TO: Professor Cohen, Professor Veshosky, Steve Roche, and Bruce McCutcheon

FROM: Anthony Buffolino

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SUBJECT: Final Project Memo

For my Senior Capstone Project, I examined the connection between engineering and sports. I believe that topics often discussed in sports, such as: speed, strength, accuracy, endurance, and team work, are topics that are also very relevant to engineering. I used these concepts to draw parallels between the technical side of engineering and the social/cultural side of sports. By making this connection, I have helped people better understand the diversity of engineers, especially those that are in hybrid fields of study like Sports Engineering. Further, I have brought attention to the Engineering Studies Program at Lafayette College which epitomizes a field of study where technology and society unite.

I addressed the connections between sports and engineering by asking, how a Sports Engineering System where engineers innovate sportswear, sportswear providers produce the products, and athletes wear and test the products, can begin to be implemented at Lafayette College? In the process of answering the question, I built bridges between three different organizations: the Lafayette Engineering Department, the Lafayette Athletic Department, and Majestic Athletic. In various meetings with representatives of these organizations, I have proposed the before stated system which combines engineering expertise, product development, and product testing.

Realizing that complete implementation of such a system was unrealistic for one semester, the main purpose of this project was to build relationships and initiate discussions between Lafayette Athletics, Lafayette Engineering, and Majestic. The ultimate goals of this project were to show that there is interest in a Sports Engineering System, explain why such a system fits and makes sense, and demonstrate that the eventual implementation of the system would epitomize the Liberal Arts and Engineering dynamic of Lafayette College.

In addressing the proposed Sports Engineering System, I first demonstrated how Sports Engineering is a topic of socio-technical debate. By using various scientific journals and peer reviewed sources (Appendix), I showed that Sports Engineering is a field that focuses on the development, testing, and design of sports equipment and sports-related technology. I then addressed the current Sports Engineering Systems by analyzing the Nike/Oregon, Under Armour/Maryland, and EvoShield/Georgia relationships. Finally, I explained why a Sports
Engineering System would not only fit, but make sense for both Lafayette College and Majestic. In doing this, I explained similarities between the organizations and also presented some past and current projects between the two.

All of the information can be viewed in full at [http://sites.lafayette.edu/egrs451-sp12-sports/](http://sites.lafayette.edu/egrs451-sp12-sports/). This website has multiple pages and tabs that take the project from opening ideas all the way to future steps. The website includes survey results concerning student’s interest in the proposed system, a report showing some completed projects between myself and Majestic, and a multitude of pictures and videos relating sports to engineering. To accompany the website, both Majestic and I produced physical objects. Majestic produced two versions of a Lafayette Baseball jersey, a traditional style jersey and an “engineered” jersey. The contrast between the jerseys will emphasize how engineering plays a significant role in sports, and will demonstrate the possibilities of a Lafayette – Majestic relationship. The jerseys will be hung in the Acopian Engineering Center at Lafayette College along with a large poster advertising the accompanying website.

Although this project has achieved its goals and has proved to be very successful, there is still tremendous room for growth. The long term goal for this project is to actually implement a dynamic Sports Engineering System between Lafayette College and Majestic. In order to do this, the project should be picked up by other Engineering Studies majors as their Senior Capstone Project. It may take a while, and the project may need to be passed down a couple years, but students can give those that follow them a set of goals and future project outlines that will lead to both progress and success.

For next year’s researcher, I suggest strengthening the current relationships by having Lafayette and Majestic representatives meet together and discuss the benefits and possibilities of a Sports Engineering System. Additionally, I think the current athletic contract that Lafayette has with Nike needs to be addressed and better understood. I think suggesting that the process start with only Lafayette Baseball is an excellent idea that, if successful, can lead to further growth. Finally, I think that work needs to be done to find a professor that is willing to teach a Sports Engineering class that can work directly with Majestic on developing new products.

Overall, this project has successfully bridged the gap between engineering and sports. It has brought attention to the field of Sports Engineering and laid the foundations for a future relationship between Lafayette College and Majestic. This project is centered on an exciting idea that has the potential to bring attention not only to the Lafayette Engineering Studies Program, but to the entire College and possibly the City of Easton. Further, this project demonstrates how Engineering Studies majors, like myself, are diverse, hybrid engineers that are capable of mastering many skills and connecting technical concepts and critical thinking to social and cultural disciplines.
Appendix

(Annotative Bibliography)


This article discusses the different types of finishes on fabrics and textiles. Most specifically this topic relates to sports in the uniform aspect. Often times the uniforms in sports are not simply cotton, polyester, or nylon. In fact the fabrics used in uniforms are almost always a hybrid of different types of fabrics and have some form of finish on the materials. This article focuses on the types of finishes and the application of them, whether it be for moisture wicking purposes, UV protection, or anti-bacterial. This article will be used to help demonstrate how engineering can help effect athletic health and performance.

Barelle, Caroline, Vincent Chabrouz and Daniel Favier. (2010). “Modeling of the time trial cyclist projected frontal area incorporating anthropometric, postural and helmet characteristics.” 

This article analyzes bicycle racing helmets on the basis of performance. Cycling helmets with different lengths and inclines were tested in a wind tunnel to determine what combination of the two provided for the least amount of wind resistance. This article discusses how the elongated and ultra sleek helmets are not for show, but rather how they are engineered to aid in athletic performance by allowing cyclists to cut through the air and produce faster times. This article will be used in the equipment section of the projects showing that helmets are a product of sports engineering.


This article focuses solely on the testing of different field turfs. The rate of deceleration is measured as a rigid mass collides with the synthetic surface. This test, known as the Hammer Test, is used to understand the effects on the human body when an athlete falls or is hit into a synthetic surface. This article will be used to address the equipment portion of the project and
will show how field turf is a product of sports engineering that can be engineered to effect health, safety, and performance.


This article focuses on the design of athletic shoes and includes a very technical and numerical analysis of different impact tests. The article talks about the importance of footwear in athletics and how shoes must have correct mechanical properties in order to work with muscles and joints of the athletes. This article falls under all categories, engineering sports performance, safety, and health. Since shoes may be the most vital of all sports technologies it gives me the ability to symbolize the idea of “building from the ground up”.


This article is much more numerical than all the others as it goes through a study where 17 modern helmets were tested with 23 different forms of impact. It proves relevant to my project because the testing process is something very important to engineering a better product and it is also the step of my project that involves the engineers at Lafayette. Further, I found this article very fitting because the first version of the football helmet was actually invented here at Lafayette College. I plan to use this article to demonstrate how engineering in sports can directly affect the health and safety of the athletes. Also I plan to use the testing portion of this article to show how Lafayette engineers play an important role in the system that I am proposing.


This book discusses the technical side of actually playing sports. This takes a different route to understanding how sports and engineering are intertwined. The book goes through all major sports including football, baseball and basketball. It discusses terms such as accuracy, strength and endurance and how they play a role in playing sports from a technical standpoint. I plan on using this book as the main resource when I am discussing terms that are often associated with
sports but also associated closely with engineering. This article will be very helpful in the introduction stages of my website.


Safety is one of the main reasons why engineering is vital in sports. This article talks about the magnitude of injuries in all sporting activities and how the rise of durable, lightweight, and impact resistant plastics has drastically reduced both injuries and deaths in sports. The creation of plastics is tied strongly with engineering and the use of these plastics is tied strongly with sports. This article addresses that relationship and talks about how innovation in the lab results in safety on the field. Again this article falls under the category of engineering athletic safety and will be used to talk about why the role of engineering in sports is vital.


This article focuses on the use of AstroTurf and other types of field turfs used in the 1980’s on NFL fields. It emphasized how the design of the turf was not benefitting the players’ health. It says that sports related injuries, most notably knee injuries, increased with the use of the synthetic surfaces as opposed to natural grass fields. This article will be used to emphasize how sports technologies can engineer health and safety in sports. In this case it will be used to show how the turfs of the 1980’s were improved upon and how modern turfs better incorporate the health and safety of athletes.


This documentary also focuses on athletic shoes, but it takes a much less technical approach. It talks about the idea of creating better athletic shoes and how that idea eventually led to the creation of sportswear and sports engineering powerhouse Nike. This is an excellent resource because it is a mainstream documentary that emphasizes the social implications of shoes as a technology. I will use this article to draw parallels between the early stages of my proposed system and the early stages of Nike.

This journal was a huge find because it is specifically dedicated to Sports Engineering. In browsing through some of the issues there are a multitude of articles that emphasize the importance of engineering in sports. Overall this journal takes a very technical approach with its articles as it discusses topics from field turf impacts, to bowling ball dynamics. I will use this journal to provide examples that can parallel the examples that I already have from my continuing work with Majestic Athletic. There are such an abundance of articles that I decided to cite the Journal itself because many articles aided this project but were not specifically mentioned.


Another key issue that relates sports to engineering is performance. This article talks about how the design and materials used for golf clubs can add distance and provide more accuracy to someone’s golf game. This article talks about strength of materials, weight of materials, and even aerodynamics of golf clubs as they relate to the striking power. This is a great example of how engineering can actually directly affect and possibly change the game. This article falls under the category of engineering athletic performance and will be used to show the technical side’s direct affect on the social side.


This article talks about the importance of the sports base layer. This is a piece of clothing that goes directly on the athlete’s skin, underneath the uniform and equipment. This is often the most engineered piece of sports equipment because it has direct contact with the athlete. This article talks about different and unique fabric combinations that can affect aspects of moisture control and temperature control for the body. This article falls under the category of both engineering sports performance and engineering sports health.