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Team 521: Housing/Chassis Design for Engine Electrical Accessories

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Abstract

The abstract is a concise statement of the significant contents of your project. The abstract should be one paragraph of between 150 and 500 words. The abstract is not indents.

Keywords: list 3 to 5 keywords that describe your project.

Disclaimer

Your sponsor may require a disclaimer on the report. Especially if it is a government sponsored project or confidential project. If a disclaimer is not required delete this section.

Acknowledgement

These remarks thanks those that helped you complete your senior design project. Especially those who have sponsored the project, provided mentorship advice, and materials. 4

- Paragraph 1 thank sponsor!
- Paragraph 2 thank advisors.
- Paragraph 3 thank those that provided you materials and resources.
- Paragraph 4 thank anyone else who helped you.

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Notation

A17	Steering Column Angle
A27	Pan Angle
A40	Back Angle
A42	Hip Angle
AAA	American Automobile Association
AARP	American Association of Retired Persons
AHP	Accelerator Heel Point
ANOVA	Analysis of Variance
AOTA	American Occupational Therapy Association
ASA	American Society on Aging
BA	Back Angle
BOF	Ball of Foot
BOFRP	Ball of Foot Reference Point
CAD	Computer Aided Design
CDC	Centers for Disease Control and Prevention
CU-ICAR	Clemson University - International Center for Automotive Research
DDI	Driver Death per Involvement Ratio
DIT	Driver Involvement per Vehicle Mile Traveled

	Difference between the calculated and measured
Difference	BOFRP to H-point
DRR	Death Rate Ratio
DRS	Driving Rehabilitation Specialist
EMM	Estimated Marginal Means
FARS	Fatality Analysis Reporting System
FMVSS	Federal Motor Vehicle Safety Standard
GES	General Estimates System
GHS	Greenville Health System
H13	Steering Wheel Thigh Clearance
H17	Wheel Center to Heel Pont
H30	H-point to accelerator heel point
HPD	H-point Design Tool
HPM	H-point Machine
HPM-II	H-point Machine II
HT	H-point Travel
HX	H-point to Accelerator Heel Point
HZ	H-point to Accelerator Heel Point
IIHS	Insurance Institute for Highway Safety
L6	BFRP to Steering Wheel Center

Chapter One: EML 4551C

1.1 Project Scope

1.2 Customer Needs

1.3 Functional Decomposition

1.4 Target Summary

The targets and metrics used for the project were mostly derived from the customer needs and functional decomposition information. Additional information was provided directly from the sponsor through conversation during meetings that also contributed to the creation of the critical targets. The critical targets of the project are the minimum and maximum temperature, the vibration input, the assembly time, and the manufacturing cost. The critical targets listed where established by the goal and the overall purpose of the project. If the critical targets are not meet, the ignition housing will not function or operate properly. Below, each function of the project is listed along with the targets within that function.

Housing Protection

The ignition housing needs to operate safely at any temperature within the range of 250 °F and -40 °F. It is very important for the housing to be tested and proven safe within this maximum and minimum temperature range. The housing unit will also experience lightning strikes due to the altitude that the planes will reach. The average lightning strike emits around 40 to 250 kilovolts. The housing unit needs to be able to withstand that value. The maximum number of cycles is listed

as a target to make sure that the design of the unit will be able to be used as much as possible without failing.

Support

There will be a lot of vibration input experienced by the housing because of its location on the turbine engine. The maximum vibration value that can be experienced is 10G's. If the housing can't sustain the amount of vibration created, the components inside may become disconnected or damaged. To prove that the housing will withstand the vibration, tests will be ran using a machine that will produce 10G's of vibration. The equipment at the Unison Industries headquarters is available for testing. The target for the number of tests is five total runs. The ultimate tensile strength of steel is 420 MPa which is the minimum value used for our force analysis target.

Manufacturing

One of the most desired improvements of the design is the assembly time. The process in which components are attached and secured inside of the housing is slow. This is because of the current method used which is attaching components with adhesive. It creates a problem when disassembly is needed for repair and maintenance of the components within the housing. The assembly time target of 20 minutes has been established to test the methods developed by the group to prove that the amount of time for assembly has been minimized. The disassembly time target was established to ensure that the repair and maintenance process of the housing is improved. The maximum weight, and size is actually the current weight and size of the housing. Using those values as the max will allow for the group to establish a weight and size under those values. The

square shape of the housing will remain the same per request of the sponsor. The cost is also an important aspect within the manufacturing function. The maximum cost of the assembly is $125. The goal is to get manufacturing costs below that maximum value.

Three Additional Targets

The additional targets were established by focusing on how the design could become simpler and use less parts. Currently the housing is held down by a total of four bolts. A maximum target of two constraints was set to allow less hardware to be used while accomplishing the same goal. Using less threaded hardware is also a good way to increase the overall simplicity of the design. By satisfying the maximum treaded hardware target with the two bolts holding down the housing, the components within the housing can be secured by snap fitting or any other type of method besides adhesive. Lastly, the maximum number of 90 degree angles used to create the shape of the housing is four. This target was used because it will allow for the simplicity of the housing to remain the same while, allowing for the components within the housing to remain in the same orientation.

1.5 Concept Generation

Concept 1.

Concept 2.

Concept 3.

Concept 4.

Concept n+1.

1.6 Concept Selection

1.8 Spring Project Plan

Chapter Two: EML 4552C

2.1 Spring Plan

Project Plan.

Build Plan.

Appendices

Appendix B: Targets

Table 1

Protection Targets

Target	Value
Max Temperature	250 °F
Minimum Temperature	-40 °F
Lightning strikes	100×10^{-8} Ωm
Max number of cycles until failure	100,000

Table 2

Support Targets

Target	Value
Vibration Input	10Gs
Number of vibration tests	5
Degree of Freedom	0

Ultimate Tensile Strength	420 MPa
Max input frequency range	1000Hz
Min Input frequency range	10Hz

Table 3

Enhance Manufacturing Targets

Target	**Value**
Max Weight	1.4lbs
Max Size	6x5x3.3 inches
Max Cost	$125 per hour
Assembly time	20min
Number of Parts damaged during disassembly	0
Disassembly time	15 min

Table 4

Targets that address other needs not listed as functions

Target	Value
Maximum housing constraints	2
Maximum number of threaded connections	2
Maximum number of angled edges	4