Miniature Modular Rack Launcher Combo

EML 4551C – Senior Design – Spring 2012
Restated Project Scope & Project Plan

Team # 3

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Needs Assessment

Unmanned Aerial Vehicles (UAVs) allow the military to perform reconnaissance as well as attack missions without risking the safety of the operators. These operators conduct these missions in a ground control station, away from any battle zones. Platforms are currently being designed for these UAVs in an effort to have the option of housing different types of weapon systems. These weapon systems will vary depending on the mission type. The purpose of our project is to design and fabricate a launcher for the Tigershark UAV capable of housing multiple types of weapons. Modular type design must be implemented which will allow the launcher to be easily configured for specific weapon loads. A detailed design with a deliverable technical data package must be presented to the ARFL before the prototype is fabricated. A fit check with the Tigershark UAV and a weapon system would complete the integration.

Project Scope

Problem Statement

The emphasis of our project involves the design and fabrication of a launcher for the Tigershark UAV, capable of housing a given weapon system. The launcher design must meet the requirements specified by the ARFL, and must undergo a critical design review before the prototype is implemented. The finished launcher will then be integrated with the UAV in which a fit check will be performed with the given payload.

Justification and Background

Unmanned aerial vehicles (UAVs) have become increasingly common on today's battlefield. Since the UAV does not need room for a pilot, the aircraft can be constructed much smaller, making it difficult to be seen and detected from the ground. In Iraq and Afghanistan, UAVs, such as the Predator and Global Hawk, have assisted ground forces by providing real time video of the battlefield using high resolution cameras. Today UAVs are being designed to house and launch multiple weapon system, which allows the aircraft to complete various missions in hostile environments.

The Tigershark is a small, cheap, autonomous UAV. Developed by L-3 Unmanned Systems, the Tigershark has a wingspan of 17.5 feet, empty airframe weight of 150 pounds, and a gross takeoff weight of 300 pounds. Currently this UAV is used as a surveillance drone. Our project will entail weaponizing the Tigershark UAV by fitting a Bomb Rack Unit (BRU) to the aircraft. This will allow the Tigershark to become more versatile and further assist ground forces on the battlefield.

Objective

Our project is to design a BRU positioned beneath the wings that is capable of housing and launching a given payload. As a project team we must determine the

requirements for the launcher depending on specific weapon loading. We must identify existing mounting hard-points and electrical interfaces when implementing our design. A detailed budget analysis must be included and presented with recommendations. A technical data package must also be presented which meets the requirements specified by the ARFL.

Methodology

There are multiple tasks needed to be done to successfully complete the rack system that is desired by our clients at Eglin Air Force Base. The first task is to communicate with our client to fully understand the product requirements. The next step is to conduct research on all the components related to our system. Some of the topics that will be covered in our background research is on the Tigershark UAV, aerodynamics, and other designs used for larger jets. Once all the background research is completed, our group will begin making preliminary designs. Once all the designs are made, we will begin to analyze and compare the designs to one another. The major considerations in this step will be the flexibility of the designs, weight, drag resistance, and complexity. After a design is selected we will construct a prototype and begin testing.

During our testing we will monitor the stability of the payload when attached to our BRU at different flight angles. We will also test the safety lock system ensuring the payload goes through safety checks before ejections. The ejector system will also be examined calculating required ejection velocity provided by the client. After testing is completed, our final design will be presented to our client at Eglin Air Force Base.

Constraints

There are constraints present during any engineering process. It is important to clearly define the constraints in order to produce an acceptable final product. The main constraints given to us by the client our listed below:

- BRU must not exceed 5 lbs.
- Capable of holding a payload that is 10lbs
- Ejection velocity of at least 4 ft/s
- Retain payload during aircraft maneuvers up to 2GS lateral load and 1G landing shock.

Expected Results

Upon project completion, a working modular rack launcher will be delivered that is capable of carrying the given payload. The launcher will be lightweight and strong while maintaining a high level of reliability. It will provide the electrical and mechanical interface to the weapons that are deployed. The launcher will have a release mechanism; and engineering analysis will be performed to ensure the best release method is determined and implemented. A conceptualized solution will be generated and any revisions will be made as per customer request. Finally, a prototype will be manufactured and test-fitted to the Tigershark UAV with inert weapons.

Project Plan