# Target Turner

## Needs Assessment Draft

Team 16
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# Abstract

Stationary Infantry Targets (SIT) have been used in the past to give a more realistic training experience to military and law enforcement. Many of these targets employ the same overall target actions, but actions such as “pop-up” or rotation have recently been implemented in order to create a more robust training model. Specifically Lockheed-Martin’s version of the SIT does not have the capability to rotate the attached target once in an upright position. The team’s objective is to create a lifting bracket to mount on Lockheed-Martin’s current SIT design. The new lifting bracket will accommodate various types of standard targets, as well as rotate the target using standard Future Army Systems of Integrated Targets (FASIT) regulations. The team plans to brainstorm on an appropriate design. Following the typical design process, the best design will be selected on a basis of appropriately ranked criteria. Once a design is selected, detailed design will begin and materials will be ordered. After these goals have been met, a prototype will be developed, implemented and tested on Lockheed-Martin’s SIT. To achieve its goals, the team will follow a schedule dictated by the master deliverables list given to the team by the Senior Design Capstone advisors. Through fluent communication with the sponsor and team advisors, the team hopes to meet the time table of this Capstone project.

# 1 Introduction

Military and law enforcement organizations have always attempted to simulate real life situations while training in order to be more prepared for real life situations. Targets that vary from simple paper and cardboard posters, to more complicated molded silhouette targets have been used to simulate real life situations where there is a need to distinguish between a hostile and a friendly entity. Coupling these target presentations with realistic spatial movements provides a robust model for what one might encounter in real life. There are various mechanisms available on the market that fully simulate an encounter where there is a need to discern friend from foe. One of those systems is the Stationary Infantry Target or SIT. The SIT system raises a concealed target up 90 degrees and presents the trainee with a target which can be either friend or foe. There are limitations of the SIT such as, the time to switch the physical target between a friendly target and a foe target, the manner in which the target is attached to the system is not universal for different, widely used targets, the target presented cannot rotate and is fixed in a fully presented position, limiting the realistic simulation of a quartering body.

The objective of this project is to implement a new target arm to the SIT, which alleviates many of the shortcomings of the original design. The new target arm shall make replacing used targets quicker and easier, accommodate various standard training targets, be able to rotate the target between a range of quartering angles once fully deployed in its upright position, as well as rotate a full 180 degrees to reveal a second, different presentation.

# 2 Project Definition

## 2.1 Background research

The Stationary Infantry Target, or SIT, has been used for many years and is a staple of live training equipment. They are primarily used in infantry platoon/squad battle courses but can also be used at gun ranges as well **[1]**. A picture of the mechanism can be seen below in Figure 1 **[2]**. The SIT mechanism has gone through many iterations over the years, making it more reliable, flexible, and simple to use. Therefore, the SIT systems that exist today are very robust. There are many different companies who design and market SIT systems, these companies include Strategic Systems, Meggitt, Lockheed Martin, and more. All the different SIT systems these companies produce essentially perform in the same way. Therefore, to incentivize organizations into buying their SIT systems, engineers are required to innovate and constantly improve their designs. These improvements are not just limited to the operation of the system but also to things such as portability, reliability, and cost **[3]**.

The competition between companies as well as increasing requirements from clients has given rise to complex SIT systems that provide more variable training. These variables add additional stress and also simulate real combat more closely giving rise to better trained personnel. Some examples include thermal targets which are used for night training, hit detection, and muzzle flash. However, the feature that the design team is primarily interested in is the rotation of a mounted target.Theissen already implements a friend/foe SIT on their MOUT (Military Operations in Urban Terrain) courses **[4]**. Also, Meggitt has a product called the MF-SIT which has the ability to raise and rotate the target a complete 360 degrees in less than a second **[2]**. This is of interest to the team since this feature is one of the goals of this project. Also, it can be seen that a rotating target has already been done and is currently in use.

It has been seen that SITs can vary in their combat simulation variability, but beyond these aspects, many systems follow a standard. For example, all SITs present the same basic targets. These include E-type, F-type, and Ivan-type targets. Also, all target systems run of FASIT 2.0 compliant firmware. FASIT is a set of regulations that helps simplify programming a training routine by keeping a universal set of commands among differing targets, and target manufacturer hardware on a range. More can be learned in the FASIT 2.0 Interface Control Document. The team will have to take these given factors into consideration in order to meet the project requirements.

Figure 1. Example of SIT

## 2.2 Need Statement

Lockheed Martin's Live Training organization specializes in training domestic and international ally militaries. Currently Lockheed supplies live fire "pop-up" targetry training systems for military target identification purposes. The new target training system requires the ability to rotate the target through various angles in either direction once the target has been lifted in order to present a friendly or foe target.

**"Lockheed-Martin's current Stationary Infantry Target does not allow for suitable target presentations"**

## 2.3 Goal Statement & Objectives

**"To create a target system that can deploy a variety of targets from a resting position, and rotate to a friendly or foe position on command."**

**Objectives**:

- Lift and rotate targets on command
- Firmware interface with FASIT
- Create a universal mount for variety of targets
- Easily attach and detach various types of targets
- Withstand 35 mph cross winds
- The motor may not be back driven
- Motor will be unaffected by heat, sand, dust, and rain
- Use Figure 11, Ivan, "E" type and "F" type targets

## 2.4 Constraints

- The total cost may not exceed $3,000.
- Motor must meet FASIT requirements. **[5]**
- Distance from bottom of lifter to top of the arm shall be no more than 18 inches.
- Weight of lifter arm with turner motor shall be no more than 10 lbs.
- Time to install new target shall be less than 10 seconds
- Motor shall rotate the target up to 90 degrees in either direction within 1 second of receiving turn command.
- Motor housing shall be rated to at least IP67.
- Arm shall survive a loose cargo test (details TBD).
- Target arm shall operate -20C to 50C and shall have a minimum storage temperature range of -40C to 60C.
- Target arm shall accommodate an Ivan-style target, an E and F-style target, and a Figure 11 target without reconfiguration (Examples of these can be seen in Figure 2. below)
- Target arm shall fit on the new Lockheed Martin Stationary Infantry Target (SIT) – part number 15721510G1 (dimensions provided).
- Arm shall not impede functionality of muzzle flash feature on the SIT.
- The new bracket and arm must be able to hold the target in wind conditions up to 35 miles per hour
- Firmware shall be compatible with all applicable FASIT 2.0 commands (Refer to Table 1)

Figure 2a.” Figure 11” Target Face


Figure 2b. “Ivan” Style 3D Target

Figure 2c. “E” Style Target

Figure 2d. “F” Style Target

Figure 2. Target Examples

**Table 1. FASIT 2.0 PD IDC calls out ASPECT field: values 0 through 6**

| FASIT 2.0 PD IDC Command | Target Action |
|---|---|
| 0 | Concealed |
| 1 | Simple Hostile |
| 2 | Restricted Hostile Left |
| 3 | Restricted Hostile Right |
| 4 | Simple Neutral |
| 5 | Restricted Neutral Left |
| 6 | Restricted Neutral Right |

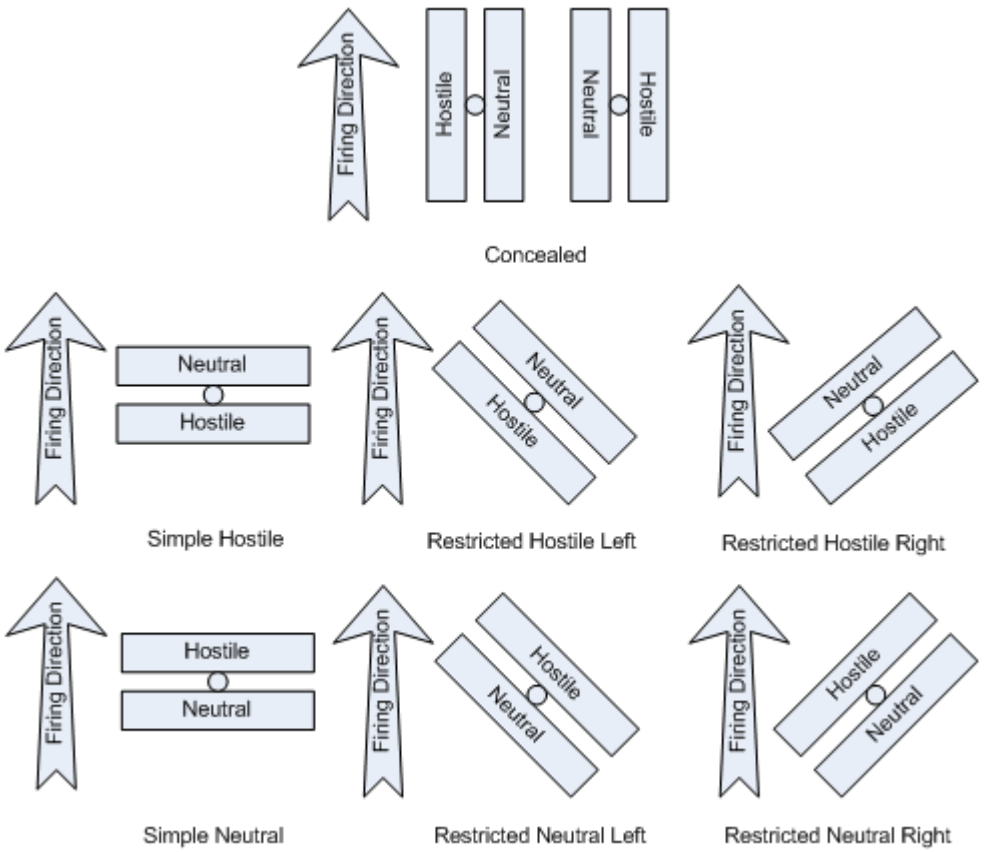


Figure 3. FASIT Target Actions

## 2.5 Methodology

The first objective for this project is to obtain all information from the sponsor regarding the project and system. Through conference calls and meetings, the team will keep communicating its needs with the sponsor, as well as receive the sponsor's needs. Once we receive the target lifting system from our sponsor, we will begin to take measurements and begin our initial design on the new lifting bracket. Having the physical mechanism on hand will help us better evaluate the ways to meet the project constraints and develop a fully functional prototype within these specifications.

In order to meet the sponsor’s needs, we must design the lifting arm with an end goal of having the production cost be less than $50 at a production quantity of 100. This will require meticulous material selection and detailed design. After brainstorming and having broad discussion on general design, the team will select what it believes is the best design for the needs of the sponsor. The team will then enter detailed design, where it will focus on the selected idea and implementing it on the lifter. Structural analysis will be performed on the proposed idea in order to make sure our idea is feasible. Once this has been achieved and the design has been certified suitable, the team will then order the parts and materials needed to construct a prototype.

Finally, after the design has been completed and the materials received, the team will begin manufacturing the prototype of the selected design. This will be done either through the college of engineering's machine shop resources or by other means if special actions must be taken to complete the fabrication of the design. After completing the prototype, the team intends to test the design by implementing it on the provided lifter to ensure all requirements and constraints have been met.

## 2.6 Schedule

At this point in the project, a detailed schedule cannot be constructed. However, the group has established weekly meetings with the sponsor, team itself, and Senior Design Capstone advisors in order to communicate the needs of the group in a routine and effective manner. In the near future, a gantt chart will be constructed to provide all details of the group's tasks to meet the dates given by the master deliverables list provided to the team by the Senior Design advisors. The gantt chart will be constructed in MS Project.

# 3 Conclusion

The SIT system is part of Lockheed martin live training exercises. Used for training domestic and ally international militaries. This system is being improved upon by the addition of a rotational feature that will allow a single unit be potentially be a friendly or foe target. This design will follow all specifications set by the sponsor. In order to establish a smooth build process the formation of a schedule is important. Through establishing a weekly meeting time with the sponsor, as well as with the Senior Design advisors, the team hopes to meet its goals. A more rigorous, detailed schedule will be developed in the next draft of this needs assessment.

# 4 References

[1]Infantry Squad Battle Course, Army Engineers
[2]Meggitt MF-SIT Specification Document
[3] MS Instruments Stationary Infantry Target Specifications
[4]Theissen GSA Federal Supply Schedule Price List
[5] Future Army System of Integrated Targets: Presentation Devices Interface Control Document 2.0