

USB Mounting Bracket Redesign Report

Alyssa Innes, Peter Han, Mohamed Osman, and Jared Torres
Junfeng Ma
26 April 2016

Abstract

Lockheed Martin is an international defense and aerospace engineering contractor, commanding projects such as the F-35 Lightning II and F-22 Raptor. The company has gained its reputation as efficient and innovative through the development of reliable and technologically advanced products. These meticulous methods bleed through every product and system they develop, and it is of utmost importance that each and every part, no matter how small, meets the same standards of quality. We have been tasked with redeveloping a USB mounting bracket to replace the current one, with fewer parts and a more reliable construction. The new bracket should also better dissipate vibrational and environmental stress. It will also allow for mounting of up to three horizontally mounted hubs, as opposed to the current two.

Key Words: USB hub, mounting bracket, design process, innovation, parts.

1. Introduction

USB Hub Mounting Bracket is designed for huge company as Lockheed Martin. They asked Penn state students for help to develop some of their new inventions. Lockheed Martin is well known company all around the world and no doubt that it is honor for us to help them invent such a design. This USB may seems as an easy invention but they can use it in wars to send data or download important algorithm on it. There are many ways that the USB might be used. We assume that it will be used in war to transport information and it will be honor for us to support the army.

2. Literature Review

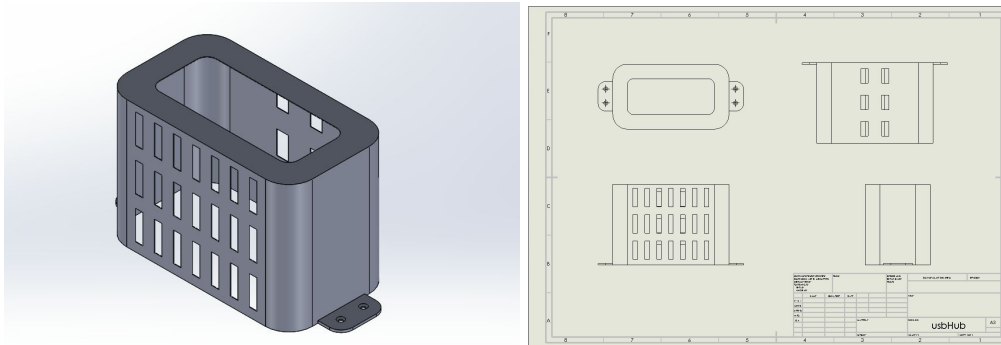
There are many different usb hub brackets on the market. Lockheed Martin provided us with a bracket model that we based most of our ideas off of. However, we also researched many other designs and based it off of one that is also able to be 3d printed. This bracket is a prototype designed for 7 port hubs that are stackable [1]. These brackets can be printed separately and then stacked so that the user can have as many as they need. This brackets are very small and lightweight and are therefore cheap and easy to print. However they may not be able to be used during flight or operations that have large vibrations. These brackets look like they will fall apart and therefore we also incorporated ideas from the model from Lockheed Martin. There bracket has a top as well as 4-point screw mounting that will help the bracket stay in place and get rid of the amount of damage that the hubs endure.

3. Design Process

Before reaching our final result, we followed the eight step design process for redesigning Lockheed Martin's USB mounting bracket. We started by analyzing the constraints that Lockheed Martin provided, which were that it must hold the given USB hub horizontally, must be able to withstand vibrations, and most importantly, be built with minimal parts. We recognized that having minimal parts was the most important customer need, so we chose to put a lot of focus into that component. After identifying and defining the problem, we started the brainstorming process and thought of all the different possible solutions that could be incorporated into our design. We first looked at already existing examples, and analyzed what we thought we could change. Then, we thought through different kinds of materials, mounting types, and structural shapes that could work for our design. After going through the decision matrix process, we came to a solution. We then transformed our ideas into a 3D model by designing the USB mounting bracket on SolidWorks, and then 3D printing it. Having a prototype is helpful for truly testing if your design works, or if there are still things that need refined. Following the eight step process really helped our team come up with the best design possible for the USB mounting bracket.

4. Design Result

Our design met all of the criteria Lockheed Martin, and more. The unibody, injection molded, ABS plastic construction is cheaper to produce and has less parts. Our design has a total of 20 parts, compared to the 38 in the original design. The fewer parts will lead to fewer opportunities for failure, and easier assembly. Also, the plastic will better dampen potential vibrational stress, as well as resist rusting and deformation. Lastly, our design is capable of mounting three hubs at once, as opposed to the original two. Our design exceeds Lockheed Martin's expectations in many ways, and could surely be adopted for further development.



5. Conclusion and Summary

As we are engineers, we tried using our basic engineering knowledge to help us to provide the full capability USB Mounting Bracket for a huge company as Lockheed Martin. Firstly, by using the product Design process, we managed out to create and develop every step of developing this new product. Secondly, we used Analytical Hierarchy Process(AHP) which gave us all the knowledge needed to develop the USB so it can satisfy most of the needs of the consumer(Lockheed Martin company). Thirdly, by using the Concept Classification Tree and by using combination Table, we drew 20 graphs which we were able to choose from these designs the most suitable mug and the one which contains the most complete features, so it can satisfy the consumers needs. Finally, we used Solidworks software to create this concept into real life. We are satisfied with our results and we are still developing the USB to make it satisfy all the consumers needs.

6. Reference

- 1 . <https://cults3d.com/en/tool/modular-bracket-for-usb-hubs>