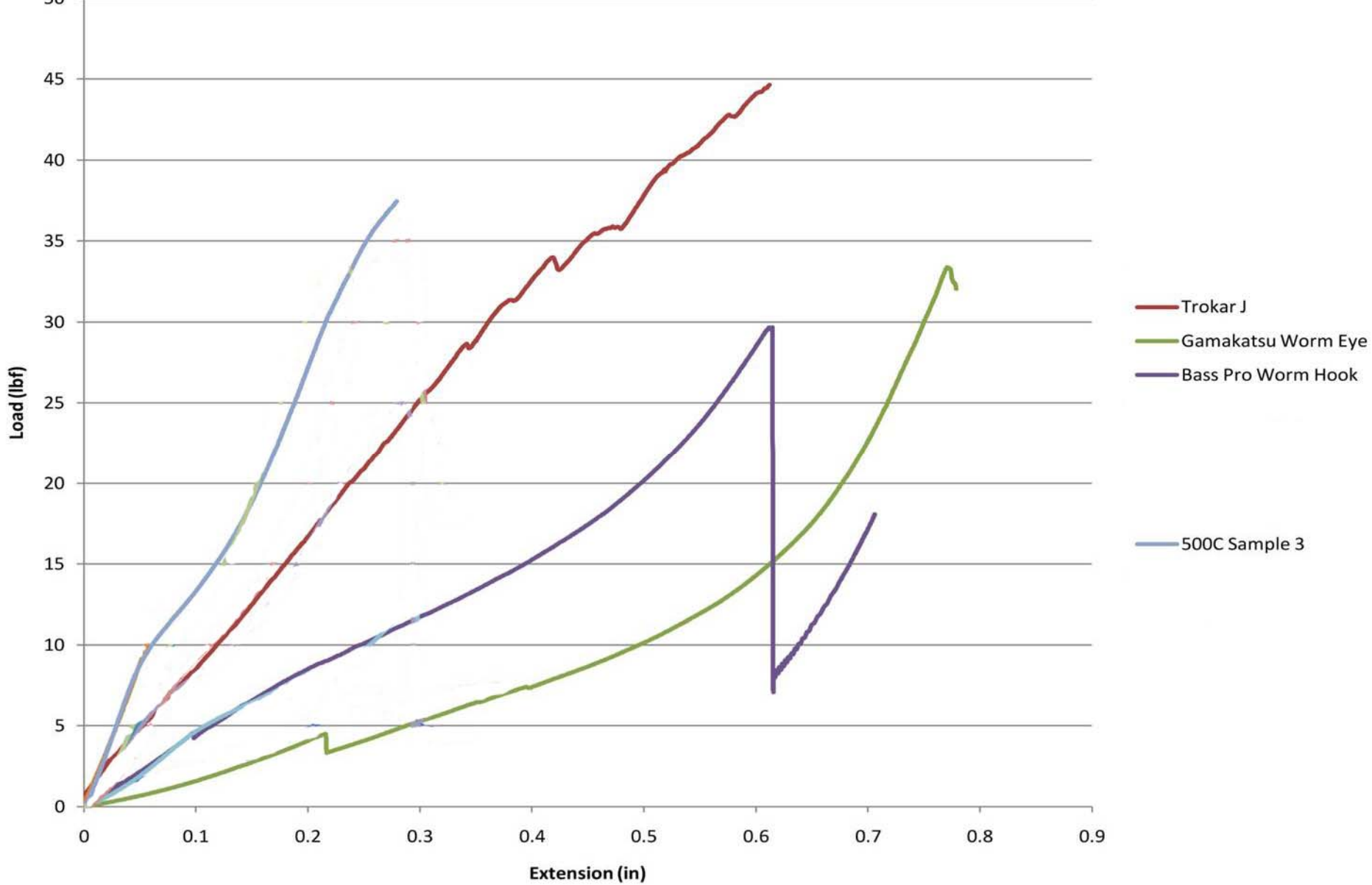


Tensile Testing



Test Results

Name	Shank Shape	Category	Chord Length	Wire Diameter	Max Load (lbf)	Mode of Failure
Trokar J				0.0602	44.64	Bend 90
500C Sample 3	Standard	2	1.09375	0.0441	37.46	Bend 90
500C Sample 4	Flattened	2	1.4375	0.0441	35.62	Bend 90
500C Sample 5	Flattened	2	1.34375	0.044	33.43	Bend 90
Gamakatsu Worm Eye				0.042	33.4	Bend 90
Bass Pro Worm Hook				0.0747	29.67	Bend 90
500C Sample 1	Standard	3	1.03125	0.0454	25.19	Bend 90
500C Sample 2	Flattened	3	1.125	0.0404	13.13	None (slip from vise)
300C Sample 2	Standard	3		0.044	11.93	Fracture
300C Sample 1	Flattened	2		0.0449	11.41	Fracture
U-Clamp				0.0394	6.76	



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)

