# University of Ottawa

# GNG 1103[B]: Group 19

# Deliverable E – Project Schedule and Cost


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## Abstract

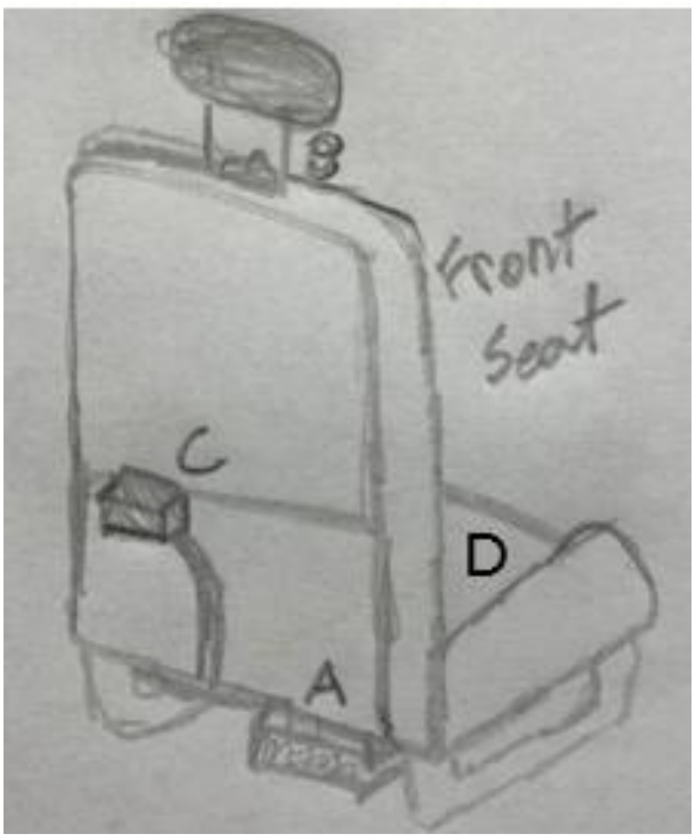
This is a document outlining the project schedule and cost for Group 19 and their Hot Car Emergency Project. In this deliverable we are tasked with researching cost associated with developing this project as-well as the time it will take for remaining components. After the schedule is shared possible risks of this project is discussed and the possible contingencies are listed. Lastly the Bill of materials and cost of each is discussed and agreed upon. In all, this file speaks to the future of the project and Costs of the project.

## 1. Introduction

This project has finished its early stages and has now moved onto development. Previously this project had very little in the way of an overarching time frame. This deliverable discusses and plans the rest of the project, risks associated with the next steps, contingencies for those risks and a Bill of Materials that contains a cost analysis. The discussion and planning of the project will come in the form of a Gantt chart and a table that consists of the rest of the necessary components of the project. The risks associated with the project are represented in a table of with risks, probabilities, level of detriment that is causes and the contingencies. The contingencies are then discussed in detail. The Bill of Materials contains all the components to our product, the links on where to get it an also the costs of each product. This deliverable will give a clear and concise plan on what is left to be done and how we can achieve these goals/deliverables.

## 2. Design with specifics

- Realistically the total length of cords needed is 20 feet give or take, depending on the vehicle.
- The Application will be made through Thunkable.

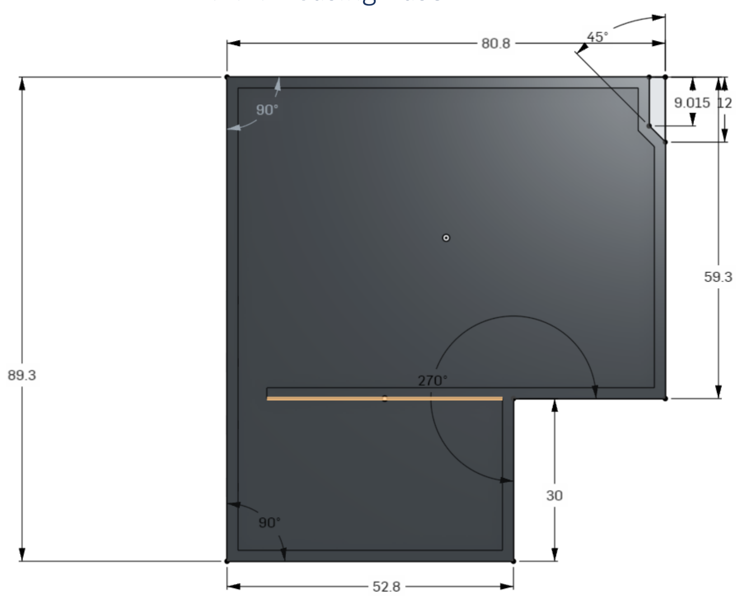



- Cords for B is roughly 40 inches
- Cords for C is roughly 17 Inches
- Cords for D is roughly 20 inches

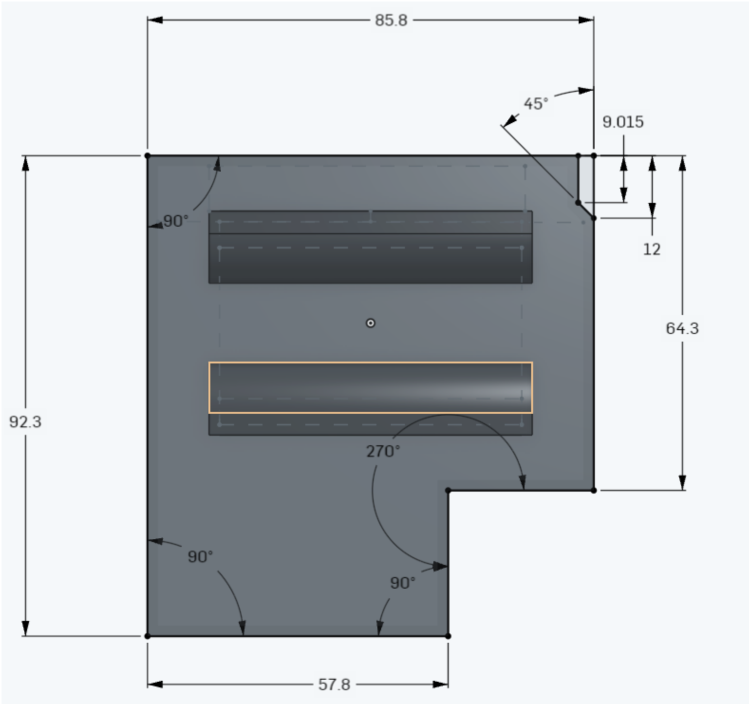
## 2.1. Arduino Casing (A)

- The walls and sections are all 2mm thick.
- There are 4 green lights on the front side displaying battery life.
- The ports on the top are for cord access.
- There is a 5mm overlap with the case lid and bottom.

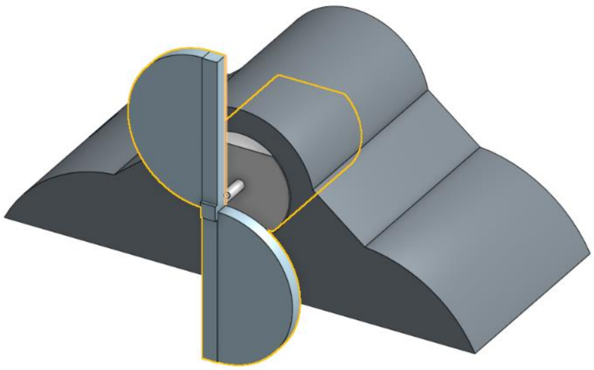
### 2.1.1. Casing Base



### 2.1.2. Casing Lid

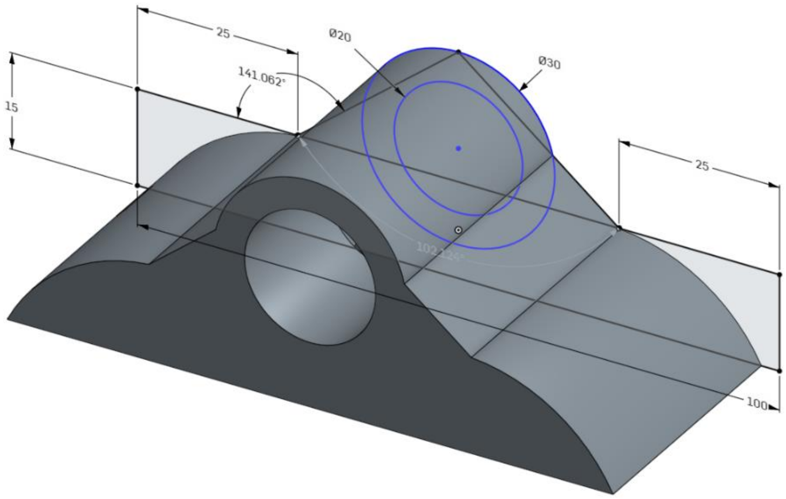



## 2.2. Auxiliary Fan (B)



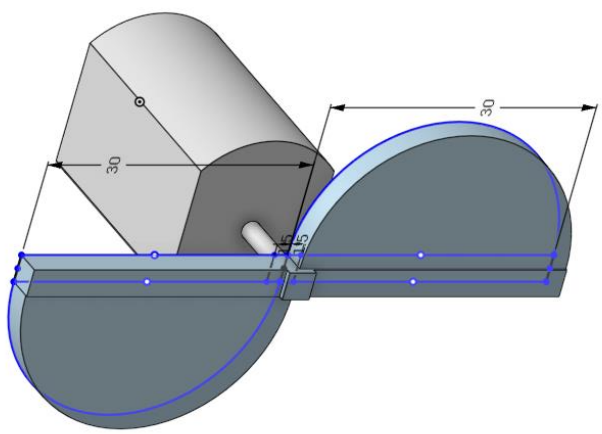
- There is a port on the hidden side port wires to access the DC motor.
- It will be affixed with Velcro on the bottom to the Velcro patch attached to the chair.

### 2.2.1. Auxiliary Fan Casing

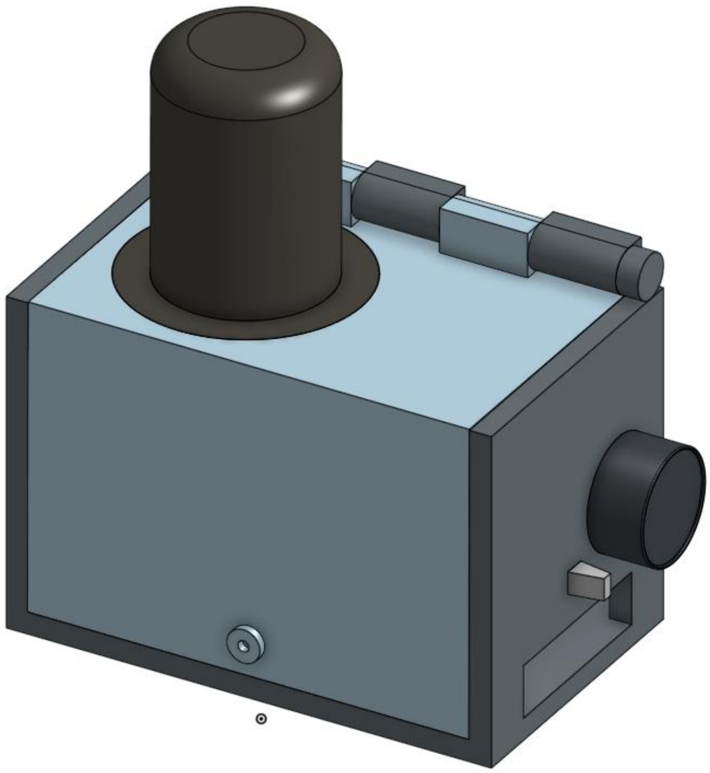



- It has width of 40 mm

### 2.2.2. Auxiliary Fan Motor



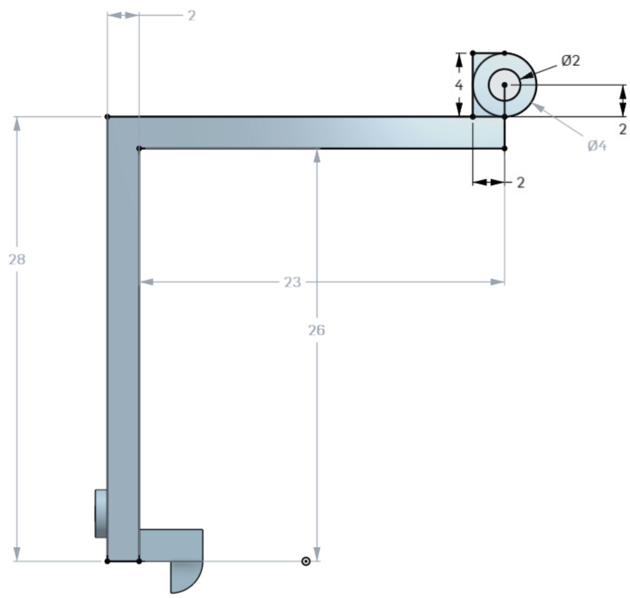
## 2.3. Sensor Module (C)



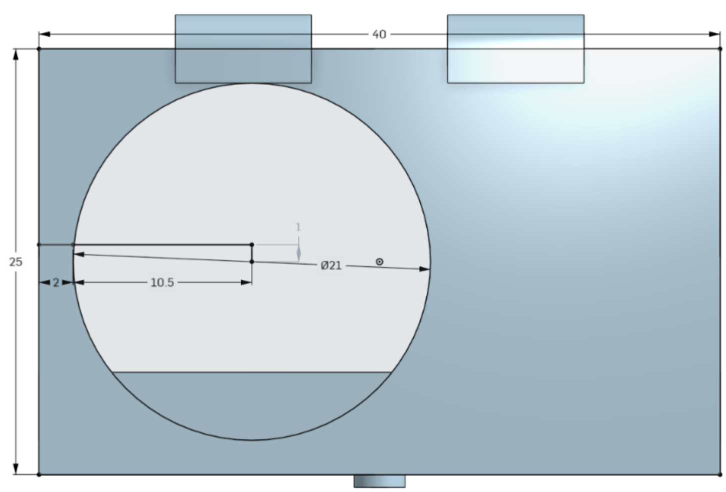
- The top sensor is the O2 Sensor, the cylinder on the side is the microphone and the small grey piece is the temperature sensor.
- The container is held together by a pin 2mm in width.
- The port on the side is for cords.
- The walls of the box is 2mm thick.

### 2.3.1. Sensor Module Lid

#### 2.3.1.1. Sensor Module Lid [Side View]

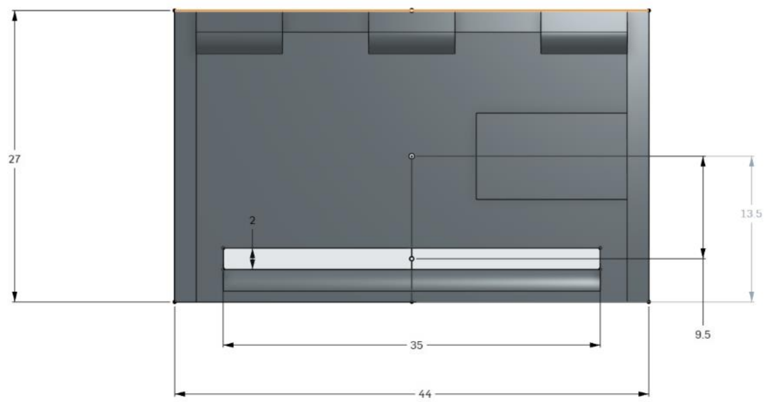



#### 2.3.1.2. Sensor Module Lid [Top View]

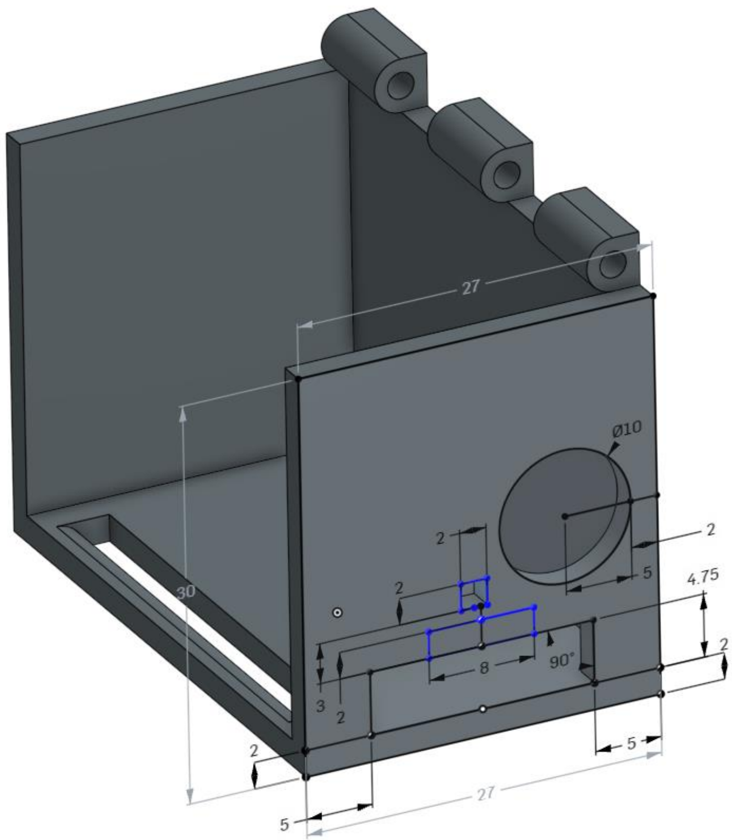


### 2.3.2. Sensor Module Base

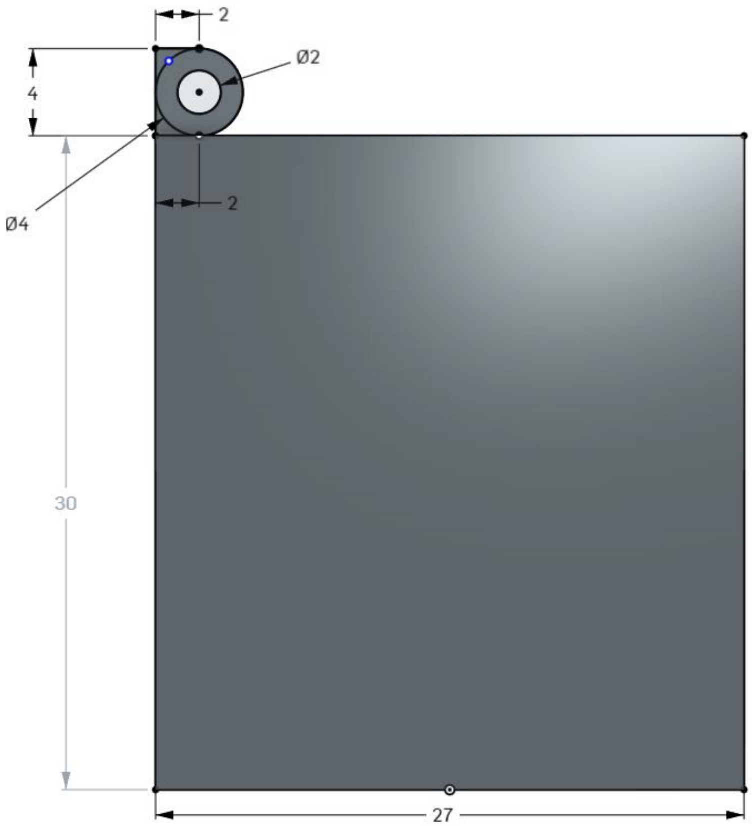
#### 2.3.2.1. Sensor Module Base [Top View]



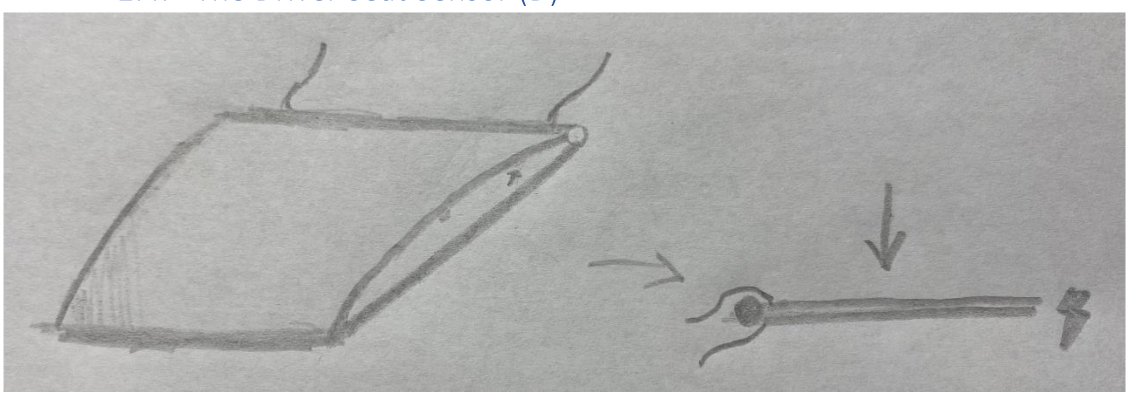

#### 2.3.2.2. Sensor Module Base [Side View (1)]



#### 2.3.2.3. Sensor Module Base [Side View (2)]

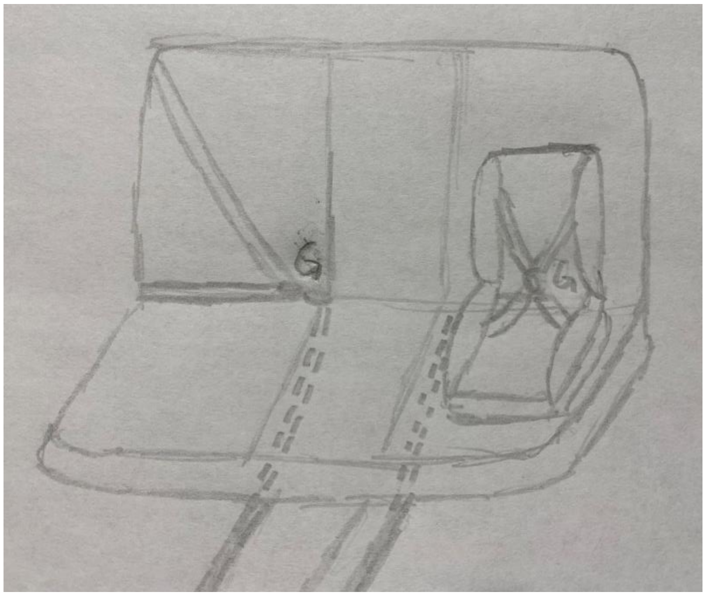


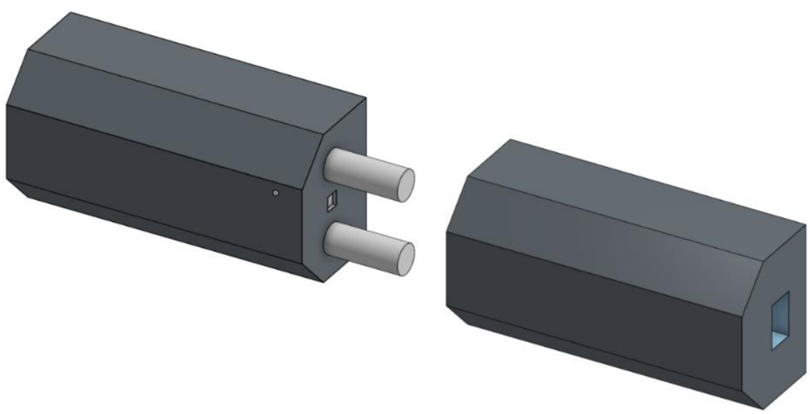

### 2.4. The Driver Seat Sensor (D)



- This small sensor is two pieces of flexible plastic covered in a fabric with conductive materials like a metal foil on the inside.
- When compressed/sat on the two conductive pieces complete the circuit.
- It is roughly 167.84mm x 210mm
- It is held together by a pin 2mm in diameter.

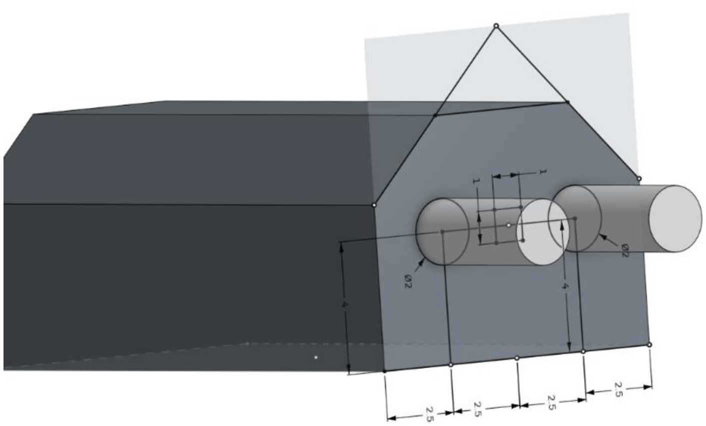
### 2.5. Seat Belt Sensor (G)





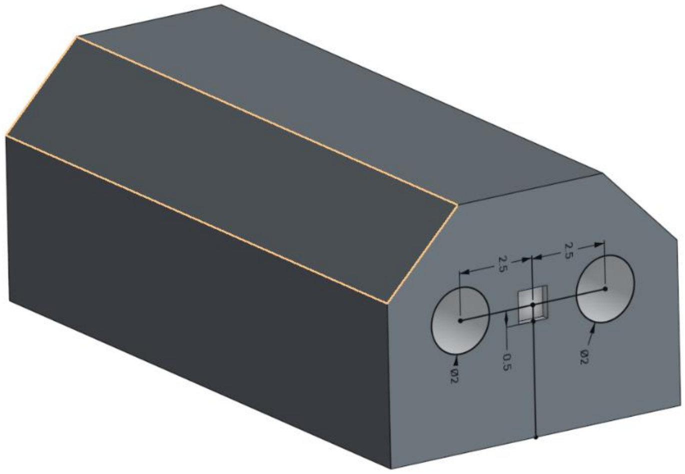
- The small hole in the back are for cords to connect to the switch.

#### 2.5.1. Seat Belt Sensor Male End



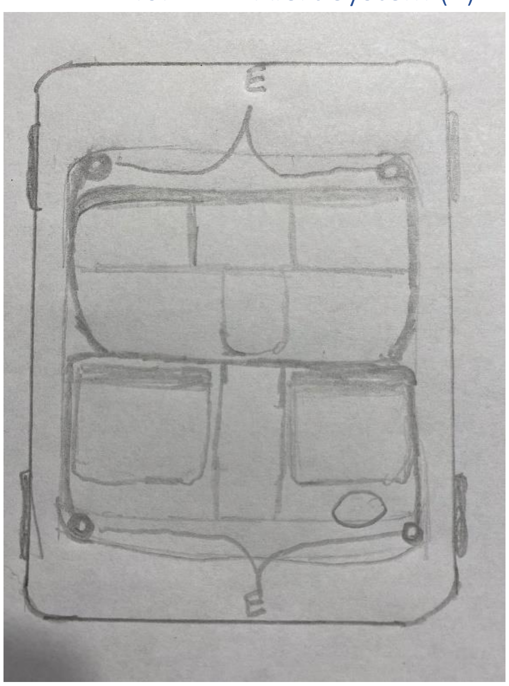
- These two pins are connected to cords used as a switch to determine if the child is there.

### 2.5.2. Seat Belt Sensor Female End



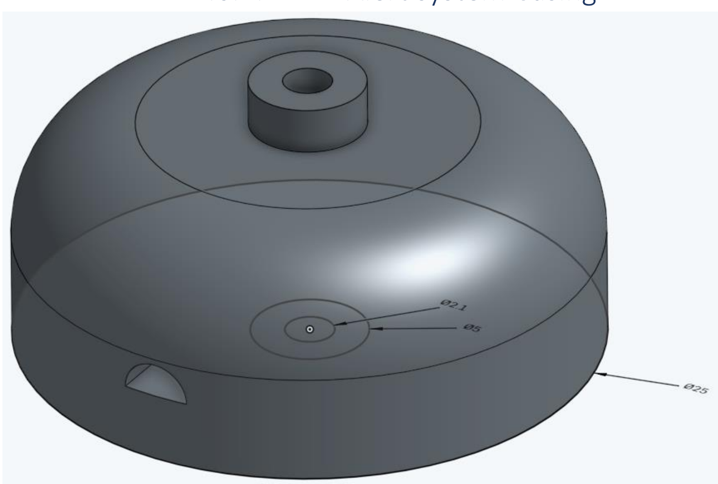

- The two circles are holes where the pins slide in while doing up your seatbelt, it conducts electricity to see if the system turns live.

## 2.6. LED Alert System (E)




- From the back to the Arduino casing is roughly 79 inches.
- From the front to the Arduino casing is roughly 72 inches.

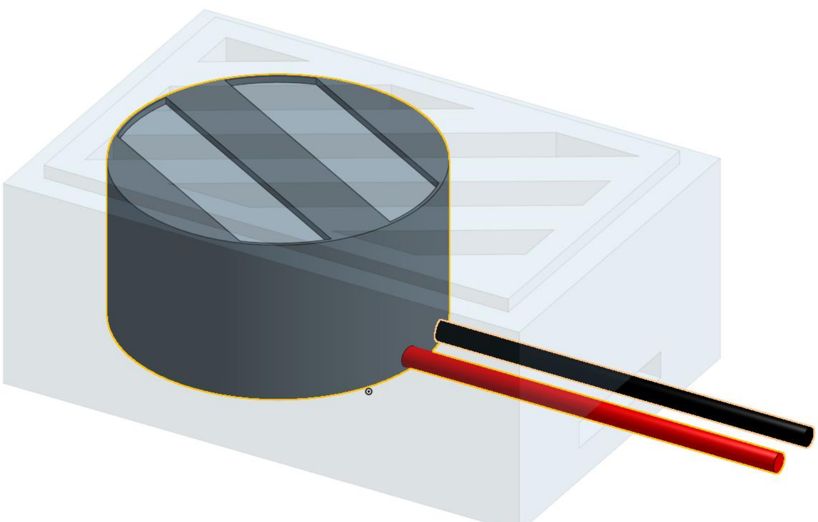
### 2.6.1. LED Alert system Casing




- The hole in the side is for the cords to connect to the Arduino.

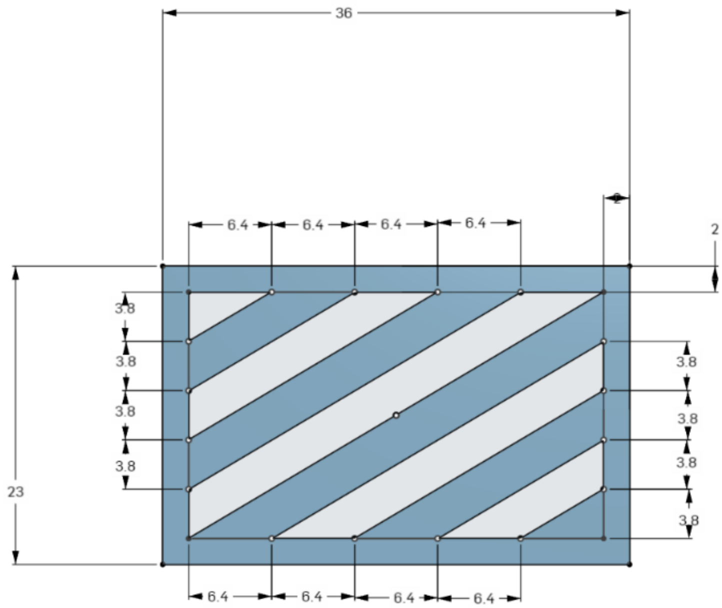
### 2.7. Buzzer Alert System (F)

- The cord for this module is roughly 86 inches.



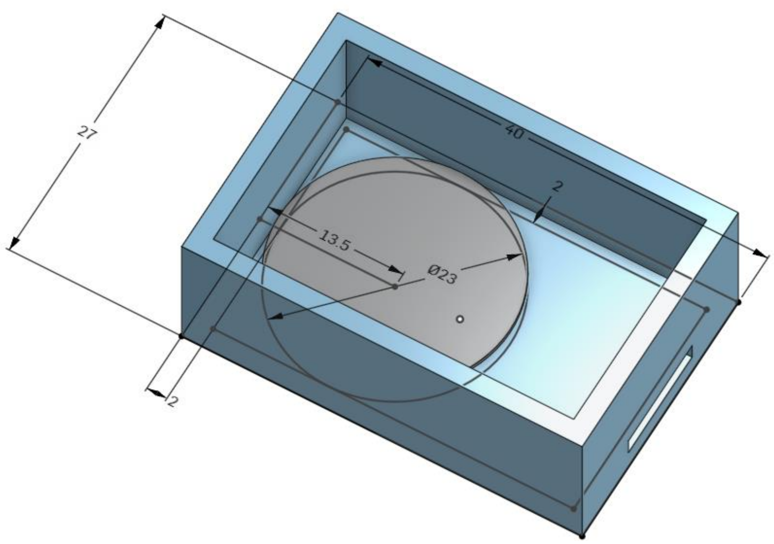
- The bottom of the Casing is affixed to the handle of the trunk with a strong adhesive.
- The walls and lid are all 2mm thick.

#### 2.7.1. Buzzer Alert System Lid




- The lid is directly affixed to the box with adhesive and epoxy.

#### 2.7.2. Buzzer Alert System Bottom




- The hole in the side is for the cords to attach.
- The height is 15.5 mm.

## 3. Project Schedule

Table 2: Project Schedule

| **Task** | **Responsible Persons** | **Time Frame** | **Due Date** |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Project Schedule and Cost (Deliverable E) | Yale Botly (Hand In) | 12 Days | OCT 26 |
| Material Gathering/Requests | Everyone | 14 Days | OCT 28 |
| Prototype 1 (Deliverable F) | Ali Gohar (Hand In) | 14 Days | Nov 4 |
| Prototype 2 (Deliverable G) | Gautam Mehta (Hand In) | 7 Days | NOV 11 |
| Final Product Revisions | Everyone | Meeting | NOV 12 |
| Prototype 3 (Deliverable H) | Haonan Zhou (Hand In) | 7 Days | NOV 25 |
| Design Day (Deliverable I) | Yale Botly (Hand in) | Milestone | DEC 1 |
| Project Review Meeting | Everyone | Meeting | DEC 7 |
| Final Presentation (Deliverable J) | Ali Gohar (Hand In) | 7 Days | DEC 9 |
| Operator's Manual (Deliverable K) | Gautam Mehta (Hand In) | 14 Days | DEC 15 |

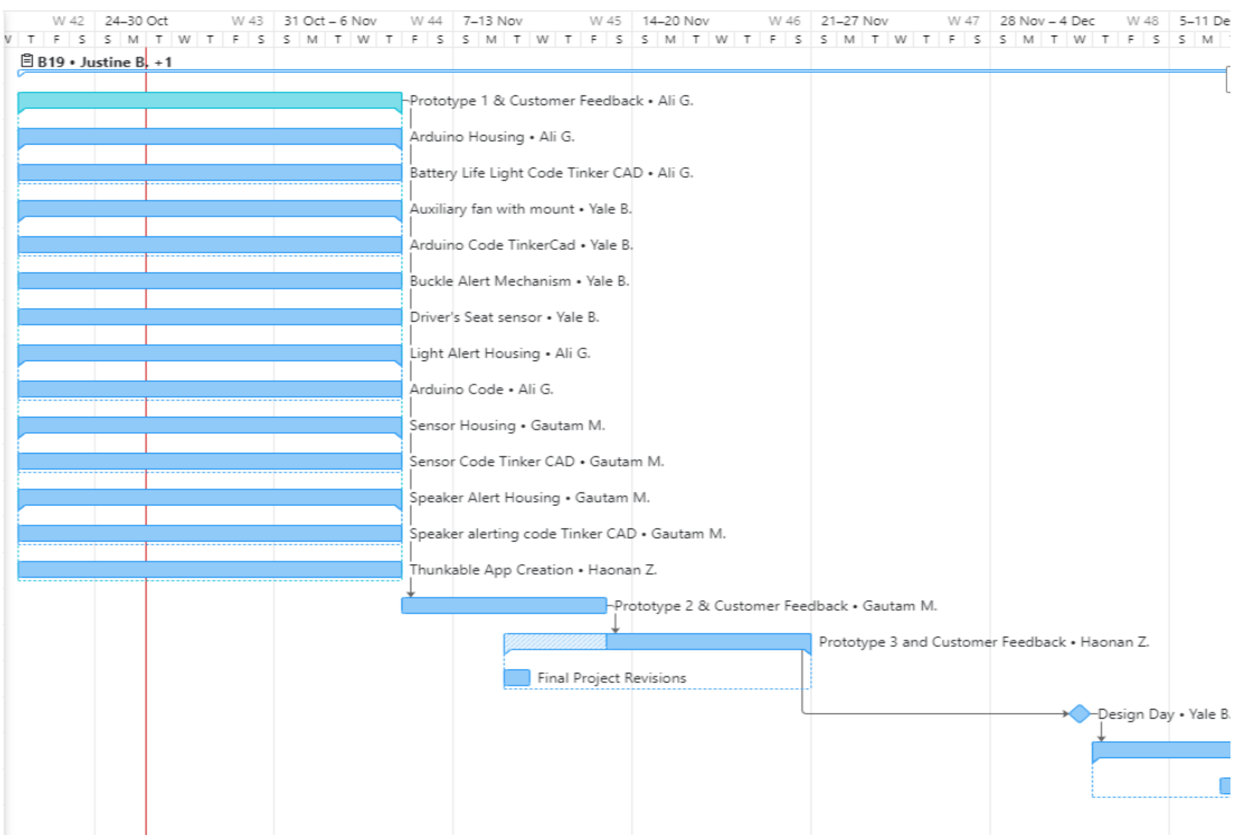



Figure 1: Gantt Chart 1

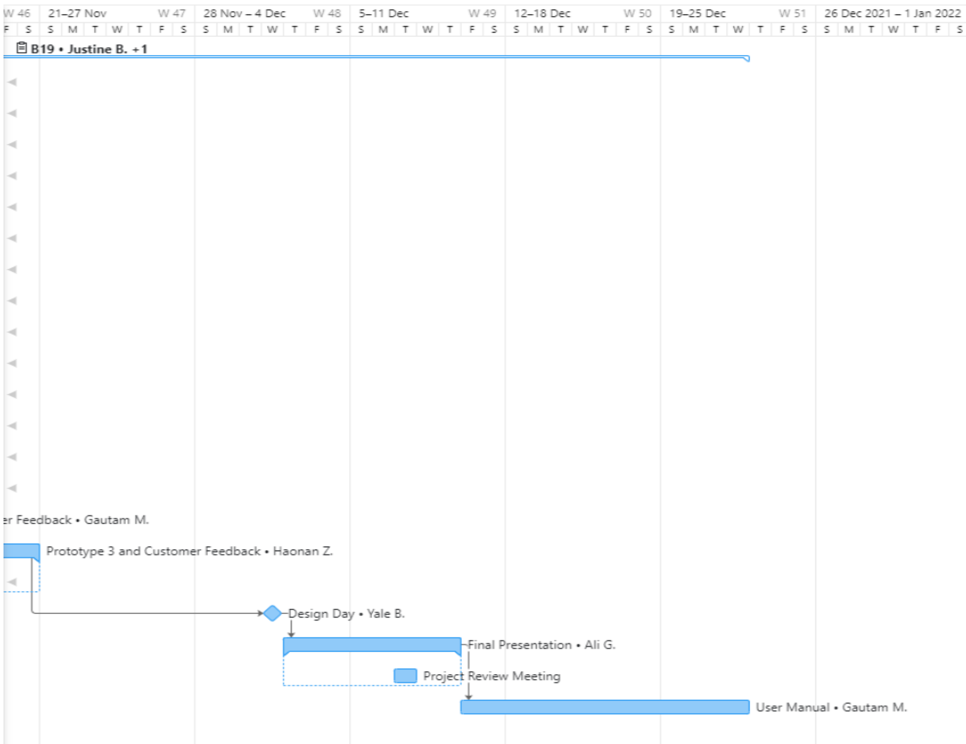



Figure 1: Gantt Chart 2

## 4. Risks and Contingencies

It is important for us to include potential risks in our planning. There are many factors, which can go wrong and can hinder the rest of the tasks. From hardware not functioning as expected, to exceeding the planned cost during prototyping, it is important for us to be prepared for such risks and have a fall-back plan in case something does go wrong. In our team, we have a strict rule for completing tasks. If someone is not able to complete their task, they need to let the team know beforehand, so the rest of us can split the task and avoid any delays. In case the team is not informed prior, the member gets a single warning, if it were to happen again, we would report it to the professor or T.A accordingly. There is also the risk of hardware not working as expected or facing difficulty synchronizing all the systems properly. The best way to avoid this is to test and make sure everything is compatible with each other and works properly before it is used. Some features of the final concept very well might not be feasible, due to our limited knowledge and in that case, it is important for the team to have a meeting and find a more realistic option. It is also highly likely that more than planned time might be needed, as many factors play into account and a delay in one task, could very well push past the planned time. In this case, it is important for our team to estimate the required extra time and plan accordingly. Product prototyping may also exceed the budget, as small things which may have been missed in the cost list, can add up and exceed the budget. If this is the case, we will have to look where cost can be saved and find more cost-efficient products. Therefore, it is essential to plan for potential risks and be prepared, as some of them are more likely to occur then others.

Table 2: Risk and Contingency Table

| Risks | Chance | Impact | Contingency |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Team member not able to complete task | Low | High | Team members split the task amongst each other to minimize delays |
| Hardware might not function properly due to low cost | Moderate | High | Test all hardware before final product |
| Some features might not be feasible | High | Moderate | Have a meeting and choose a more feasible option |
| More then planned time is needed | Moderate to Low | High | Estimate the extra time required and add it |
| Product prototyping might exceed cost | Moderate to High | Moderate | Look for more cost-efficient alternatives. |
| Systems might not sync properly with each other | Moderate | High | Make sure all the products are compatible with each other and have support. |

Team member not able to complete task:

-It is likely a team member could not complete their task due to illness, being overwhelmed by other work or personal issues.

Hardware might not function:

-Due to low-cost hardware, it is possible we could end up with faulty hardware, which can cause issues getting the system to work properly and can also waste a lot of time diagnosing issues that might be hardware related but may not seem like it.

Some Features might not be feasible:

-Some features like the belt clip might not be feasible due to restrictions on budget, and limited knowledge.

More than planned time is needed:

-Some tasks may not be completed on time because of troubleshooting and revising. This will impact the other tasks which may have to pushed backed accordingly.

Product Prototyping might exceed cost:

- The cost of the prototyping may exceed the cost analysis, as some hardware might not be properly functional, or other small things like resistors and wires, could be left out of the cost analysis and can add up to increase the overall cost of the prototype.

Systems might not sync with each other:

-It is possible that because some products might not be compatible with each other. For example, there may be a different version of Bluetooth on the fan, which may not be able to synchronize with the central control unit, causing it not to work.

# 5. Bill of Materials

Owing to the limited budget, we need to spend money prudently and cautiously. Thus, we have listed a potential costs table below.

| Part# | Part Name | Description | Cost ($) |
|---|---|---|---|
| 1 | Humidity/Temperature sensor (DHT22) | Link | 9.99$ |
| 2 | Gas Sensor (MQ-6) | Link | 6.50$ |
| 3 | Microphone amplifier (3.7W ClassD) | Link | 8.00$ |
| 4 | Buzzer (Active) | Link | 2.00$ |
| 5 | Cooling Fan for raspberry pi | Link | 6.00$ |
| 6 | Elegoo - Micro control. | N/A | 0.00$ |
| 7 | Relay 4 channels | Link | 22.00$ |
| 8 | Velcro | Link | 0.11$ |
| 9 | 12V Battery | Link | 9.95$ |
| 10 | LEDs x 4 | Link | 1.20$ |
| 11 | 12V LED strips | Link | 5.00$ |
| 12 | Thunkable | Link | 0.00$ |
| 13 | Laser Cutting | N/A | 0.00$ |
| 14 | 3-D printing | N/A | 0.00$ |
| 15 | Wiring x2 | Link | 5.00$* |
| 16 | Double sided adhesive | N/A | 0.00$ |
| 18 | Wood | N/A (Leftovers) | 0.00$ |
| 19 | Filaments | N/A (Leftovers) | 0.00$ |
| 20 | Zipties x4 | Link | 2.36$ |
| **Total** | | | **77.97$** |

## 5.1. Equipment List

| Part | Description |
|---|---|
| Protoboard | Wiring block used to centralize circuits |
| Multimeter | Use to measure electronic components of the system |
| 3-D printer | This machine will be used to make the case for the sensor and possibly other things |
| Laser Cutter | This is a machine that will be used to cut out the pieces for our cases to the Arduino |
| Soldering/solder | Used to connect wiring between sensors and |
| Jumperwires | Used to make non permanent connections during the prototyping stage |
| ThinkerCad | Used to virtually create circuits before physical production begins |
| DHT lib | Library for the DHT 22 sensor |
| MQ-6 lib | Library for the MQ-6 sensor |
| Class D lib | Library for Class D microphone Amplifier |

## 6. Conclusion

In this deliverable, we were given the opportunity to plan ahead for the future of our project. This was done by creating a project schedule which highlights important tasks and dates for each group member to keep in mind. We then identified various risks which could cause our group issues, and determined contingencies. Finally, we developed a bill of materials, which lists all of the potential costs associated with the project. This deliverable was great for us to visualize the direction in which our project is headed.

## 7. Wrike URL

https://www.wrike.com/workspace.htm?acc=4975842&wr=20#path=folder&id=758826352&vid=47240218