****

**One Box Gunnery Trainer**

**Restated Project Scope**

***Sponsored by Lockheed Martin***

***Donation by Pelican-Hardigg***

***Group 10***

***Anthony Muller***

***Gerald Tyberghein***

***Joshua Wood***

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**I. Needs Assessment**

The Tabletop Advanced Gunnery Trainer System (TAGTS) is the current gunnery trainer used by the military. This system is used to train many different levels of military units, from novice drivers, to veteran gunners. The system, however, is currently packed in several different cases, totaling over 200-300 lbs. There is a need for a more compact and convenient system, that is assemble in the ‘deployable’ position, and disassemble in the transportable position. Initially, one of our main focuses was to implement the correct tactical sights, however this was determined unnecessary, since the computer software built into the trainer has very accurate sights, although digital. Also, when we first generated concepts for our system, we were unaware as to whether or not the gunner handle was an accurate account for what is in the M1A1 Abrams tank that we are designing for. Since visiting Lockheed Martin and talking to our sponsor correspondent, Jeffrey Payne, we have learned that the only task we must account for, for the handle, is to make sure it is tactically positioned correctly when deployed, and safe when in the transport position. This change did not factor into any changes in our time schedule.

**II. Project Scope**

**A. Project Statement**

The emphasis of this project is to make a new deployable gunnery trainer that can be stored in a compact case, while maintaining correct tactical positioning for the grips and sights while in a “packed” or “assembled” position. This case must also be portable and easy to deploy either on the ground, or set up on a table while accounting for military standard lifting weight. This changed from the initial statement, when we assumed the system must be able to be deployed in a tactical position from the floor. This was the main decision of our design project, and made for a lot of ideas and analysis.

**B. Justification and Background**

Lockheed Martin will be the customer in this project; however the customer who will use this gunnery trainer system is the military. This trainer will be designed purely to be used indoors; however the case must undergo several tests that will verify its safety in any given environment. Some of these tests will be: vibration analysis, for when the case is on a truck or ship, climate testing, shock testing, impact testing, and many more. It is unknown to us what kind of environmental conditions the case will be subjected to, but we must satisfy the MIL-STD-810 requirements before our design can be used by military.

The existing solution has been explained, but a more detailed overview can allow one to see why a redesign is in great need. As of right now, the system is manually assembled on a tabletop by the user, and the separate components are connected in a specific fashion. What this design does not recognize is the need for a more convenient storage unit that could also serve as the surface in which the components are mounted on, in effect utilizing the space of the storage unit. For example, the grip must be mounted onto a table, which may not always be available given a certain situation. With as many electrical components as there are, cooling will be an issue. We want to make sure the case has sufficient air ventilation to prevent from any possible overheating. We initially thought we would have to implement a cooling system, however this would add too much weight and cost, and would most likely be unnecessary if we design around a clear airflow design. While this design works, a more user-friendly, compact, convenient, and portable design can be proposed.

**C. Objective**

To design and construct a mobile deployable TAGTS gunner trainer box with accurate tactical controls. In addition, the new model must more compact and faster to setup and breakdown as well as independent of any additional needs save an electrical socket. The final goal is a portable, one box deployable gunner trainer solution that will provide immersive, accurate virtual training, being lightweight as our design specifications permit.

**D. The Methodology**

The initial step is to define the needs of the customer. This will allow our design team to quantify the issues associated with this project and to visualize the necessary steps to create a product within the guidelines of the sponsor. The next stage will be to research current gunnery trainer system to gain insight into how it might be improved and tailored to the clients’ needs. Durability needs, case layout, proper ventilation, and mounting systems will all need to be investigated in order to provide the most well rounded product. Once these topics have been covered in depth, the group will then hold multiple sessions to brain storm ideas and possibilities. Following this process, the top idea will be refined until it is determined by a weighted matrix which system is the best. The main components of the decision matrix will be:

* Ease of use
* Weight
* Portability
* Setup and breakdown time
* Durability
* Simplicity of replacement of parts should they fail

Throughout the course of the project, discourse with the sponsor is imperative, as is their approval of our selected system. After the final model is selected and it is approved by the sponsor, a prototype will be built and tested. Due to the rough transport of military equipment, rigorous durability testing will be needed to in addition to all other forms of assessment to ensure that all criteria are met to the highest degree.

**E. Constraints**

The sponsor, Lockheed Martin, decided that an update to the current TAGTS equipment was necessary upon interviews with various Marines upon amphibious assault vessels in order to best accommodate their needs. According to the Marines, a single box with a weight of less than 100 pounds was highly desirable, even at the expense of functionality. This was impossible to meet, given our design criteria, thus a new goal of under 120 pounds was set. In light of these needs, weight and portability are the greatest constraints of this project. Additionally, these trainer boxes will be shipped all over the world alongside other military equipment, which raises resilience concerns. Pelican Cases has graciously offered a case for the needs of the project, so the packaging of the sensitive components is more worrisome than the hardiness of the case itself. Cooling is another priority, as the case must retain ambient temperatures well within the specified operating ranges of both the monitor and computer. This is dependent upon both the ventilation of the case, as well as the mounting of the system within the case. Each constraint much be taken into careful consideration in order to maintain a well-balanced product that satisfies all requirements.

**F. Expected Results**

By the completion of this project, a portable, one-box deployable gunnery training box should be produced that meets the tactical standards of modern control systems as well as the durability of United States military equipment. All parts should either be commercially available or easily obtainable by Lockheed Martin. This product should be simple to produce, undemanding in maintenance and up to the rigors of military transport. The system should be considerably more self-contained and effortless to prepare while retaining the same training fundamentals of its predecessor.