Needs Assessment

**Team No. 21**

**Remote Controlled Target System**



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# ABSTRACT

Sea target training systems provides maritime target systems for all branches of law enforcement, homeland security and the military. Jason, the CEO of Sea Target training systems has requested our services to possibly redesign, improve and/or optimize the turning system on one of his upcoming base maritime target models. His specific needs for this remotely controlled target system are a user friendly interface, Wi-Fi and mobile app controlled program and durable hardware for in service conditions. His goal is to introduce a state of the heart training device that will revolutionize the maritime training curriculum with a highly realistic simulation feature. Team 21 will utilize all the engineering design methods paired with the technical engineering background to meet this objective over the course of the next year.

# Introduction

Firearm training has always been an important focus on police and military training processes. This creates a large market for advancements in training technologies. Group 21 has been brought on board a business venture that will aim to further these advancements. Group 21 has been tasked by their sponsor to design this unique target system accounting for the important constraints and objectives developed through their partnership and discussions with the sponsor.

Jason Knowles, CEO of Hard Target Security Group and Sea Target Systems, LLC, is a special agent for the Florida Department of Law Enforcement. He’s done service with the Tallahassee Police Department and while with the USMC Scout Snipers, he was in charge of special ops and marksmanship training. His main theme in marksmanship training was physiological applications, meaning aiming while under stressed conditions. He realized that this was an important concept when training since in times of need, one has to be able to shoot accurately by instinct and automatic body function. While considering this concept, he realized an opportunity for optimal heuristic training: maritime training. By being able to train accuracy while standing in a vessel with factors such as wind, unstable grounding and moving targets, maritime training can be the solution to effective law enforcement and military weapons training. To this date, there is no maritime training program that is available to both law enforcement and the military. With this in mind, he started Sea Target Systems, LLC and began designing the first sea target system.

# Project Definition

 Currently, Jason has a prototype of his maritime target system. It is a square aluminum frame with a remotely controlled turning system that allows the targets to be moved at the control of a button. In the figure below is a photo of the prototype.



*Figure 1. The Odyssey Model from Sea Target Training Systems*

Please note that the figure above only depicts the stationary target and the feature we are describing is not shown above. The remote and controls are currently run under an analog system and Jason requests that the new optimized turning system be upgraded to a digital one. He cannot stress enough how important the interface and modern controls are to the new and improved design. A mobile app controlled through Wifi was suggested by Jason in order for instructors to have accessibility and a user friendly interface. He hopes to create a new maritime target system that will be able to simulate realistic combat conditions with a modern control system.

## 2.1 Needs Statement

“Maritime sea training targets lack realistic turning features.”

### 2.2 Background Research

 Our background research was done through our sponsor Jason Knowles. With experience as a marksmanship trainer and former USMC SCOTUS Sniper he has extensive knowledge on marksmanship curricula, military training methods and all types of weapons. This enables Jason to not only be the inventor of the product but a very knowledgeable and reliable customer as well.

* **Customer and product development team feedback:** Our sponsor, who created the design for the product, had requested feedback from his fellow peers during the proof of concept. The feedback he received helped him develop the current designs that are the small, medium, and large frames along with the current prototype of the turning accessory.
* **Patent, copyright and intellectual property research:** Jason required a non-disclosure agreement to be signed by all group members as well as the advisor and instructors of the senior design course. This was done in order to protect his ability to patent his design. There are no other maritime target systems in the market, making it an open patentable idea.
* **Codes and Standards research:**
* **Similar design research**: Upon further research of turning target mechanisms, several were discovered which are used for land based training, not maritime or sea use.

### 2.3 Goals Statement and Objectives

The goal of this project is to improve and optimize on the design of the turning mechanism of the maritime sea target system, while maintaining the lightweight, affordable and practical functions of the existing design.

In order to reach our goal, we must establish clear objectives, these objectives are:

* Design an efficient turning mechanism controlled through a Wi-Fi connection.
* Determine aspects of design that need to be improved or left alone.
* Develop an application that is compatible with both iOS and Android devices.
* Controller must have a range of at least 100 yards.
* Uphold quality of materials and housing of electronics.
* Stabilize turning system onto frame of target.
* Maintain practical frame design for setup and breakdown of product.
* Power the servo motor for the turning mechanism with a 12V battery.
* Develop programs to control the manner in which the target rotates, pauses, and returns.
* Allow for manual rotation of targets through application.

### 2.4 Constraints

All engineering projects experience some sort of limitations on their designs or constraints. Some may be the most trivial such as: time and money. But, all types of projects and situations bring about a new set of constraints that may not be too apparent. In the case of Team 21’s remotely controlled target system project, some constraints are inherent by nature and some stem from the sponsor’s or customer’s needs and requirements. Below is a list of the constraints for this particular design project.

* The abilities, knowledge, and experience of the team members
* The total duration of project from birth of idea to execution of design.
* Environmental factors including water damage, corrosion of materials, and weather conditions at sea.
* The existing frame of the target system will not change through the design process. This limits the design because it must operate within the existing frame.
* (Temperature requirements??)

# Methodology: House of Quality

In order to determine which aspects of the design will be most important and will have the

greatest impact on customer satisfaction a House of Quality diagram was created. First Team 21

brainstormed and formulated a list of requirements that would be most critical in terms of

customer satisfaction. Following the creation of the customer requirements (CR) an established

a list of engineering characteristics that are the most vital aspects of the design was created.

Then the team created a correlation matrix determining how much or how little the engineering

characteristic in question impacted a customer requirement. Further analysis on the process and

rank of importance can be seen on the House of Quality diagram displayed below in Figure (X).

Furthermore, a comparison of competitors’ products and their impact on the customer

requirements formulated by Team 21 is shown to the right of the correlation matrix on the House

of Quality diagram. The rank for each engineering requirement based on the customer

requirements are given below the correlation matrix.

#  Conclusion

The sponsor for this project, Jason Knowles, is the CEO of Hard Target Security Group. As a former USMC SCOTUS sniper and marksmanship training coordinator, he established his own set of requirements he would want in his own training sessions. The group brainstormed to create a clear set of engineering characteristics governing the design process and correlated each engineering characteristic to each customer requirement. This process is exemplified in the House of Quality shown above. The process of the creating the House of Quality also included competitor comparisons. After researching similar designs of the sponsor’s prototype the group concluded that there is an abundance of land based turning target system but none with maritime capability. The maritime target system will be improved by the addition of a modern turning target system. The turning system has Wi-Fi connectivity through an application that can be downloaded from an iOS or Android devices. The modified turning mechanism will be attached to the target frame which the sponsor, Jason Knowles, designed and has created a physical prototype.

# References

Includes all references: articles, media facts, books, reports, regulations, internet articles, papers that you referenced from the text. In the text, citations should be [1] or [1-4] (if more than two citations are required at same place) and should be placed in “Reference” section in the order of their introduction. The computer software “End Notes” or the MS WORD tools – “insert, reference, footnote, endnote” (or “cross reference” if you refer to the same reference more than once) should be used to help you organize and manage your references.

References can be written in single space with extra space between references as in the format below. There are many different ways to arrange the information and punctuation in a reference listing. The most important thing is to make sure all references are complete and that the format of your references is consistent throughout. See additional suggestions and possible formatting options online.

Example:

1. N. Gupta. Dynamic modeling and motion planning for robotic skid-steered vehicles, Ph.D. dissertation, Florida State University, Tallahassee, FL, June 2014.
2. C. Ordonez, N. Gupta, W. Yu, O. Chuy, and E. Collins. Modeling of skid-steered wheeled robotic vehicles on sloped terrains. In Proceedings of the ASME Dynamic Systems and Control Conference, pages 91–99, 2012.
3. Dieter, George E., and Linda C. Schmidt. *Engineering Design*. Boston: McGraw-Hill Higher Education, 2009. Print.

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