EnPRO 358

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Collaborators: Taylor Augy Park---Sparrowhawk, Delta Hook Technologies

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ENPRO Team:

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Table of Contents

I. Abstract:

Recreational fishing is a sizable market, generating over a billion dollars of economic output and providing well over a million American's with jobs. There are many variations of fishing hooks available that retain the same basic shape and structure, the most popular examples being, the standard J-hook, treble hook and the new "Trokar", which is "surgically sharpened". However, there are many limitations associated with existing fishing hooks. One such limitation is that fishing hooks are not able to reliably hold the fish after embedding. Introducing a barb to the hook usually solves this issue, doing so however creates problems when setting the hook and furthermore, barbs can cause damage to the fish during the removal process. Another concern is that contemporary fishing hooks have problems with snagging on nearby rock formations, algae, weeds, or other vegetation in the water.

The greatest concern with conventional fishhooks is that of the danger facing anglers, especially young or inexperienced anglers. The exposed barbed fishhook can pierce through the skin and lodge the hook into the angler. Due to the nature of the barb, the angler can either push the hook the remaining distance until the barb penetrates the skin again, then cutting the barb off and removing the hook, or have the hook surgically removed. Among the major corporations, namely Gamakatsu, Mustad & Son and Eagle Claw, there appears to be an absence of fishing hooks equipped with barbless, safe and snag-resistant features, which will all be developed into Sparrowhawk's innovative fishhook, The Delta Hook Technology (DHT).

The EnPRO 358 team will work with the CEO and entrepreneur behind Sparrowhawk, LLC, Taylor Augy Park and several other professional organizations to develop a prototype of the Delta Hook Technology (DHT), which will be showcased at iCAST 2010. iCAST 2010 is the premier fishing tradeshow for sport fishing anglers and provides Sparrowhawk with the appropriate environment to gain entrance in the sports fishing market and establish the company's reputation.

EnPRO 358 offers an opportunity for students to gain experience in developing the components of a business strategy plan, as well as, developing and testing designs and mock-ups that demonstrate the value of innovation and its place in the market.

II. Team Information:

The EnPRO 358 roster is located in Appendix A.

Mission Statement:

Create a prototype for the Delta Hook Technology that is safer for the angler, snag free, weedless, more dependably secures the fish to the hook. The prototype will be used to build consumer interest at iCAST 2010. In addition, conduct market research and develop a viable business plan that will bring DHT to the market.

Team Objectives:

- Break into product development and business team
- Produce a functional prototype that manifests the physical and mechanical properties which are ideal for catching Micropterus salmoides, commonly known as the largemouth bass.
- Attend iCAST 2010 (July 14-16,2010, Las Vegas, NV) in order to introduce Delta Hook Technology to the sports fishing industry
- Create a business and marketing strategy with finalized financial statement and a detailed manufacturing procedure
- Implement safety and ethics in prototype development and business planning

III. Background:

Business Development:

Summer 2009

The business team had several objectives for the summer of 2009. The three main objectives were to determine the target market, explore possible marketing methods, and conduct a consumer survey. The current market research done by the business team covered several aspects of sport fishing. The research was not limited to possible competitor products, but also included sales information, and national consumer buying habits. Since the current fishing market contains many competing companies, eventually the research became focused on similar bass fishing hooks already popular in the market. Some of the key pieces of information discovered about fishing habits in the United States are:

- 40 million Americans recreationally fish. That is more than golf and tennis combined.
- There was approximately $45 billion in retail sales of fishing related items.
- The top five states in terms of revenue are Florida, Texas, Minnesota, California, and Michigan.
- Over $125 billion in overall economic output, including sales of hooks.
- More than one million jobs are supported by fishing (e.g. retailers, manufacturers)
- Approximately 10.3 million anglers fish for black bass, making it the largest species market.

From this information, the team focused on the black bass, which is a family that includes largemouth bass. Knowing this, the product development team was better able to narrow choices of dimensions for the DHT including both size and holding capacity.

Finally, the business team crafted a consumer survey and administered the survey to one hundred anglers in the Chicago area. The survey was designed to gauge a person's fishing and spending habits; additionally, the survey provided insight on important product features similar to the Delta Hook. Surveys were given at Bass Pro Shop in Bolingbrook, Cabela's in Hoffman Estates, and Henry's Sports, Bait and Marine in Chicago. All three locations were chosen because they are important retailers for the sports fishing market. Both Bass Pro Shop and Cabela's are large nationwide retailers with a wide customer base and huge inventories. Henry's is a small, local shop located very close to the IIT main campus. Henry's is of particular interest to IPRO 358 because a working relationship with a local retailer is a potential launch point for DHT to enter the market. From the survey results, a better understanding of DHT's potential customer base was developed. A significant finding came from the survey. On the question posed for how frequently the person fishes, the option "more than twenty times a year", the survey population asked for a response "more than twenty times a week". We want to target active,

experienced angler because of their knowledge and sport fishing. Another major piece of information gained from the survey was the value of fishing hook features.

Fall 2009

Building on the work accomplished in the summer, the fall team worked to better prepare the Delta Hook Technology for launch into the existing market. This was accomplished by means of market research, in the form of surveys, developing positioning strategies, working with pricing and financial data. Concerning Market research the team administered surveys at local fishing equipment (Henry's), retail stores (Walmart) and to local anglers fishing along popular piers. These surveys provided base consumer information, such as what features were most important and how much an individual was willing to spend on a hook. Using the information gathered via surveys and online research on pricing and hooks features of off retail outlets' websites, the team was able to create several positioning maps. These maps position the DHT as a hook designed for both amateur and professional sports fisherman who regularly go fishing and are concerned with a safer, snag-resistant and high performance hooks. Due to its safety features the team also felt that it could be marketed for younger anglers. The team was also able to assess promotional concerns; a promotional mix was created which could be used for the DHT's launch at iCAST 2010. Advertising on television and also in outdoor magazines was discussed and the tagline "The way nature intended it".

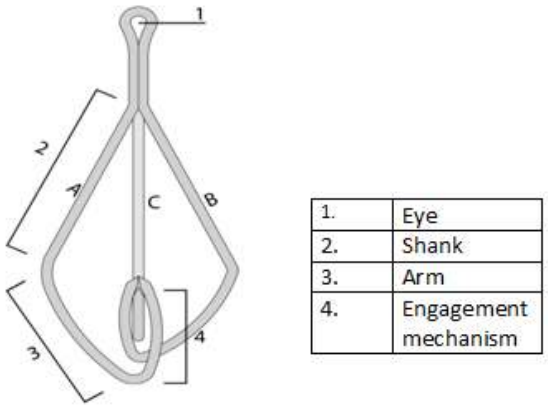
Pricing analysis was preformed by means of positioning/ perceptual maps, which took into account competitor pricing and also through the data collected of field surveys. The primary task for pricing analysis was to execute a regression analysis on the value that other hooks on the market provided to consumers. It was determined that the Eagle Claw Lazer Sharp hook design was the closest match to our product. By working in conjunction with the Product Team, it was determined that approximately 7 inches of material would be required per hook including 0.5 inch of wastage per hook. After doing research from various manufacturers we found the best price from: http://www.smallparts.com. The direct material costs were valued at $0.33 per hook. While the exact manufacturing methods were at the time unknown, the team was able to make assumptions pertaining to labor, particularly that heat treatment would be involved. Using this information the team was able to secure a quote from a heat treatment firm in Ohio, of $0.17 per hook. An average fixed cost of $1 per hook was established, which amounted to a price of $1.50 per hook for production. Using the data collected from surveys, which showed that 40% of the sample population was willing to pay between $2 and $4.99 per hook, while 28% were willing to pay between $5 and $9.99 for a superior product such as the Delta hook, the team was able to price the hook at approximately $3.25 per hook for sale in the market.

The fall team was also able to conduct a financial analysis for the DHT. It was aimed at producing a break-even analysis and a cash flow analysis, which were both calculated based upon expenditure estimates. Which were, $20,000 for marketing

and administrative expenses, $50,000 for ICAST costs and a variable cost of $75,000 that was generated from projected sales numbers. All together the estimated expenditure amounted to $145,000. After including fixed expenses they expected the cost of goods sold to amount to $145,000. Revenue was calculated to be $472,500 of which $327,000 would be profit. Based upon these calculations, 26,415 hooks would need to be sold to break even. Under pessimistic, expected and optimistic conditions the ENPRO358 team expected to generate revenues of $287,001.58, $394,121.89 and $660,912 respectively.
Finally the fall team approached the task of establishing a supply chain; however as at the time there was not enough information concerning an actual manufacturing process, the team was forced to make assumptions as to the origin of the supply process, as in where were these hooks to be manufactured. Two scenarios were drawn up for customer order to product delivery, the only difference between the two being that in the first manufacturing is done in China and packaging in the US, while in the second both packaging and manufacturing are taken of in the US.

Product Development:

In order to best understand the Delta Hook, figure 1 is provided as a reference.



1.	Eye
2.	Shank
3.	Arm
4.	Engagement mechanism

Figure 1. A illustration of the Delta Hook. Segments A, B, and C are the shanks.

Summer 2009

Many technological aspects must be considered during production of the mock-ups such as material selection, engagement mechanism, and durability. Originally, the sponsor, Augy Park created a number of mock-ups. One of the hooks consisted of a shank that was entirely composed of light gauge cable; this allowed any one of the engagement mechanisms to twist into ineffective positions. The torsional

movement of the hooks was prevented by replacing the shank with a flat flexible metal.

Figure 2. A brief pictorial history of the Delta Hook. Mock-up A and mock-up B are from Mr. Park. Mock-up C is similar to mock-up 1 and mock-up 2. Mock-up D is the current working prototype.

The summer 2009 semester of IPRO 358, created their own mock-ups and each mock up was analyzed for flaws and re-engineered. The team's first mock-up consisted of six parts: three flexing shanks (A, B, & C) made out of flat hair clips, and three hooks bent from safety pins, bonded with an epoxy. The team decided to create the base out of a cap mold created from epoxy putty. The shape and material chosen for the flexing unit worked as expected. The flat shank material allowed the engagement mechanism to flex only in the planar directions (mock-up A). The second mock-up incorporated a new epoxy base, but due to the bulky attributes of epoxy, the arms were over-flexing properly to fully engage. The mock-ups created by the summer team may be seen in figure 3 along with a traditional treble hook for size comparison.

Figure 3. Mock-ups from the Summer 2009 IPRO: Mock-up-1, Mock-up-2 along with a traditional treble hook are shown. Mock-up-1 is a two piece design, joined by epoxy; Mock-up-2 is a two piece design with smaller epoxy joints. The third hook from the left is a treble hook; it is displayed for scaling comparion.

To fix the problem of the epoxy while still maintaining one dimensional bending, the team decided to come up with a new one piece design that avoided epoxy all together. The epoxy need to be removed from the design because the bulky joints hindered the planar motion of the hook.

Fall 2009

In the previous semester work was done on a two piece solution for the DHT (Fig.2. Mock-up C), which is a flat shank join to a rigid arm, however the joint between the two pieces proved to be difficult both in terms of manufacturing and mechanical functioning. The fall 2009 team explored the possibility of a one-piece design (Fig.2. Mock-up D), in which only one material was used (i.e. a piece of wire). In order to achieve planar motion, a portion of the wire was flattened, which proved to be an effective method of altering the wire's physical and mechanical properties. Hardness and rigidity were introduced through heat treatment, and tempering was explored. The fall team bent wire into the shape of the Delta hook, which was then heat-treated and quenched. After processing of the bent hooks, an increase in strength was observed, however the mock-ups were still not comparable to existing hooks in terms of strength. This is in a large part due to the fact that the steel wire used in these mock-ups, ASTM 1006 and 1008, proved to have to a low a carbon content to be effectively tempered. A steel wire of higher carbon content, ASTM 1080, would be required for the heat treatment to be effective.

The wire was bent accurately and rapidly into the shape of the Delta hook using a jig. The first jig used was very basic; a piece of wire was bent around a series of nails which had been hammered into a plank of wood. It was slow and inaccurate, thus the team cut out a set of molds on a CNC milling machine, which was located at the Fab Lab in Chicago's Museum of Science and Industry. A piece of wire was pressed between the two molds and the wire was bent into the desired shape. The molds were made out of wood and therefore the molding method only worked for softer wire (lower carbon content, ASTM 1006 - 1008). The present challenge is to develop a new method that can shape more rigid wire (higher carbon content, ASTM 1080).

In addition to bending the wire with a jig, a method was needed which could scale the Delta Hook to a smaller size; the team could not effectively bend the acute angles on a scale necessary for a final prototype using the existing jigs. To resolve the bending of rigid wire, a professional wire bending company, Master Spring and Wire Form Company, was contacted. A dialogue was established, and remains an important agenda item to be accomplished in the spring 2010 EnPRO.

Joining the bases of the hooks was the final challenge in the fall 2009. Soldering the three hooks together was used successfully for large-scale mock-ups; it is not a sufficient method to join a properly scaled prototype. As a soldered connection is not of sufficient strength for field-testing and also at the scale the joint would not be large enough to be effective.

All of the product development was centered at a dedicated test bench. The bench was utilized to conduct fatigue testing and flex testing. The other two necessary tests, unbending and sharpness, are quite standard, and there are facilities on campus which were utilized. Figure 3 gives a brief history of the Delta Hook.

Social and Ethical Considerations:

In dealing with the innovative fishing hook technology, EnPRO 358 will have to consider several unique ethical challenges. The first consideration deals with the secrecy surrounding the specific design details of the hook—EnPRO 358 should be careful not to disclose information that has not yet been patented. It is up to the group members to ensure that they do not forfeit the trust of their sponsor. Another ethical consideration deals with the use of material in the hook itself. From an environmental standpoint, the material should be non-toxic, and the hook should cause minimal damage to the fish which bite down upon it. On a similar note, one of

the goals of EnPRO 358 is to create a hook which is safer to humans than traditional options. Team members must strive to achieve a high level of safety to not only meet their goal, but also simply to create a product that is not a danger to its users. EnPRO 358 will address the social and ethical considerations while working to bring the Delta Hook Technology to the market.

IV. Team Value Statement:

All group members participating in EnPRO 358 acknowledge and agree to adhere to the following principles of professional and ethical conduct:

- To complete their assigned tasks in a timely manner and trust in their fellow team members to do likewise
- To seek help and/or clarification when needed to understand what is required of them
- To remain informed of all topics and important issues addressed by the group
- To treat each of the group members with courtesy and respect as dictated by professional standards
- To communicate clearly and effectively when sharing information with the group
- To be present, on time, attentive, and open-minded during group meetings so as to achieve maximal participation and comprehension
- To resolve any grievances among group members quickly and peacefully, thereby maintaining focus on their primary objective
- To provide/accept constructive criticism to/from other group members politely

Absence/Tardy Policy:

All team members are expected to fully participate in IPRO 358. Class begins at 3:15p.m. promptly. Any team members who are more than 15 minutes late will be counted as tardy. Four tardies will be equivalent to one absence, resulting in a 2.5% reduction from that team member's final class grade.

Each member is allowed one personal unexcused absence without any academic penalty. All other absences must be petitioned one week prior to the expected absence. The petition must be presented in front of the group for group approval.

- If the absence of that team member is approved:
- A task will be assigned (pertaining to the individual's subteam)
- a written and oral presentation will be assigned
- the hour do not count toward out of class work
- the team member will present their findings to the class

- In the case where a team member exceeds the one personal unexcused absence, a penalty will be incurred. Each class missed will result in a 2.5% reduction of that team member's final grade.

As it relates to the decision-making process, relevant decisions are to be voted upon, with majority rule. There will be a provision for allowing decisions that were struck down to be reconsidered for discussion after a vote. The motion will be set forth by one individual from the majority party. Up to five minutes will be set aside for discussion before the final vote. This will be the decisive vote. There will be communication established in group meetings, as well as outside of meetings. There are many portals we will utilize for discussion: discussion boards on iGroups, Gmail, Google Documents, etc.

Conflict Resolution:

In order to relate to one another in a manner that is fair, equitable, and honest, EnPRO 358 members must keep open lines of communication. They need to be aware of each other's comfort zones and treat each other with respect. A conflict resolution statement has been developed that will dictate the necessary steps required to identify and mediate problems within the group. Conflicts may arise over issues such as distribution of work, classroom attendance, or simple differences in opinion. By adhering to the conflict resolution plan, and maintaining dedication to cooperation, EnPRO 358 will overcome challenges and become a high performing team during the spring 2010 semester. The points below act as a guideline to resolving any conflict that may arise during the course of the semester:

- Identify the conflict
- Approach persons involved to discuss problem
- If conflict remain unresolved, the team leader and/or professors will mediate
- To ensure a democratic solution, group discussion will ensue to review and insure that the conflict has been resolved

V. Work Breakdown:

Business Development:

Marketing

Consumer Surveys
Each member is expected to conduct 20 consumer surveys to anglers of all backgrounds and ages. Surveys will be conducted at retail stores (Wal-Mart), outdoor retailers (Bass Pro Shops, Cabellas, etc…) and bait shops (Henry's), as well as on online fishing forums and fishing groups. These surveys will provide us with information as to the preference in terms of preferred hooks and lures, species fished for, and amount of time spent fishing of users. Consumer analysis information will be gained from the results of the surveys, giving Sparrowhawk an idea of who the target customer is and how they should market Delta Hook Technologies to maximize market share. Additionally, Expected Value to the Consumer (EVC) analysis will be created using the results of the surveys. This analysis will provide in detail information about what anglers are looking for in a fishing hook and how much they will be willing to pay for our hook.

Strengths, Weaknesses, Opportunities and Threats Analysis (SWOT)
A SWOT analysis will be conducted that will analyze the strengths, weaknesses, opportunities and threats associated with Sparrowhawk's DHT hook relative to the fishing hook market. The SWOT analysis will identify certain factors that will help or deter the objective of becoming a successful player in the fish hook market. An example SWOT analysis chart is provided in figure 4.

Figure 4. **S**trengths, **W**eaknesses, **O**pportunies, and **T**hreats are vital to identify the characteristic qualities of Delta Hook Technologies.

Competitor Analysis
Competitor analysis will provide insight on current players in the fish hook market and their strategies in terms of products, pricing, marketing and other general business strategies. The analysis will give Sparrowhawk valuable information on where and how they will penetrate and remain competitive in the market.

Financial
Using competitor and market information, financial projections will be completed, including: projected balance sales, balance sheets, income statements, profit margins, costs, and growth. This information will be created using cost information gained from the product development team, manufacturing, packaging, advertising, and distribution.

Production

Manufacturing Strategy
A manufacturing strategy will be created detailing where and when the DHT will be manufactured. Also, the quantity of hooks manufactured will be decided upon using strategic market information.

Packaging Strategy
Packaging will be outsourced to a professional packaging firm. A connection has been established with Sigma Services Corporation (Mundelein, IL) and packaging options are being priced. The pricing details include type of packaging (clam shell or blister assembly), amount of hooks per package (three to five), and package design will be decided upon.

Advertising Strategy
An advertising campaign will be created describing the benefits of DHT to anglers. How and where the advertising will be put into effect will be decided upon using consumer information gained from surveys. Also, a campaign and slogan will be decided upon in order to most effectively attract consumers.

Sales and Distribution
Ultimately, a sales and distribution strategy will be created to include sales channels, distributors. Where DHT will be sold will be decided upon using supply and demand information.

General Business Strategies

Business Plan
Using all of the above information, a detailed business plan will be prepared in order to gain the interest of potential investors. Additionally, using the business plan a one to two minute elevator pitch will be created in order to gain the initial interest of potential investors. Ultimately, a formal presentation will be constructed to show investors and gain investments.

Product Development:

Academic Resources:

The EnPRO team will maintain contact with Professor Sheldon Mostovoy whose expertise lies in the field of materials engineering. His knowledge will provide insight to pertinent materials issues including choice of material used to make the hook, the properties of these materials (i.e. stiffness, strength, elasticity, etc.), and in the stress and force analysis of the hook, as well as providing a link to the on-campus testing resources, such as the hardness testers. Information gathered from Professor Mostovoy will be via individual meetings and will be documented in writing as well as voice recordings.

Water Chamber Flume:

The Delta Hook's fluid dynamics and other competitive commercial hooks will be analyzed for water flow profiles. By analyzing the fluid mechanics of commercial hooks the team will be able to measure the "action" (the way the hook moves through the water) and compare to other competitive commercial hooks. If the Delta Hook's movement is unique, further analysis will ensue to understand the hook's ability attract largemouth bass. Additionally, knowing the movement pattern of the Delta hook will aid in ultimate design of the lure, in particular, where the hook should be placed on the lure.

Author Contacts:

The EnPRO team will have an in-depth understanding of the feeding behavior and biological habits of largemouth bass to help in the stress analysis and design of the hook. Bass feeding experts Andrew Carroll and Peter Wainwright will be consulted. The information is intended to help understand the force that the bass exerts when feeding. The force will determine the minimum strength need in the highest stressed part of the hook, thus guiding material selection and strengthening methods.

Furthermore, Dr. Keith A. Jones, the author of *Knowing Bass; the Scientific Approach to Catching More Fish*, will be contacted. His insight into bass anatomy, behavior,

and eating habits will provide expert perspective and advice in understanding the instinctual habits of the largemouth bass. In the designing the hook, the size of fish is another factor influencing hook dimensions. The basic anatomy of the largemouth bass (mouth size, mature bass average weight, etc.) will determine how large or small the hook needs to be, as well as, the gage (diameter) of the wire used to form the hook.

Professional Resources:

ArcelorMittal:
Arcelor Mittal is the world's leading steel maker. Dr. Champion Chigwedu, a metalulogist has shown interest in participating in the material properties and selection process. EnPRO 358 intends to establish a professional working relationship with Arcelor Mittal.

Bass Pro Shop:
Bass Pro Shop is one of the leading outdoor retailers and specializes in the sale of fishing equipment. Retailers like The Bass Pro Shop offer SparrowHawk the opportunity to demonstrate the capabilities of the Delta Hook. Bass Pro Shop has facilities for testing out fishing equipment in a glass tank in front of a customer audience.

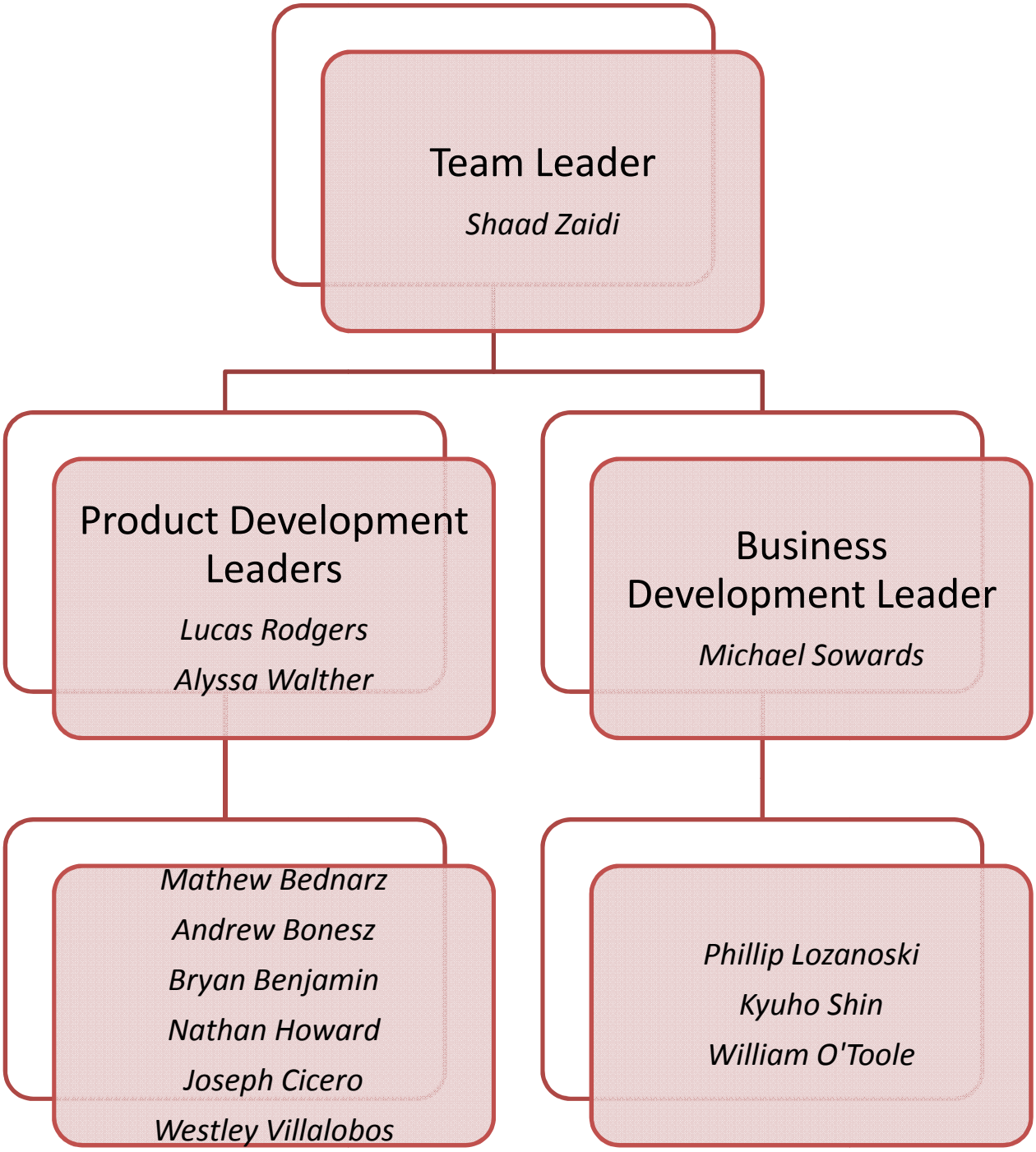
Master Spring:
Master Spring and Wire Form Co. is a local manufacturer of wire forms and springs. The process of contracting Master Spring to manufacture the initial batch of Delta Hooks is being negotiated. Utilizing their automated manufacturing process to create a small sample size of hooks that can be tested and modified will greatly expedite the design and prototyping of the Delta Hook.

Trips:

EnPRO 358 plans to take several trips in order to further our research and understanding of our project. A trip to Master Spring and Wire Form Company is planned in order to gain knowledge of professional level wire bending, as well as making contact with a possible manufacturer of the Delta Hook.

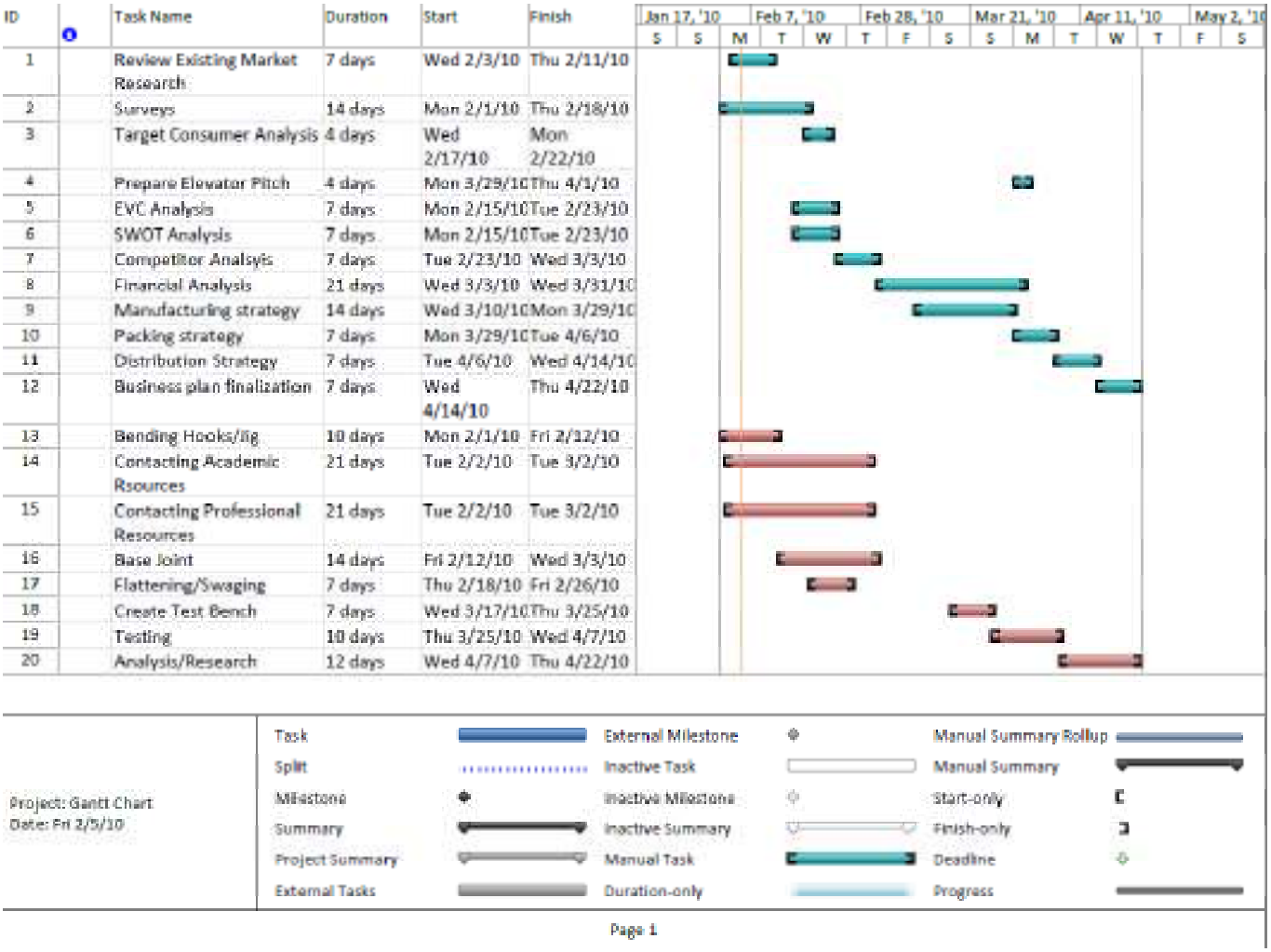
One of the main criticisms of EnPRO 358 during the fall of 2009 was the lack of research into the biomechanics of targeted fish species (i.e. largemouth bass and other similar sized species). In response, a trip to the Berkley Fish Research Center (Spirit Lake, IA) to meet Dr. Keith Jones, is being considered. This trip would provide potential testing area for the Delta Hook and hands-on knowledge of the mechanics and behaviors of largemouth bass.

Team Structure:



VI. Expected Results:

Gantt Chart:



ID	Task Name	Duration	Start	Finish
1	Review Existing Market Research	7 days	Wed 2/3/10	Thu 2/11/10
2	Surveys	14 days	Mon 2/1/10	Thu 2/18/10
3	Target Consumer Analysis	4 days	Wed 2/17/10	Mon 2/22/10
4	Prepare Elevator Pitch	4 days	Mon 3/29/10	Thu 4/1/10
5	EVC Analysis	7 days	Mon 2/15/10	Tue 2/23/10
6	SWOT Analysis	7 days	Mon 2/15/10	Tue 2/23/10
7	Competitor Analsyis	7 days	Tue 2/23/10	Wed 3/3/10
8	Financial Analysis	21 days	Wed 3/3/10	Wed 3/31/10
9	Manufacturing strategy	14 days	Wed 3/10/10	Mon 3/29/10
10	Packing strategy	7 days	Mon 3/29/10	Tue 4/6/10
11	Distribution Strategy	7 days	Tue 4/6/10	Wed 4/14/10
12	Business plan finalization	7 days	Wed 4/14/10	Thu 4/22/10
13	Bending Hooks/Jig	10 days	Mon 2/1/10	Fri 2/12/10
14	Contacting Academic Rsources	21 days	Tue 2/2/10	Tue 3/2/10
15	Contacting Professional Resources	21 days	Tue 2/2/10	Tue 3/2/10
16	Base Joint	14 days	Fri 2/12/10	Wed 3/3/10
17	Flattening/Swaging	7 days	Thu 2/18/10	Fri 2/26/10
18	Create Test Bench	7 days	Wed 3/17/10	Thu 3/25/10
19	Testing	10 days	Thu 3/25/10	Wed 4/7/10
20	Analysis/Research	12 days	Wed 4/7/10	Thu 4/22/10

Figure 5. The blue bars represent the tasks pertaining to the business development team and the red bars represent the tasks pertaining to the product development team.

Business Development:

By the end of the spring term of 2010 the business team will have a viable business and marketing strategy in place that can be used to propel the DHT into the sports fishing existing market. Additional market research and analysis will be completed, in the form of field surveys and competitor product research, this will help in product placement as in pricing and advertising. Each team member in Enpro 358 will complete 20 surveys, to be conducted at retail stores, specialty locations, at piers and on online forums, or sports fishing websites.

The business team will establish a cost structure and manufacturing strategy. Material selection and manufacturing methods, in terms of labor, will be both greatly affect the production cost of the DHT, as such they must be monitored by the business team. Other topics that affect cost, being packaging and distribution, will also be assessed during the semester. In terms of securing funding the team will develop a business plan and marketing campaign presentation that can be pitched to angel investors.

Ultimately the business team will be prepared to launch the DHT at iCAST 2010, by working side by side with the product development team, finalizing a manufacturing strategy and having an evocative marketing strategy in place.

Product Development:

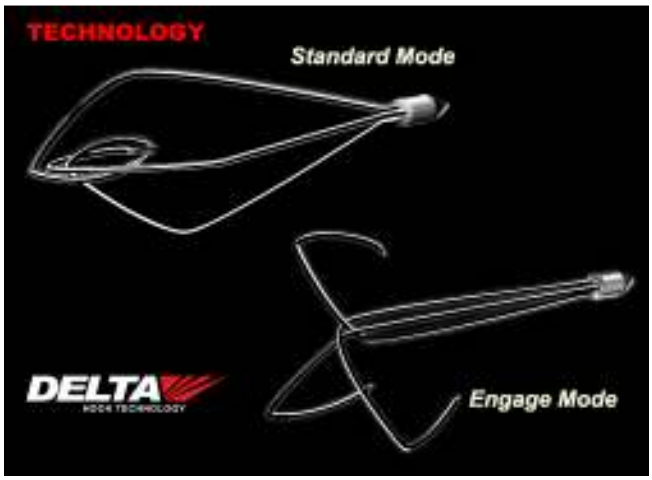


Figure 6. The sponsor's depiction of the fully functioning Delta Hook.

The main priority of EnPRO 358 is to complete the design of Delta Hook Technology's new innovative fish hook and develop a functional prototype to present to our sponsor and investors. Figure 6 is the functional prototype and the ultimate goal. By the end of the semester, after the Delta Hook has undergone numerous quality tests, it will be ready for placement in the iCAST 2010 (July 14-16, 2010, Las Vegas, NV).

With the flow of information from group to group the team hopes to accomplish functional teamwork. As an EnPRO, goals outside of the initial scope of the project have been set up to benefit the individual needs of its members. Effective communication between group members, public speaking and professional business experience were all important qualities that the team's members hoped to improve throughout the course of the semester. As the semester progresses, there will be more and more of a demand for interpersonal relationships between team members and outside sources, and it is the hope of this team that the professional bonds that are formed help raise the level of work this team is capable of.

Risks and Potential Failures:

With any new innovation, there are risks, and potential failures. This is the case with the development of the DHT because some unchartered territory is being explored. There is currently no product similar to the Delta Hook on the market to work from, everything is new. The following items are a description of risks potential failures relating to the steps that need to be taken to develop DHT.

Business Development:

The project proposes a disruptive technology. An incremental technology continually progresses and improves its market over the calculated time. However, DHT requires a careful preparation as it has a potential to create completely new markets or destroy existing markets.

The Project will face hardships on establishing manufacturing, packaging, and distributing costs. This can be overcome by gaining adequate funding from investors.

Moreover, there are many difficulties in the marketing research phase. A high-quality survey needs to be created and distributed. Thorough research on competitors is must so DHT is prepared for any positive or negative reactions from the competitors.

To protect the information related to DHT, the Non-Disclosure Agreement form will be signed by all the parties that work with EnPRO 358 team and will restrict access by third parties.

Last but not least, time is the key to the completion of the project. If all the deliverables get completed on time, the project should be successful.

Other Identified risks and difficulties include:

- Establishing manufacturing, packaging, and distribution resources at an effective cost
- Gaining initial exposure w/ consumer
- Gaining initial funding from investors
- Disruptive technology
- Survey length/ willingness to complete
- NDA protection
- Competitor reaction

Product Development:

Bending / Hook Forming:
The risk associated with manual bending/hook forming is possible injury to the wire bender because the wire is difficult to work with and has sharp edges. These risks can be reduced by obeying proper safety methods. Potential failures during this process include: not being able to find an adequate material, not being able to bend the wire to the required dimensions either manually or professionally, and not being able to streamline the bending process.

Flattening/ Swaging
The most disconcerting risk associated with flattening/swaging is possible injury to the wire bender while using hammers or heating torches. These risks can be reduced by obeying proper safety methods. Potential failures include: not being able to find an adequate material, not being to flatten/swag the wire to the required dimensions, either manually or professionally, and not being able to streamline the flattening/swaging process.

Base Joint Assembly

The risk in manually joining the base with the use of brazing or welding is injury to the worker because of high temperatures created from the process. This risk can be reduced by obeying proper safety methods. Possible failures in this process include: not being able to find a brazing material that is strong enough for the joint, not being able to braze or weld the joint without degrading the properties of the hook material that is used, not being able to manually braze or weld the joint, and not being able to braze or weld the joint without changing the dimensions of the hook.

Testing
The risks involved in testing hooks include injuries that can occur from lifting heavy weights, dropping heavy weights on body parts, and projectiles ejected from hooks being tested. These

can be reduced by obeying proper safety methods. Possible failures in the testing process will most likely be failed tests in which something went wrong, either operator error or testing method error.

Analysis/ Research

The only apparent risk in research is exposing intellectual property to outside resources. The potential failures in analysis/research of the product regard finding information applicable to the Delta Hook development.

VII. Budget:

Item	Description	Cost
Travel expense	Visiting professional services Bass Pro Shop Trips	$300
Professional Services	Master Spring	$1000
Material and Supplies	Wire---$50 Literature---$25	$75
TOTAL		$1375

Budget Detail:

The proposed budget for EnPRO 358 spring 2010 is aimed at attaining professional services and utilizing outside resources to expedite the production of the Delta Hook. Travel expenses are for trips to Arcelor Mittal (Burns Harbor, IN), trips to Bass Pro Shops (Boilingbrook, IL), and trips to Master Spring and Wire (Riverdale, IL). Although these trips will be minimized to reduce cost, visiting the advantages of establishing relationships with Arcelor Mittal are important to advancing material selection (as detailed in product development, methodology). Furthermore, trips to Bass Pro Shop will provide a site to conduct a survey necessary for market research. The professional wire bender, Master Spring and Wire, is of utmost importance to the team; a contract with Master Spring and Wire would allow for mass production of the Delta Hooks, a necessary component of realizing the manufacturing and distribution goals of Delta Hook Technologies. Master Spring Charges a, one-time five hundred dollar set-up fee. The fee programs their wire machine to specifically produce the Delta Hook. More importantly, in the recent past, a non-disclosure agreement (NDA) has been signed by both Augy Park (sponsor) and Master Spring and Wire; because the NDA has been completed the road is cleared for production of the Delta Hook. The remaining five hundred dollars allotted for Master Spring and Wire will be used to order function prototypes for both destructive and field testing (outlined in product development work analysis). The material and supplies budgeted moneys will be used to purchase pertinent literature (i.e. biomechnical study of largemouth bass behavior) and wire to continue perfecting the current mock-ups. Be assured, the money spent at Master Spring has come from two semesters of research and manual production of the Delta Hook; with the extra funds for Master Wire and Spring, the progress of the Delta Hook has the potential to reach out to field testing, destructive testing, and iCAST demonstrations.

VIII. Designation of Roles:

iGroups Moderator:

Nathan Howard. He will be responsible for on-time posting of deliverables and editing the project calendar.

Agenda Maker:

Shaad Zaidi will be responsible for preparing agendas for both the Tuesday and Thursday regularly scheduled meeting times. The agenda is to be posted on iGroups by 5:00p.m. on the day preceding the regularly scheduled meeting times (Monday and Wednesday by 5:00p.m.).

Minute Taker:

Michael Soward will generate meeting minutes and document meeting agenda items and the action taken on those items. Items will be posted to iGroups immediately after each meeting.

Time Keeper:

Phillip Lozanoski will keep the group on task and remind the group leader of timing in order to accomplish all agenda items efficiently.

Appendix A:

Mathew Bednarz(mbedarz@iit.edu)
Third Year Chemical Engineer
Mathew has knowledge of Chemical engineering and lab experience working with acids. He is proficient in Microsoft Office along with knowledge of C++ and mathematics. He hopes to gain some valuable experience in product development and initiate professional relationships with possible employers. He feels that this EnPRO may help him with some of his weaker points such as public speaking, writing and business management.

Bryan Benjamin (bbenjami@iit.edu)
Third Year Mechanical Engineer
Bryan is experienced in welding/brazing and metal forming, which will help in the production of testable prototypes. He also has experience in AutoCad and Microsoft Office, which can be used in the design and reporting of data. A genuine interest in fishing will provide motivation to assist the team in finishing the task. He is hoping to gain experience in the manufacturing process and exposure to the release of a product to the market. Bryan will gain skills in formal report writing and public speaking; he is also looking forward to working in a team environment.

Andrew Bonesz (abonesz@iit.edu)
Fifth Year Architecture Major
Andrew has a passion for creative design and problem solving. His strengths include knowledge of materials and building, and fishing. As a team member, his weakness is time management and engineering knowledge. Over the course of this semester, Andrew hopes to learn about some of the business actions necessary to bring an innovation into the marketplace.

Joseph Cicero (jcicero@iit.edu)
Fourth Year Mechanical Engineer
Joseph has an interest in fishing, the driving forces for him to join EnPRO 358. Joe has engineering coursework relating to product design and material properties, both of which will be useful in product development. He has experience with water-jet machining and CAD work for water-jet machines. He has experience using laser cutters, power tools,hand tools, and welding. He is skilled in Microsoft Office Suite, AutoCad, and has experience with MatLab. Joe has worked in IPRO 347 in which a manual welding process was being automated. Joe wants to learn more about product design and develop better team and problem solving skills. His weaknesses include communication and procrastination.

Nathan Howard (nhoward@iit.edu)
Third Year Mechanical and Aerospace Engineer
Nathan has experience with automotive repair and design. He has spent time working with the SAE formula hybrid team and worked as an Intern at Electro-Motive Diesel. Nathan is also on his second semester with ENPRO 358 and can give many insights into the project so far. Nathan is also skilled in many computer programs including Microsoft Office Suite, AutoCAD, Solidworks, Nx5, MatLab, and Maple. Through EnPRO 358 he plans to gain an understanding of the process a startup company goes through to get a product on the market.

Phillip Lozanoski (plozanos@iit.edu)
Third Year Biomedical Engineer
Phillip has knowledge in the fields of biology, chemistry, and engineering. He will use his diverse background to assist the EnPRO 358 team wherever he can best be utilized. Additionally, Phillip will use his knowledge of formal document writing to help the group produce the deliverables. He hopes to gain experience working on his weakness, business knowledge and development.

Lucas Rodgers (lrodger1@iit.edu)
Fifth Year Architecture Major
Lucas has extensive experience in the field of construction. His strengths include practical problem solving, metal and wood craftsmanship, and fishing knowledge. His weaknesses are limited engineering knowledge, understanding of physics, and advanced math. He joined EnPRO 358 because of his involvement in fishing, but also his interested in the process of taking a product from idea to production. Lucas hopes to attain a full understanding of the initiative and commitment needed to take a product from ideas to the shelves, and hopes to be an integral part of the product development team while learning new skills and thought patterns from the business team.

Kyuho Shin (ksin1@iit.edu)
4th Year Architecture Major
Kyuho has an interest in business. He wants to learn about business development. Kyuho is skilled with MS Office and design software skills. He needs to develop his time management skills and business knowledge. Kyuho looks forward to working with the business development plan. He will gain from working as a member of the business team.

Michael Sowards (msowards@iit.edu)
Third Year International Entrepreneurship
Michael is well versed in working with innovative projects. Having written several business plans in the past and studied in the business school, he will lead the business team. Michael is capable of raising pitch money to initiate production of the Delta hooks. He has networking groups in the Stuart School of Business that are willing to provide assistance in establishing the business. Michael is proficient in MS Word, Excel, Project and PowerPoint. His knowledge in these programs will help the team illustrate their business data.

Michael has limited exposure to production. Michael is looking to gain insight to what it takes to design and test the functionality of products being developed.

William R. O'Toole (wotoole@iit.edu)
Third Year Business Major
Bill has a knowledge of business skills such as finances, marketing, and strategy. He has previously worked in a group project that involved analyzing markets and industries, he has conducted consumer analysis, and built business strategies. Hhe is proficient in MS Office and AutoCad. Bill is looking to gain valuable experience in networking skills, business relationship skills, and general marketing strategy skills. Bill's weaknesses include material and prototype testing.

Westley Villalobos (wvillalo@iit.edu)
3rd Year Mechanical and Aerospace Engineering
Westley has background knowledge in the behaviors and properties of materials. He also has experience with Microsoft Office programs such as Excel, Word, and PowerPoint, which will be utilized in the reporting and presenting of data and design processes. A lifelong sportsman, he is very familiar and experienced with many styles and techniques in fishing, which should prove useful in the designing and marketing of a revolutionary product in the industry. He looks to develop his report writing and gain experience with team design projects. Westley is excited to take on the challenges presented by this project and hopes to use the experience to improve in these areas. He hopes to gain knowledge and experience in the designing and testing of products, as well as becoming familiar with the process of starting a business.

Alyssa Walther (awalther@iit.edu)
Third Year Mechanical and Aerospace Engineer
Alyssa will apply her knowledge to the product development, specifically force and stress analysis and materials selection methods. She has experience in MS office (Word, Excel, and PowerPoint). She would like to further her experience by working with engineering materials and testing. She hopes to gain insight into business development. Ultimately, the experience will give Alyssa insight into her professional pursuit.

Shaad Zaidi (szaidi7@iit.edu)
Fifth Year Architecture Major
Shaad is returning for a second semester in EnPRO 358; as such he has a good base of knowledge to help the team this semester. He has worked on several large-scale group projects during his architectural education and understands the dynamics of groups and enjoys nothing more than working with and learning from colleges with different backgrounds. Due to his education in architecture, he is extremely efficient with both drawing and modeling programs, such as AutoCAD, 3d Studio Max and Rhino, as well programs such as adobe Photoshop and Illustrator. Additionally, he has an intimate knowledge of detailing, a knowledge that will help designing the Delta Hook in EnPRO 358. Having never worked on the realization of

a business plan, he hopes that this semester will provide him with a working knowledge of how to approach such a task.