Miniature Modular Rack Launcher Combo

EML 4551C – Senior Design – Fall 2011
Project Specifications and Project Plan

Team # 3

Casey Brown, Keith Kirkpatrick, Cyril John and Bryan Rickards
Department of Mechanical Engineering, Florida State University, Tallahassee, FL

Project Sponsor
Eglin Air Force Base

Project Advisor(s)

Dr. Jonathan Clark, PhD
Department of Mechanical Engineering

Mr. Russell Roberts
Eglin Air Force Base

Reviewed by Advisor(s):

Introduction

This project is sponsored by the Air Force Research Laboratory Munitions Directorate at Eglin Air Force Base ~~in Pensacola~~, FL. The goal of this project is to develop a ~~BRU (~~Bomb Rack Unit~~)~~ that attaches to the Tigershark UAV. The BRU will hold a cylindrical payload and will be responsible for supplying an electrical signal between the user and the payload that is to be dropped. The BRU will be built with multiple safety features, designed to lock-out the release mechanism when the UAV is not in flight, as well as when the BRU is not in the "armed" mode. The preliminary design considerations will be focused on the types of release and launching mechanisms. An engineering analysis will be performed to determine the optimal design.

Product Specifications

This product is comprised of two main systems, the launching/mounting system and the safety features of the system. The mechanical components of the system will be integrated with an electrical interface that will communicate with the Tigershark UAV. The primary focus of this project is to build a launch system capable of being properly mounted and weaponized to the Tigershark UAV.

Launching/Mounting Systems

The BRU ~~(Bomb Rack Unit)~~ mounts to a pylon attached ~~to~~ under the wings of the Tigershark. This pylon has mounting holes located 11 inches center to center in which the BRU will be mounted, which in turn secures it to the aircraft. The pylon is one inch thick and has 0.26 inch diameter mounting holes drilled 1.19 inches above the bottom of the pylon.

The payload is to be four inches in diameter with hooks 11 inches apart that ~~attach to~~are secured by the BRU. The payload is going to weigh 10 pounds, and will be ejected from the ~~wing~~ BRU instead of being allowed to freefall. This is to ensure a safe ~~launch seperation~~separation from the ~~wing with no jams~~aircraft. The ~~system that ejects the payload~~BRU will be a mechatronic system controlled ~~on~~ from ~~the~~ a remote ground ~~by a remote~~ control station. It~~This system~~ will be powered by 28 volts from the Tigershark.

Safety Features

The first safety feature for this project is pins inserted into the sides of the BRU to disable the system while the aircraft is on the ground. These pins will have flags attached to them that say “Remove Before Flight”. If these pins are not removed before takeoff the BRU will be disabled and it will be impossible to drop the payload in flight.

Once the pins have been removed, the next safety feature will be utilized in flight. A safety ~~switch~~ interlock is integrated into ~~the electrical interface between~~ the BRU ~~and the UAV~~to prevent inadvertent release of the payload. ~~This switch is designed to prevent the BRU from~~

~~releasing the payload before the weapon is set to "armed".~~ Once the system is put into armed mode, this safety feature disengages to allow the payload to be launched. The ~~Fire~~ release control is the ~~last switch~~final system that is integrated into the BRU, which ~~to, which will only work once the previous switch and fail-safe pins have been used.~~ releases the hooks and ejects the payload.

Quality Function Deployment

		Engineering Specifications						
		Yield Strength	Young's Modulus	Ejector type selection	Release mechanism selection	Mounting hole separation	Weight	Plating thickness
Customer Needs	Lightweight (5lb max)			**X**	**X**		**X**	**X**
	Holds payload steady				**X**			**X**
	Attaches underneath wing					**X**		
	Releases payload from BRU				**X**			
	Ejects payload from BRU			**X**	**X**			
	Safe operation			**X**	**X**			
	Long lasting	**X**	**X**					**X**
	Units	psi	psi			in	lb	in

Fig. 1- QFD table

The Xs establishes the relationship between the Customers Needs paired with the Engineering Specifications. According to the above chart, selecting the correct ejector and release mechanism will be crucial to the success of this project

ID	Task Name	Start	Finish	Duration	Days Completed
1	Project Definition	09/06/11	10/15/11	39	37
2	Needs Assessment	09/20/11	10/11/11	21	21
3	Product Specification	10/06/11	10/13/11	7	7
4	Background Research	09/20/11	10/15/11	25	23
5	Concept Generation	10/06/11	10/18/11	12	7
6	Concept Design	10/18/11	10/25/11	7	0
7	Interim Design	10/26/11	11/15/11	20	0
8	Final Design	11/16/11	12/06/11	20	0
9	Cost Assessment	11/29/11	12/04/11	5	0
10	Final Paper	11/22/11	12/06/11	14	0

11	Order Parts	12/01/11	12/06/11	5	0

Fig. 2- Table of Project Plan

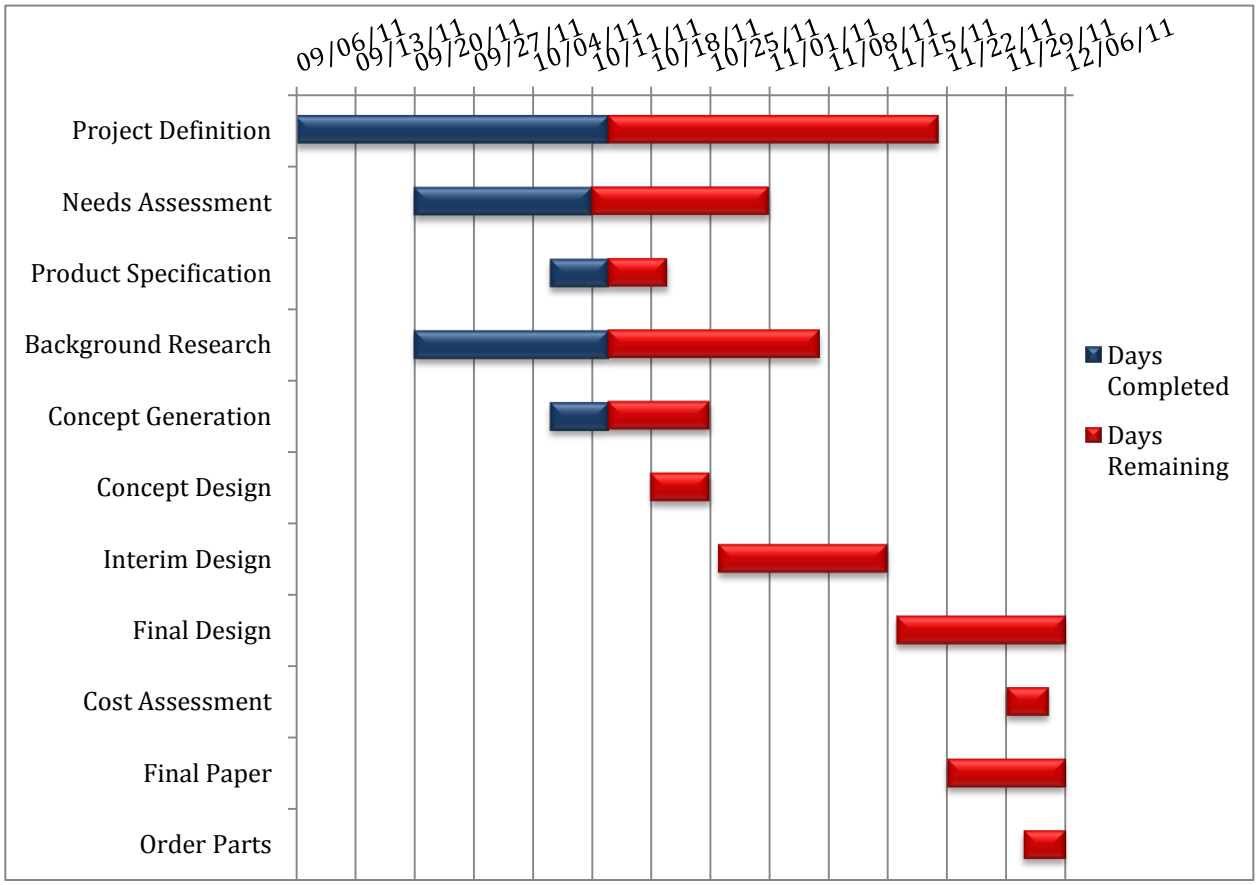

Fig. 3- Gantt Chart of Project Plan