Lockheed Martin
Additive Manufacturing

Introduction to Engineering Design
EDGSN 100 Section 002

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Purpose

• Take advantage of additive manufacturing (3D printing) technology to solve new problems or redesign existing solutions.

• Use additive manufacturing’s ability to create parts that were previously impossible to reduce weight, cost, and assembly time.

• Improve designs iteratively through rapid prototyping made possible with desktop 3D printing
Background

• Additive Manufacturing, or 3D Printing, is the process of joining materials layer upon layer to make objects from a 3D model.
• Conventional (subtractive) manufacturing methods start with more material than is necessary and then remove material to get to a finished shape. With additive manufacturing, you only add material where you want it.

• 3D printing is used for a variety of reasons:
  • To create cheap prototypes rapidly
  • To dramatically reduce weight of products
  • To create new parts and structures that were never before possible.
Sponsor

• Lockheed Martin is a global security and aerospace company
• Headquartered in Bethesda, Maryland
• Employed approximately 126,000 people worldwide
• Principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services.
Project Description

• redesign a USB Hub Mounting Bracket used as a debug and auxiliary mounting device for a custom avionics mission system. The new USB Hubs will provide greater capability for the avionics technician through an increased capacity of connections and allow for installation in various areas on the platform.
• The primary goal of this project is to reduce the total number of parts for this assembly and provide a vertical installation configuration

Design Criteria:

1. Design a bracket for a 7-port USB Hub
2. Design a bracket for vertical mounting
3. Design new cable retention for USB and Power cables
4. Bonus: Design a bracket for stacking three Hubs together
5. Bonus: Design a bracket for mounting horizontally
Procedures (1 of 2)

1. Original design was analyzed for weaknesses in the design, i.e. unnecessary parts, extra material
2. Possible improvements were discussed and several sketches were made to plan out potential options
3. Final design was chosen based on feasibility, adherence to design criteria, and effectiveness
4. Measurements for the USB hub were researched, and the design for the new USB hub was dimensioned accordingly

5. A 3D model was created using solidworks

6. A prototype was made using additive manufacturing technology
Results and Discussion

• The bracket is composed of three parts: the main body, the front plate, and the back plate.

• The body can hold 7-port USB hubs. There are 2 projections attached both top and bottom to allow stacking in a vertical manner.

• The front is designed to be able to thread in the USB cords so that USB would stay in place even after installation.

• Back plate allows to loop out the power cable ports and keep attached.
Conclusions and Recommendations

• More effective in assembly; There are less screws and parts.
• Better puts the USB into place after installation.
• Allows better efficiency in work place as it is stackable and small in size. (Vertically attachable with screws.)
• Meets all the design criteria and is more convenient to use and is more practical in use.
Closing

- Improvement of the original design was made. The new design provides a better result while meeting all the design criteria. Also it provides efficient use of space in the work place due to its assembly.
- We thank Lockheed Martin in giving us this opportunity to work and develop the original product. We would be honored to further work with the company. If there are further questions, please contact one of us.