Design Project 2: Lockheed Martin

Lockheed Martin is a global security and aerospace company that is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems that relies on the use of Universal Serial Buses (USBs) to connect multiple devices to their data processors.

Throughout our EDSGN 100 course this semester, we have implemented the problem-solving skills that we have learned in that classroom to solve real challenges. In addition, this project was our first industry-like experience that can show us what our futures could potentially hold for us. We were also able to gain teamwork experience in the fun field on engineering.

As aspiring engineers, our goal is to redesign and improve the current USB hub mounting bracket to be a vertical, 7 port USB bracket that can withstand vibrational loading and ensures proper cable retention. This project is a very key aspect of what Lockheed Martin because it enables multiple data processors to be connected to one another as well as backed up so that no information is ever jeopardized in very areas that they are invested in. Through the use of additive manufacturing, also known as 3D printing, our final design will encompass all the requirements that Lockheed Martin had asked. While our main goal is to provide a product suitable for Lockheed Martin, our design team would also like to have this product to be the first of its' kind and suitable for many other companies as well.

1. AHP

- uses pair-wise comparison to compare attributes of a given design. You rank all the attributes from 1-9 using the table below as a key.

The Fundamental Scale for Pairwise Comparisons		
Intensity of Importance	**Definition**	**Explanation**
1	Equal importance	Two elements contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one element over another
5	Strong importance	Experience and judgment strongly favor one element over another
7	Very strong importance	One element is favored very strongly over another; its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one element over another is of the highest possible order of affirmation
Intensities of 2, 4, 6, and 8 can be used to express intermediate values. Intensities 1.1, 1.2, 1.3, etc. can be used for elements that are very close in importance.		

AHP TABLE

	Temperature Control	**Cable Rentention**	**Shock Absorption**	**Stacking**	Total (Ri)	Weight
Temperature Control	1	0.333333333	0.333333333	0.2	1.86	0.08306043
Cable Retention	3	1	1	0.6	5.6	0.25007443
Shock Absorption	3	1	1	0.6	5.6	0.25007443
Stacking	5	1.666666667	1.666666667	1	9.33333333	0.41679071
Total					22.3933333	
Temperature	can withstand hot temperatures	space between each port	water cooling system	fan		
can withstand hot temperatures	1	0.2	1	1	3.2	0.125
space between each port	5	1	5	5	16	0.625
water cooling system	1	0.2	1	1	3.2	0.125
fan	1	0.2	1	1	3.2	0.125
Total					**25.6**	
Cable Rentention	clamps	tube for power cable	zip ties to post			
clamps	1	0.20	0.333333333		1.53	0.11111111
tube for power cable	5	1.00	1.67		7.67	0.55555556
zip ties to post	3	0.6	1		4.6	0.33333333
Total					**13.80**	
Shock Absorption	suspension system	rubberized bottom	gel			
suspension system	1	0.333333333	1		2.33333333	0.2
rubberized bottom	3	1	3		7	0.6
gel	1	0.33	1		2.33	0.2
Total					**11.67**	
Stacking	cylindrical screwing	lego style	slots			
cylindrical screwing	1	0.33	0.2		1.53	0.11111111
lego style	3	1	0.6		4.6	0.33333333
slots	5	1.666666667	1		7.66666667	0.55555556
Total					**13.80**	

2. Concept Scoring Table:

- Use objective methods to select to your consensus final concept selection
- Pick reference model, which becomes 0.
- Rate the other concepts based on the reference
    - Better than= +
    - Same as= 0
    - Worse than = -
- Combine ranks and improve the concepts or decide, which ones to continue with

	A2B1C2D1	A2B2C2D1	A2B3C2D1	A2B2C2D2	A2B2C2D3
Temperature	0	0	0	0	0
Cable Retention	0	+	0	+	+
Shock Absorption	0	0	0	0	0
Stacking	0	-	-	0	+
Sum +	0	1	0	1	2
Sum 0	4	2	3	3	2
Sum -	0	1	1	0	0
Net Score	-4	0	-1	1	2
Rank	5	3	4	2	1
Continue	No	No	No	No	Yes