University of Vermont
College of Engineering and Mathematical Sciences

Project Printed Defense
Team #19 - Product Update for Additive Manufacturing

Deliverable:
Scope Statement

Team:	*Contact Information:*
Matthew Bouvier	mrbouvie@uvm.edu
Michael Calascibetta	mcalasci@uvm.edu
Kevin Capone	kcapone@uvm.edu
Jack Fletcher	jjfletch@uvm.edu
Zach Moyse	zmoyse@uvm.edu

GENERAL DYNAMICS

DATE	REVISION	RELEASE NOTES
9/17/2018	1	Initial Release
9/24/2018	2	Reformatting of bullet points

Tuesday 25th September, 2018

Contents

1 Introduction

This document outlines the scope of the project. Included in this document is the problem statement, the goals the team must accomplish, the major deliverables needed to document completed goals, the external dependencies present that success hinges on, the current assumptions regarding this project, along with any exclusionary or inclusionary actions pertaining to the project.

2 Scope Statement

2.1 Rewritten Problem Statement

Additive manufacturing is a relatively new technology that rivals existing manufacturing methods. Since the technology is new, much remains to be researched about the technique's feasibility for specific applications. Additive manufacturing techniques must be researched and understood in the context of complex weapon systems. Material properties in different directions must be explored and existing designs are to be optimized for additive manufacturing methods. Additive manufacturing methods are only useful if they are cost competitive to other techniques, therefore the financials regarding additive manufacturing must be investigated. In short, there is a gap in knowledge regarding the feasibility of using additive manufacturing techniques to build components for weapon systems, and this project will lessen that gap.

2.2 Goals

- Review subsystem design and loads.
- Research AM techniques and post processing methods for optimizing part performance.
- Redesign subsystem parts for additive manufacturing methods.
- Complete FEA analysis on subsystem or part based on the static and dynamic loads specific to the part or subsystem's application.
- Complete cost analysis on using additive manufacturing for subsystem or part.
- Generate redesigned subsystem or part.
- Develop test plan to determine the strength and material properties of the subsystem or part.

- Execute test plan.
- Compile report containing test data, FEA analysis, cost analysis and all supporting research and documentation.

2.3 Major Deliverables

- A functional prototype to be tested in the current weapon system. This prototype shall be modified and optimized for additive manufacturing methods based upon team research.
- Full technical report with containing tested material properties, testing processes, CAD drawings with dimensions, and FMEA analysis.
- Feasibility report discussing the cost, weight, safety and functionality of the design with regard to additive manufacturing.

2.4 External Dependencies

- Limitation of current additive manufacturing techniques.
- Tolerances using available manufacturing processes.
- Functionality of the weapon system as a whole.
- Available and allowable facilities for testing and manufacturing parts defined by confidential elements and drawings.

2.5 Assumptions

- General Dynamics OTS will supply the team with current component, or subsystem, including all relevant dimensions. The team will be able to interact with and observe in detail the full weapon system and its subsystems, such that the needs of the project and product are understood fully.
- General Dynamics OTS will make clear what is protected or confidential information.
- General Dynamics OTS will provide printing, manufacturing, and testing facilities, or will provide the team with approved facilities to conduct such work.

- General Dynamics OTS will provide all environmental and loading conditions experienced by the component or subsystem, as well as the tolerances required.
- General Dynamics OTS shall provide storage devices that will securely hold all technical data pertaining to the project.

2.6 Exclusions/Inclusions

- The team will be allowed to see assembly facility, and inspect all components relevant to the subsystem of interest.
- All project work will be done with focus on the weapon system specified by GD-OTS.
- The team will be able to fire or witness the live firing of the weapons system.
- The team is willing to provide a presentation for the GD-OTS team, separate from senior design night.
- Additional or unexpected costs exceeding the budget will not be paid for by the UVM team members.
- The team shall not provide painting recommendations and related costs for final prototype.