



This Is My Jam

Nose Cone and Forward Cover for Mk-41 Vertical Launch System UAV.



Team Members

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Project Sponsor

Lockheed Martin

Background: This project is split into two parts. The mechanical engineering team is focusing on the nose cone and forward cover. The aerospace engineering team is developing the persistent jamming UAV. The aerospace team has provided target dimensions and weight for the UAV and also given guidance that they would like the nose cone to break away from the rest of the UAV to allow the jammer to continue on.

Currently, there are no designs for the launch of a UAV without an Unmanned Aerial System (UAS). The main challenge is to design a breakaway mechanism for the nose cone to separate from the rest of the UAV. Prior to breaking away, the nose cone needs to protect the payload as well as penetrate the forward cover.

Objectives: Develop an Unmanned Aerial Vehicle to be used as a persistent jammer that is capable of being launched from the MK 41 Vertical Launch System (VLS). The main problem from a mechanical engineering standpoint is developing the nose cone to protect the sensor inside the UAV and break through the canister forward cover. Included in this problem is the challenge to develop the forward cover material and design that the missile can break through while protecting the missile while in storage.

Designs:

The This is Our Jam team went through an elaborate design process and found the best suitable nose cone and forward cover to move forward. The forward cover seen in Figure 1 was designed to have a controlled failure mode with a single layer of material. This controlled failure mode consisted of having a circular groove with a smaller

thickness in the center, and then have a “X” shaped groove with an even smaller thickness within that circle. This would control the failure by having the lines with the smallest thickness fail first and effectively tear into four different flaps and allow the missile to pass through unscathed. This design was made assuming that the material used for the forward cover would be a type of rubber and would tear when penetrated.

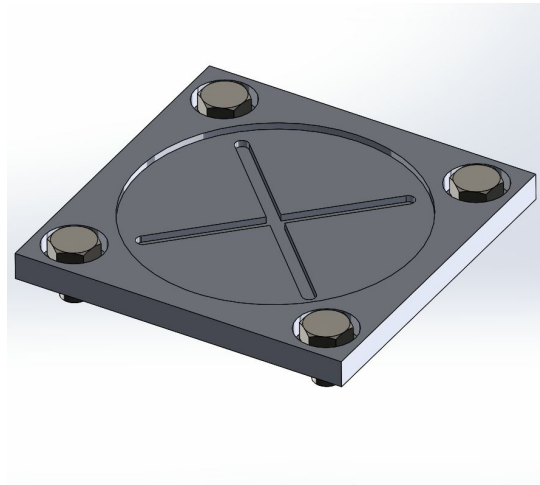


Figure 1: Forward Cover selected design

The nose cone seen in Figure 2 was designed to have an ellipsoid shape and was split down the center into two halves. The two halves are designed to be bolted together, as well as the entire nose cone is designed to be bolted to the main body of the missile.

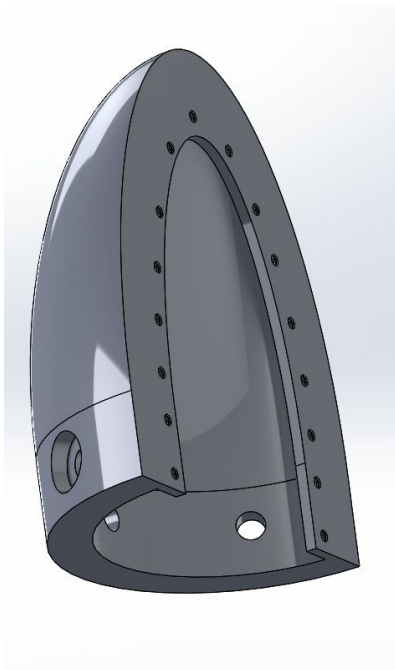


Figure 2: Nose Cone selected design

Test Plan: The team plans to follow a testing schedule which will include tensile test and tear test for rubber for forward cover, pressure test for forward cover, drop test for nose cone, and finally a proof of concept test for forward cover and nose cone. The proof of concept test will test the final design to make sure the team's predictions and designs are well thought out.



Figure 4: This Is Our Jam Team members