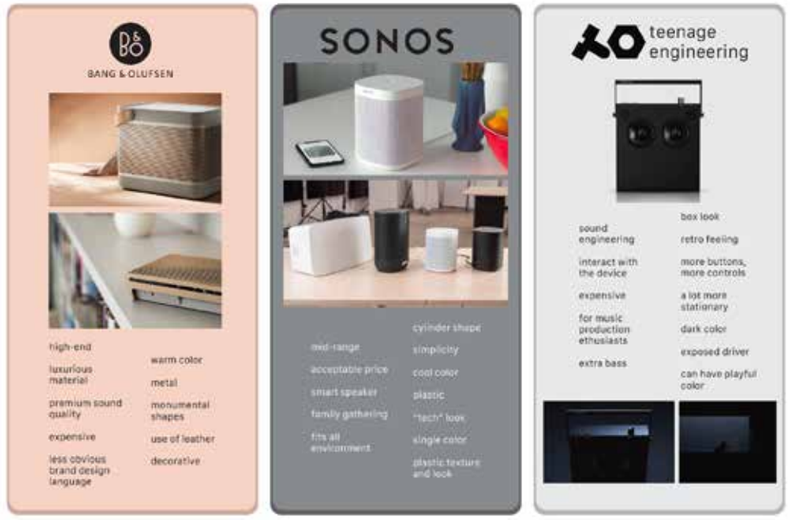
Product Prototype Process II

Summer 2022

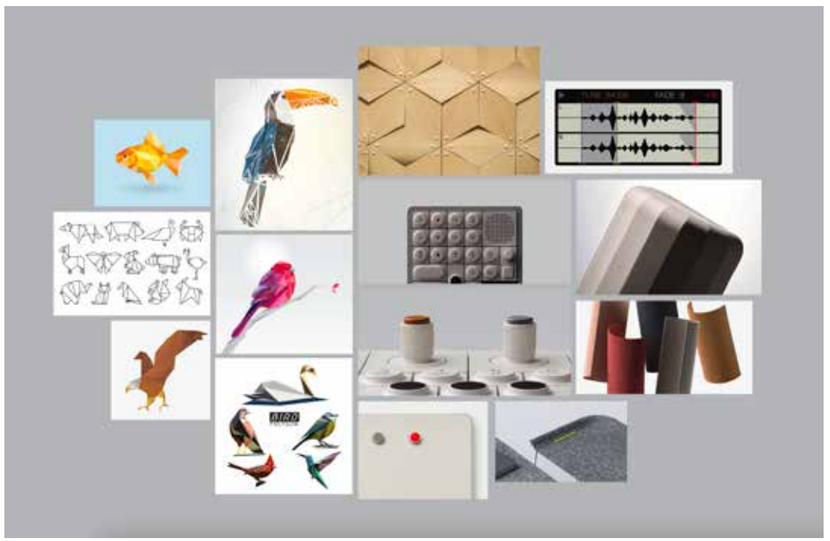
Yingfan “Jay” Liu

Instructor: Arnie Martin

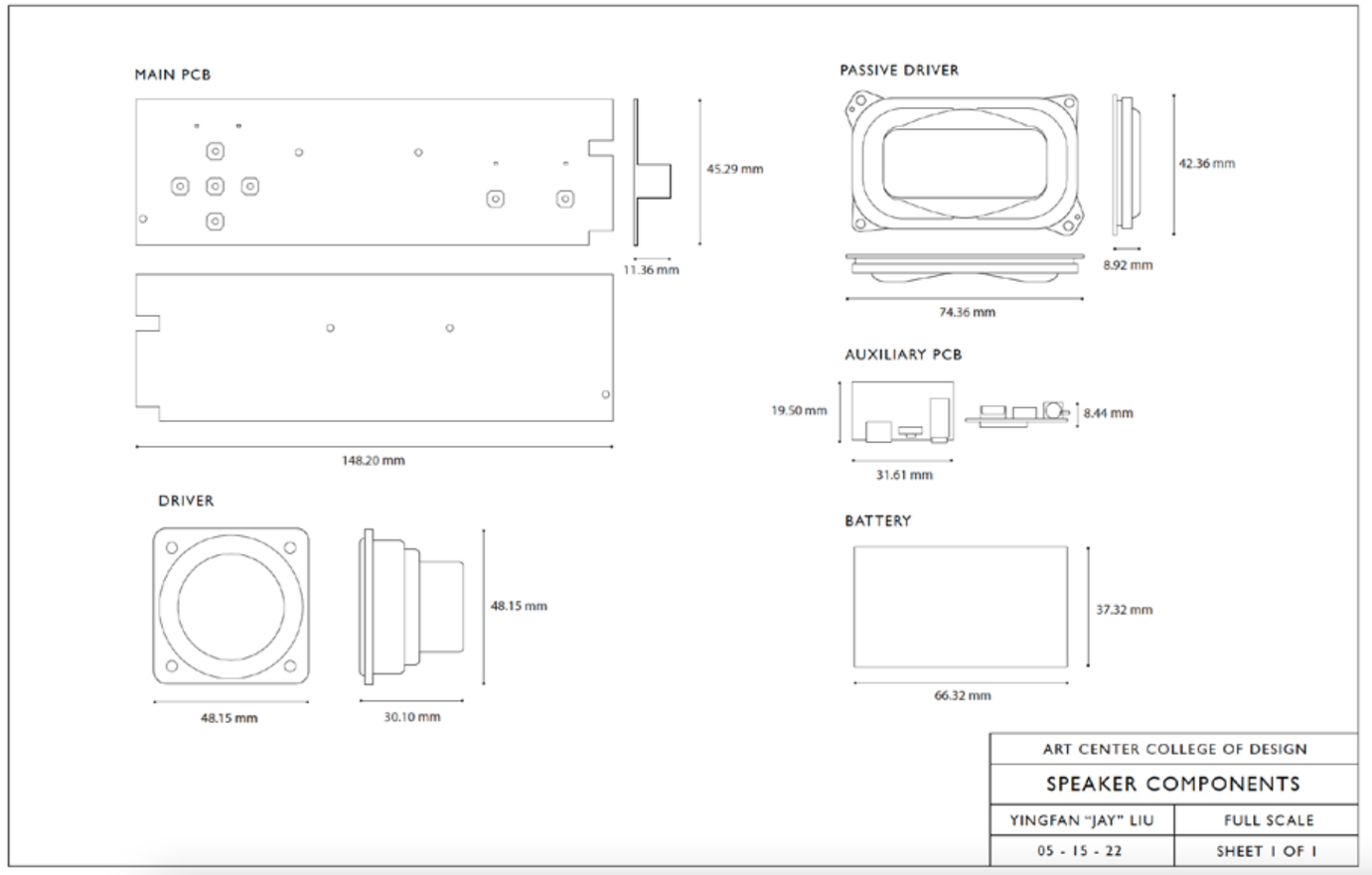
Week 1



Benchmark of 3 portable speaker brands

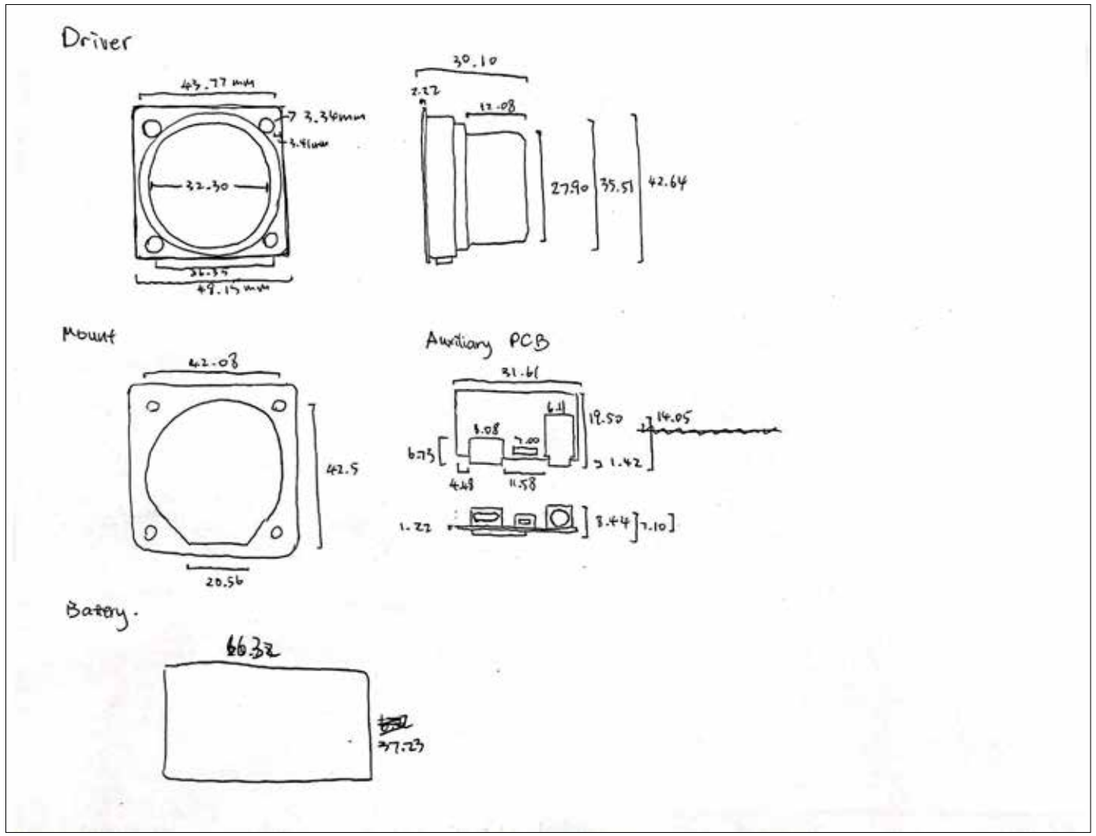


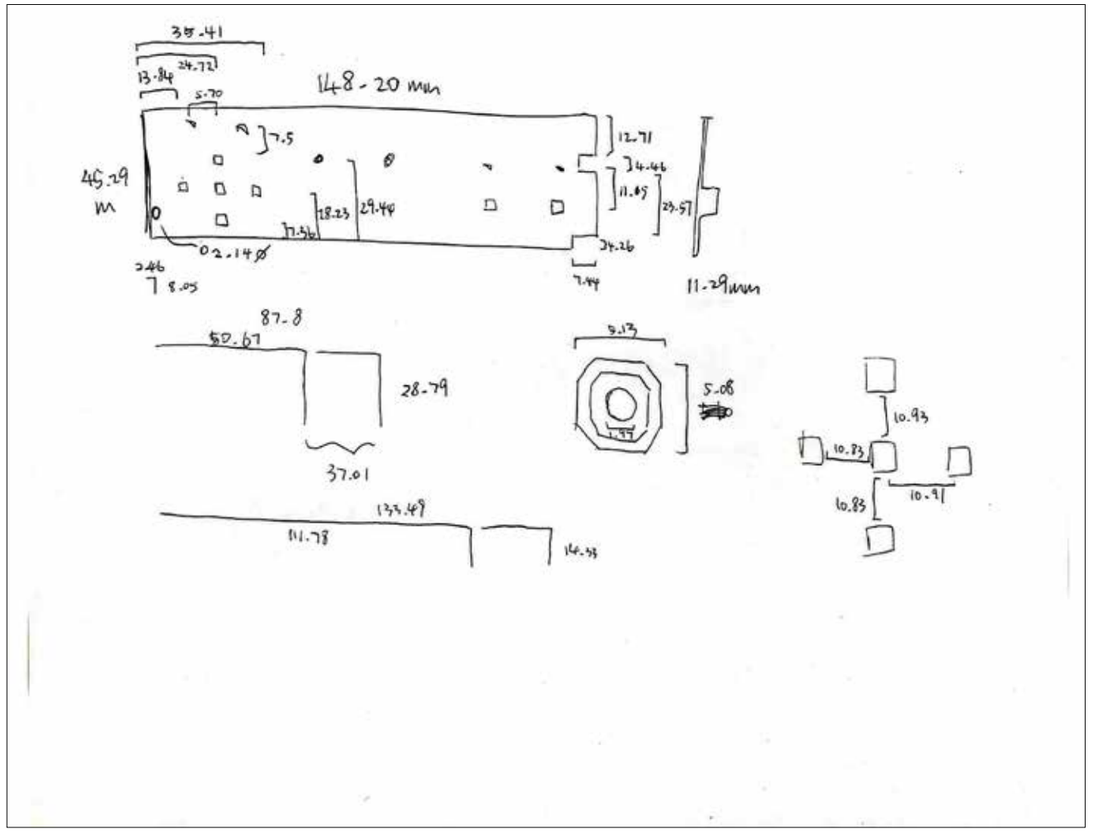
Design inspiration board



Speaker Components Orthographic

Week 1





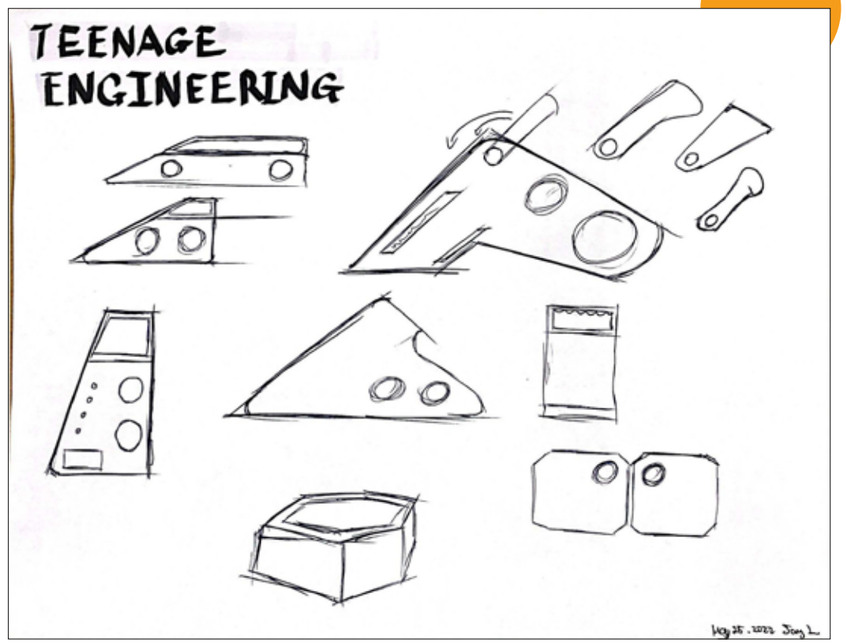
DOSS Speaker Parts Sketch

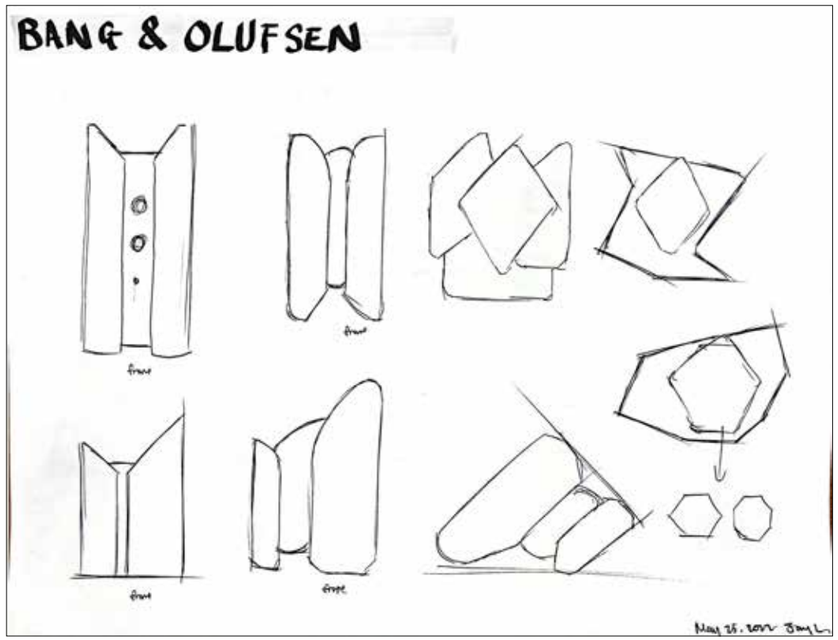
Week 1

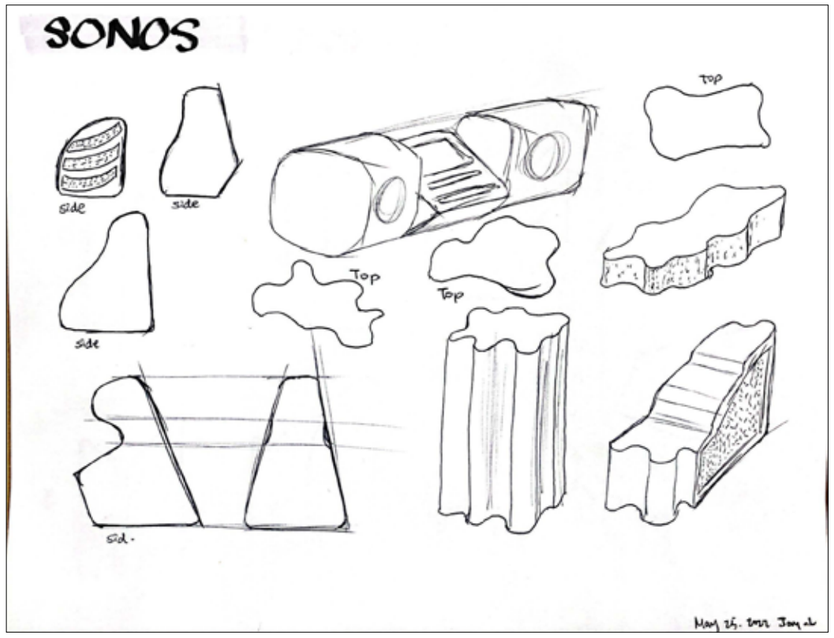
DOSS Speaker Taken Apart

Week 1

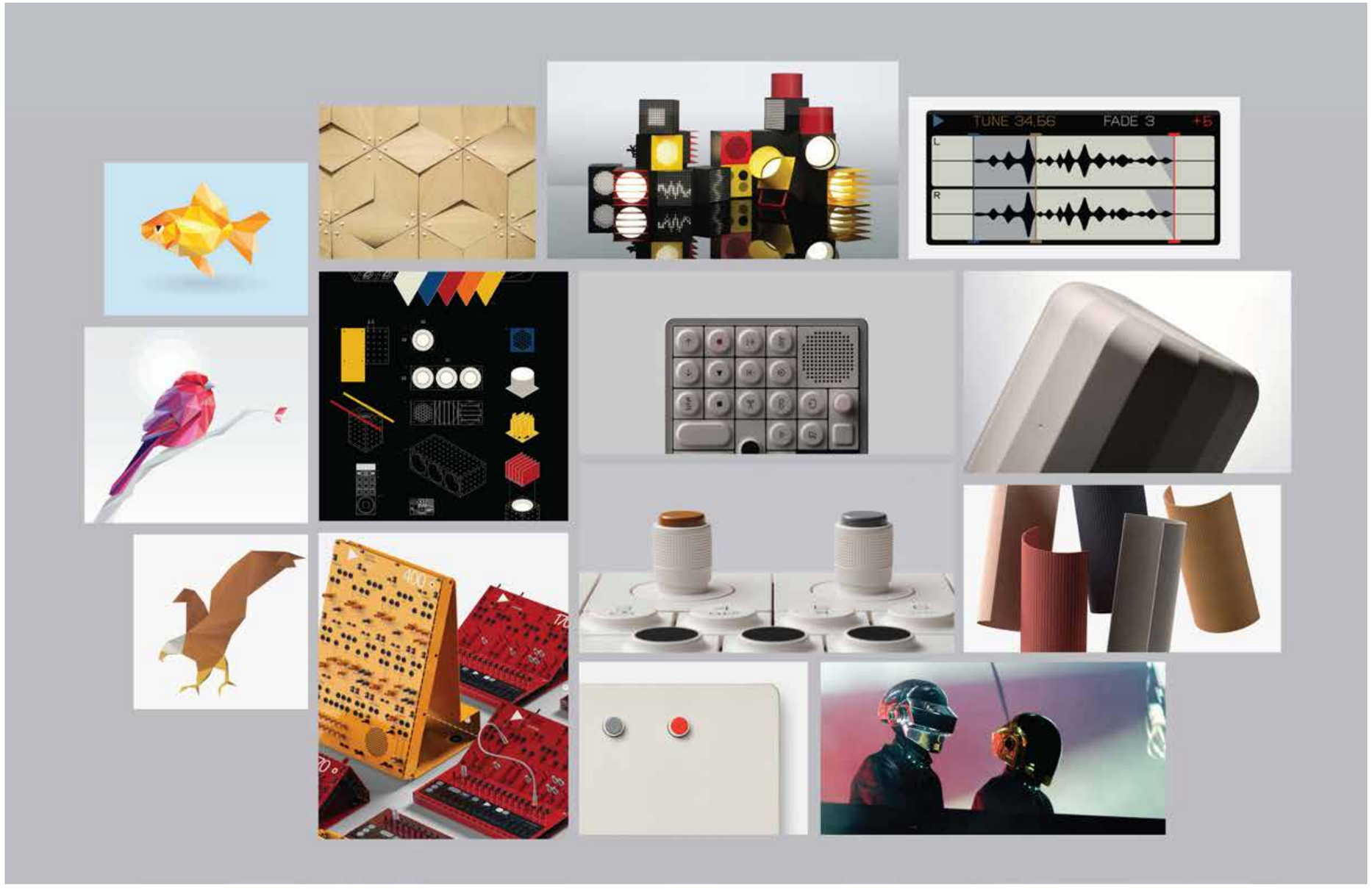
Speaker Design Sketches stage 1







Week 2

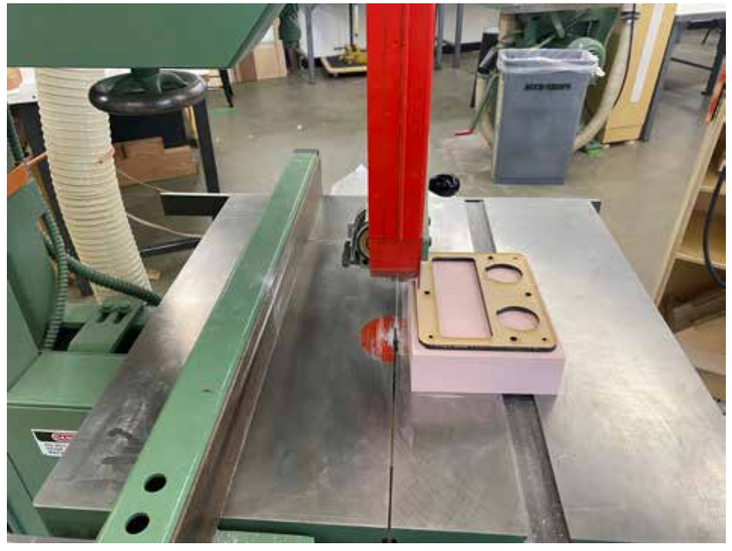


Design inspiration board, ver. 2

Week 2

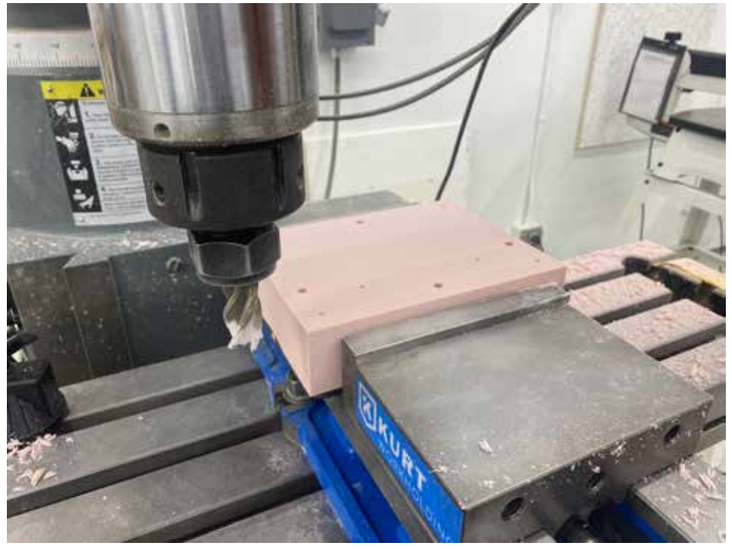
Practice Speaker Process

The practice speaker gives insights and experience on techniques to making our own speaker at the end.

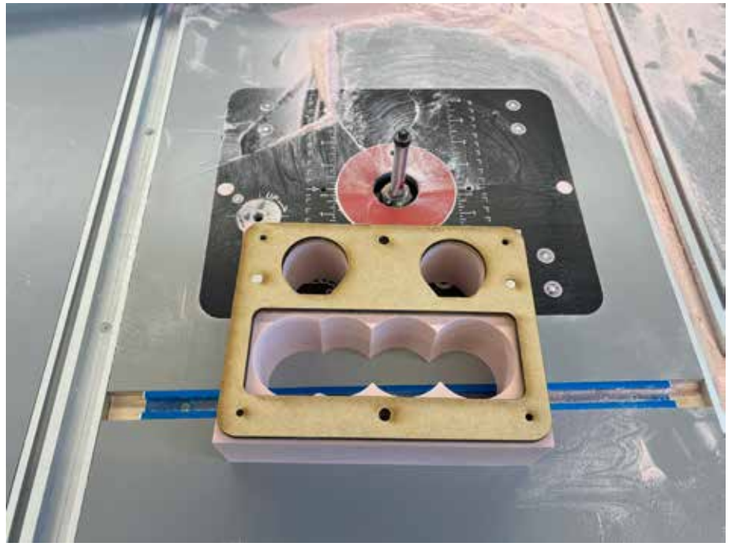


Use the template to cut the over all shape of the speaker.

Drill holes for the screws.



Mill the overall piece to the desired depth.

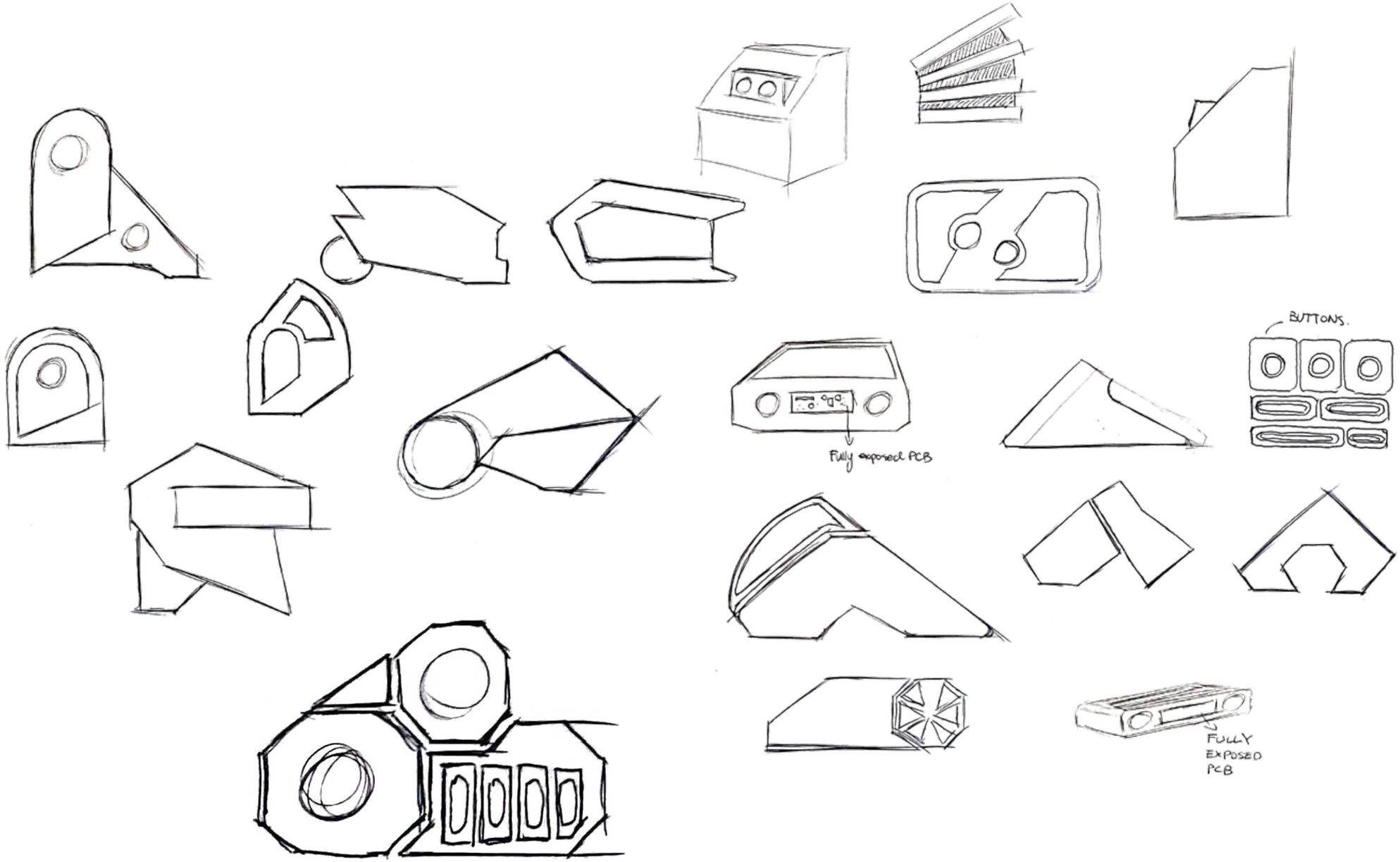


Route the interior and exterior of the speaker.

Week 2

Speaker Design Sketches stage 2

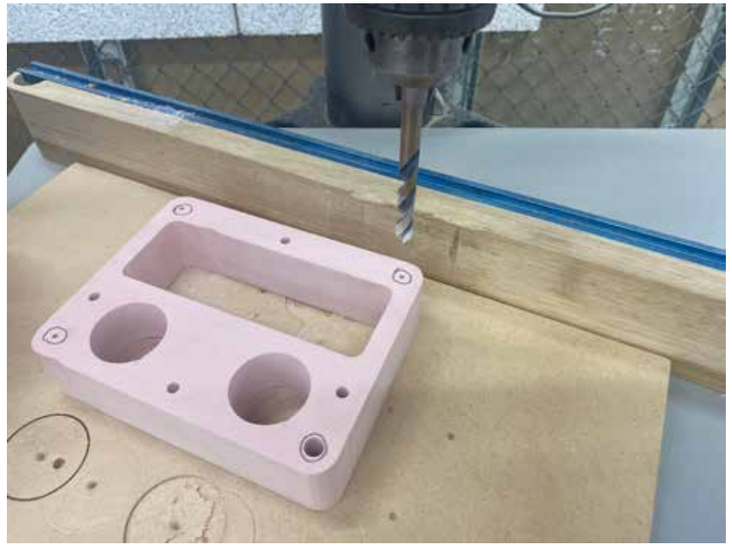
After exploring my own interest of each brand in the first stage of ideation, I eventually picked Teenage Engineering as the one that I will be designer for. This company's design is relatively form follows function and use a lot of graphic design technnique in the shape of their product.



Week 3

Practice Speaker Process

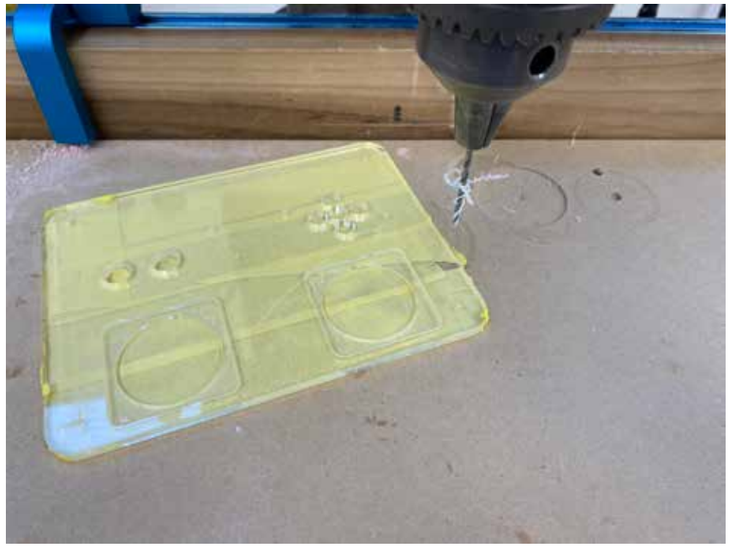
The practice speaker gives insights and experience on techniques to making our own speaker at the end.



Drill the countersink hole for mounting the front panel.

Drill holes for the screws that mounts the active driver.

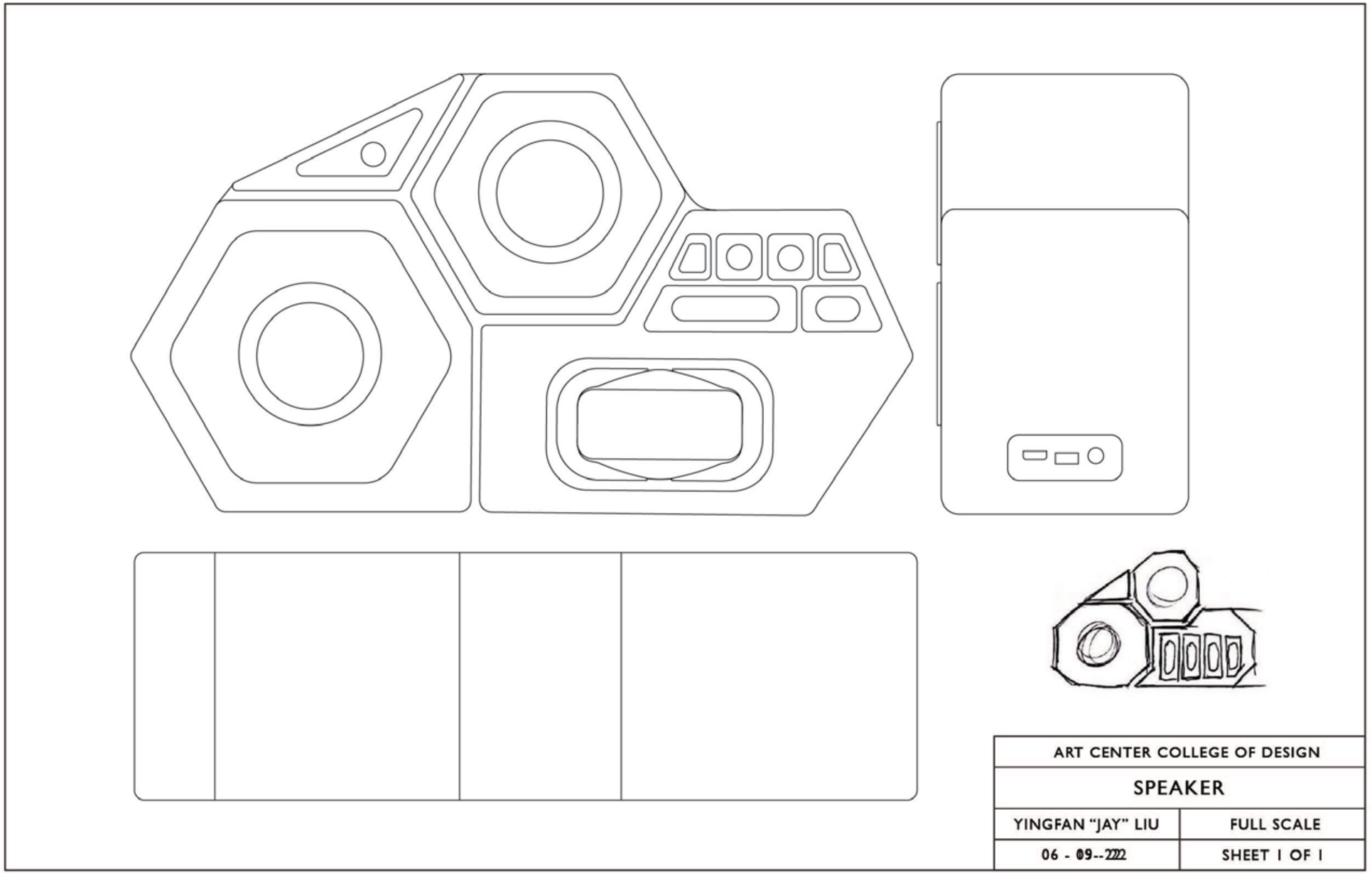
Router the relief for the driver



Drill and tap the screw hole on the front panel.

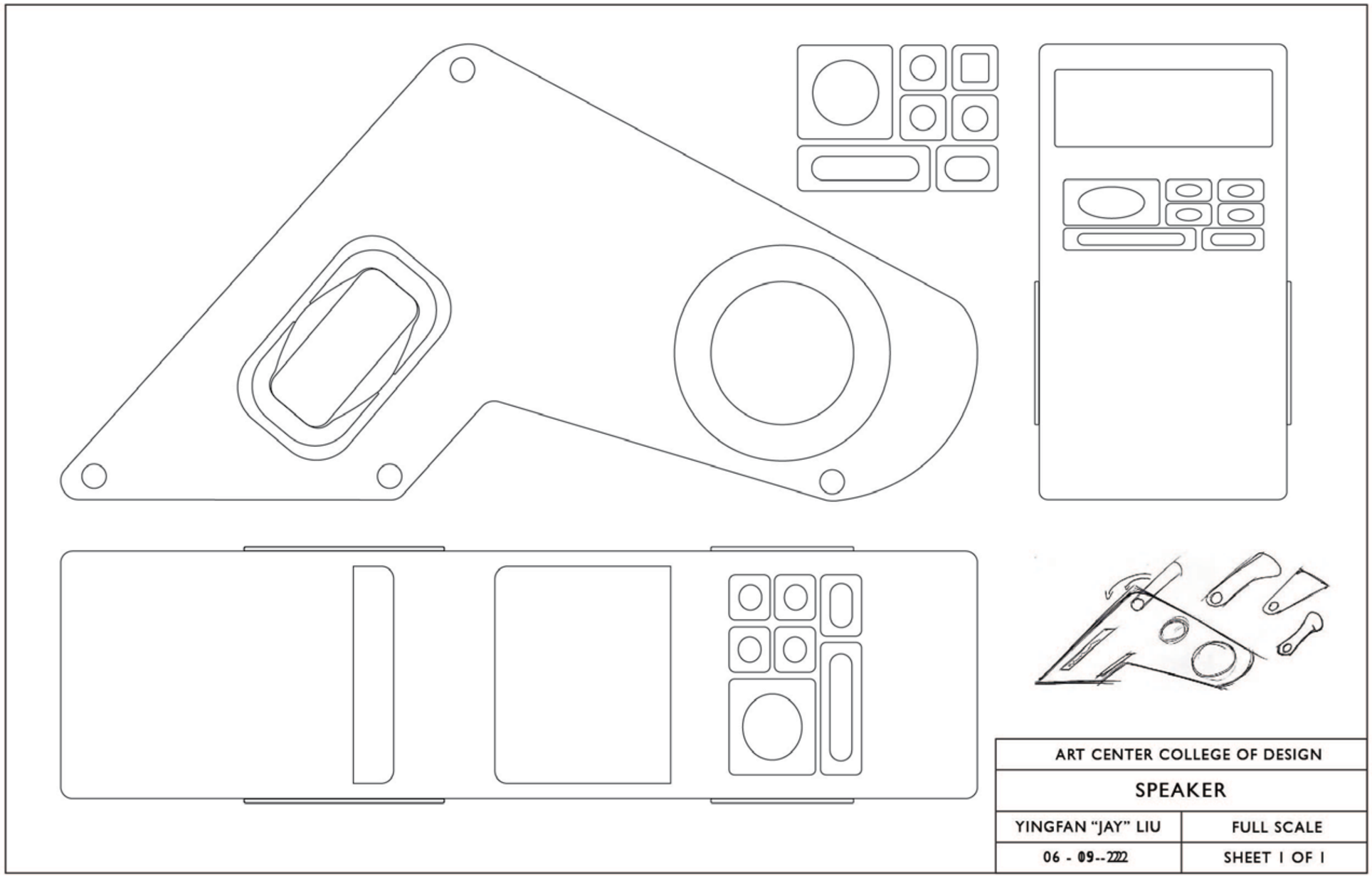
Week 3

Speaker Design Mock-Up stage 1



Week 3

Speaker Design Mock-Up stage 1

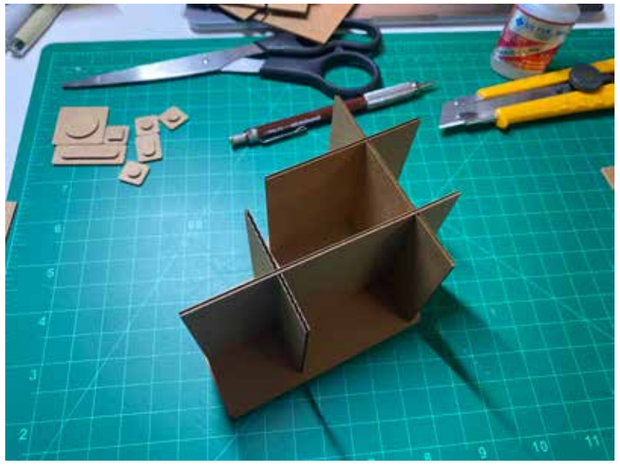


Week 3

Speaker Design Mock-Up stage 1

This stage of mocks-ups explored only the exterior shape and overall size of the speaker.

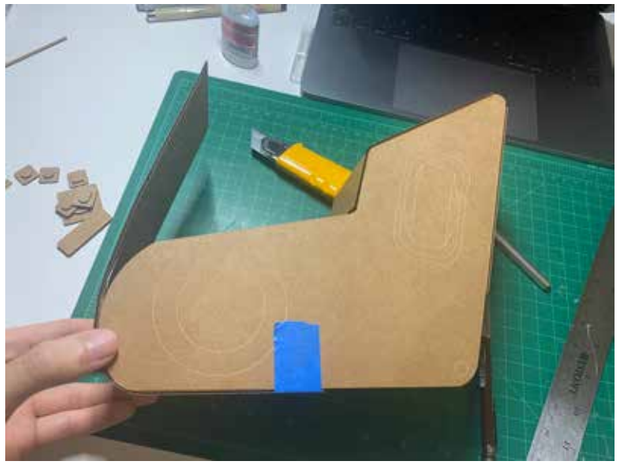
Assemble the buttons.



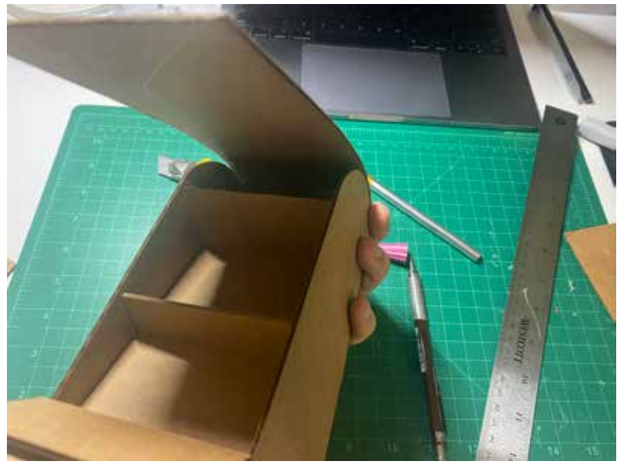
Inner struction connstruction.

Assembling each individual part.

Same process for the other mock-up.



Wrap around the outter surface.

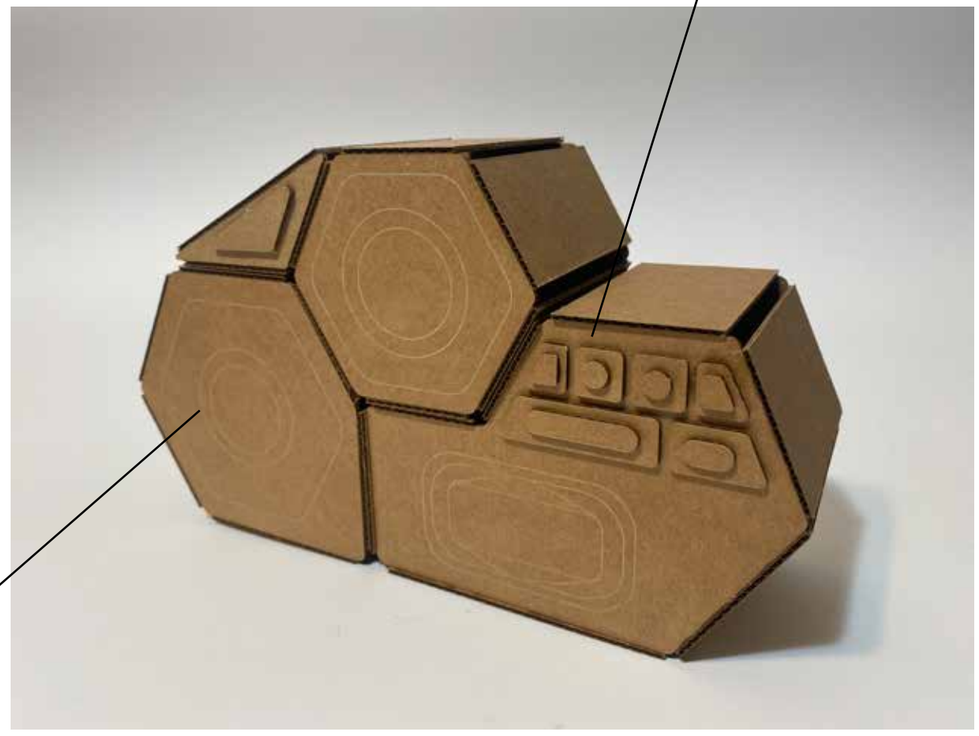


Wrap around the outter surface.

Week 3

Speaker Design Mock-Up stage 1

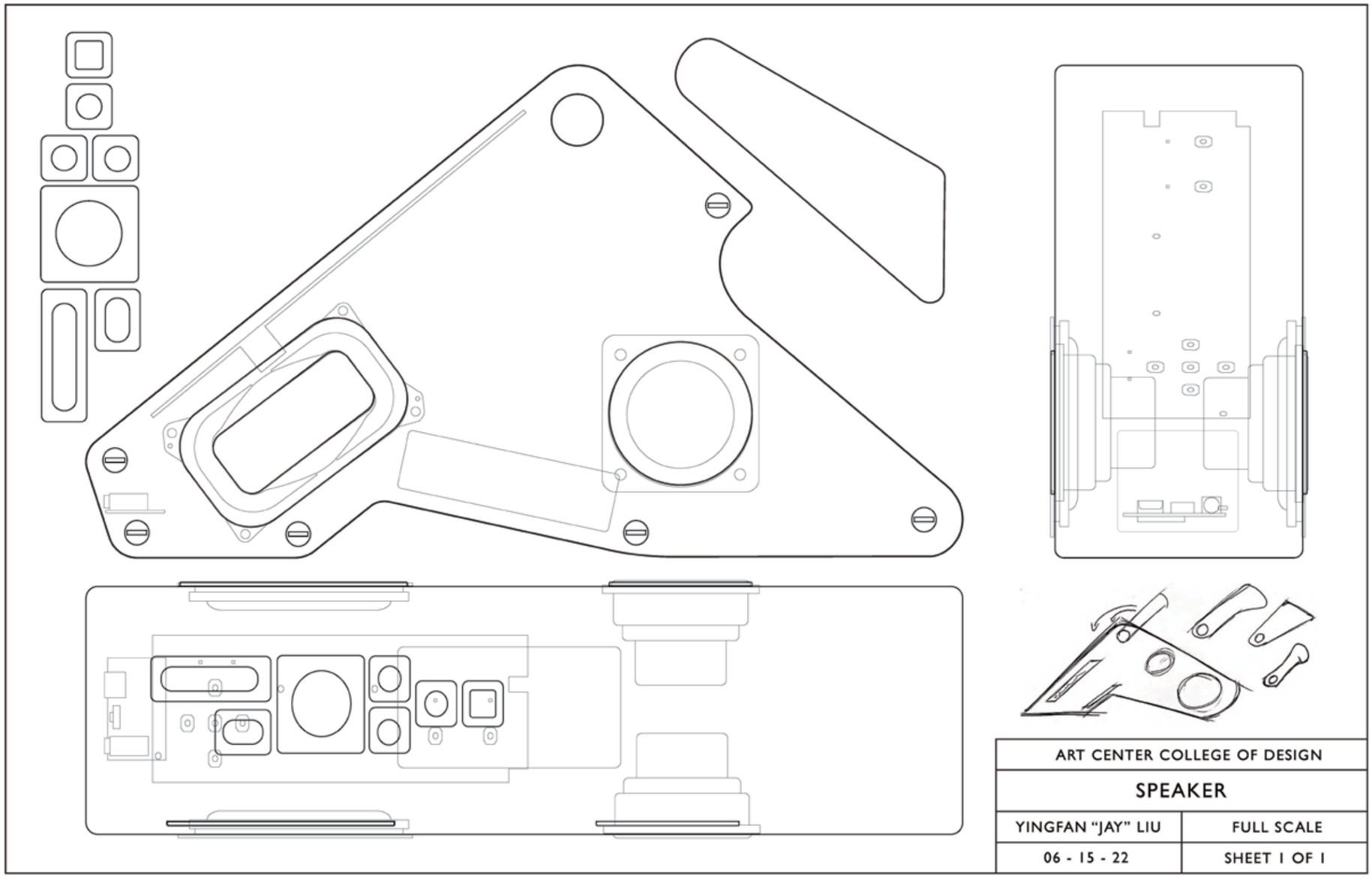
This stage of mocks-ups explored only the exterior shape and overall size of the speaker.



Week 4

Speaker Design Mock-Up stage 2

This stage of mocks-ups add the external handle as how it is on the speaker that the brand itself has to give it a more retro look.



Week 4

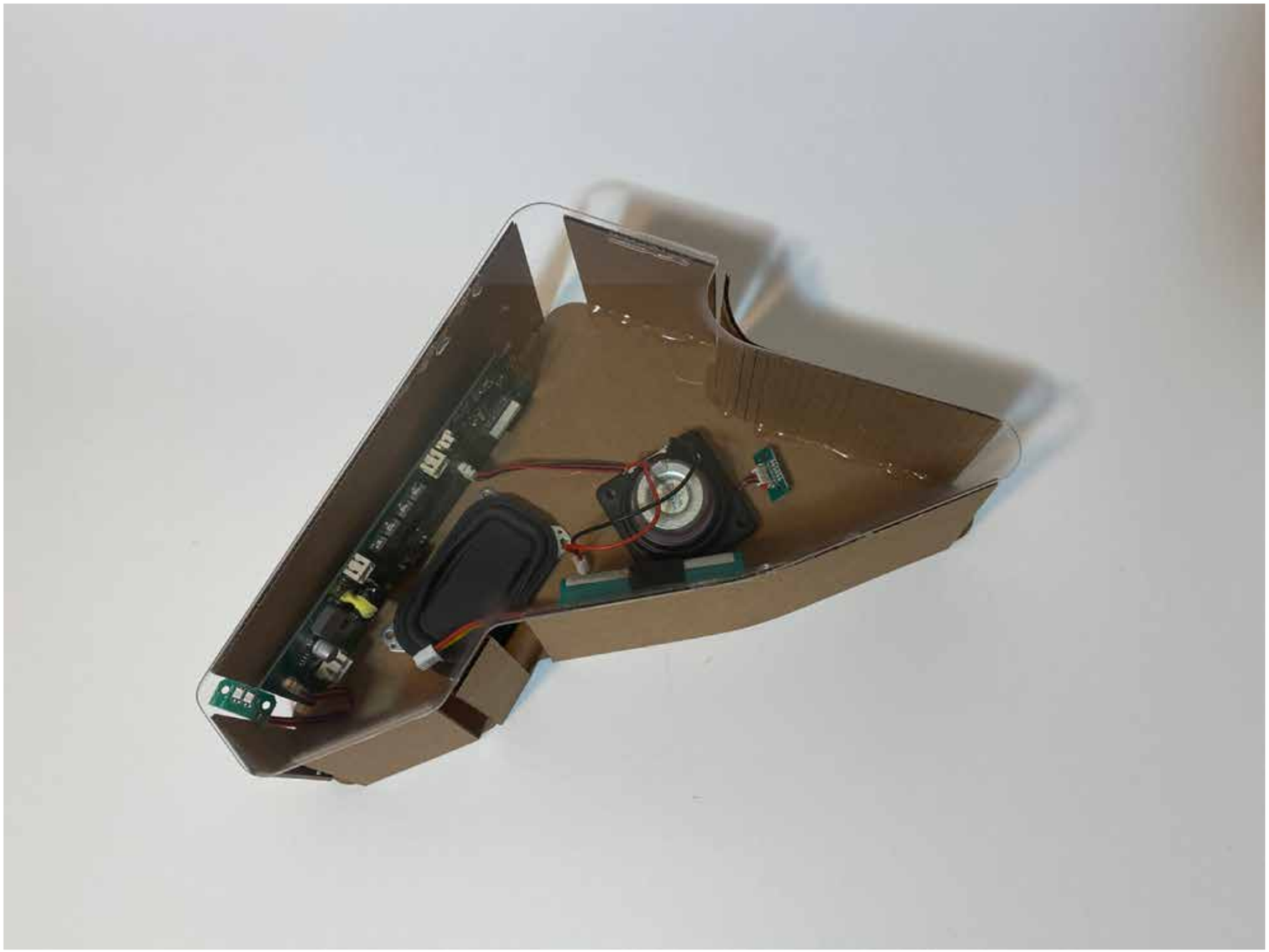
Speaker Design Mock-Up stage 2

This stage of mocks-ups add the external handle as how it is on the speaker that the brand itself has to give it a more retro look.

Week 4

Speaker Design Mock-Up stage 2

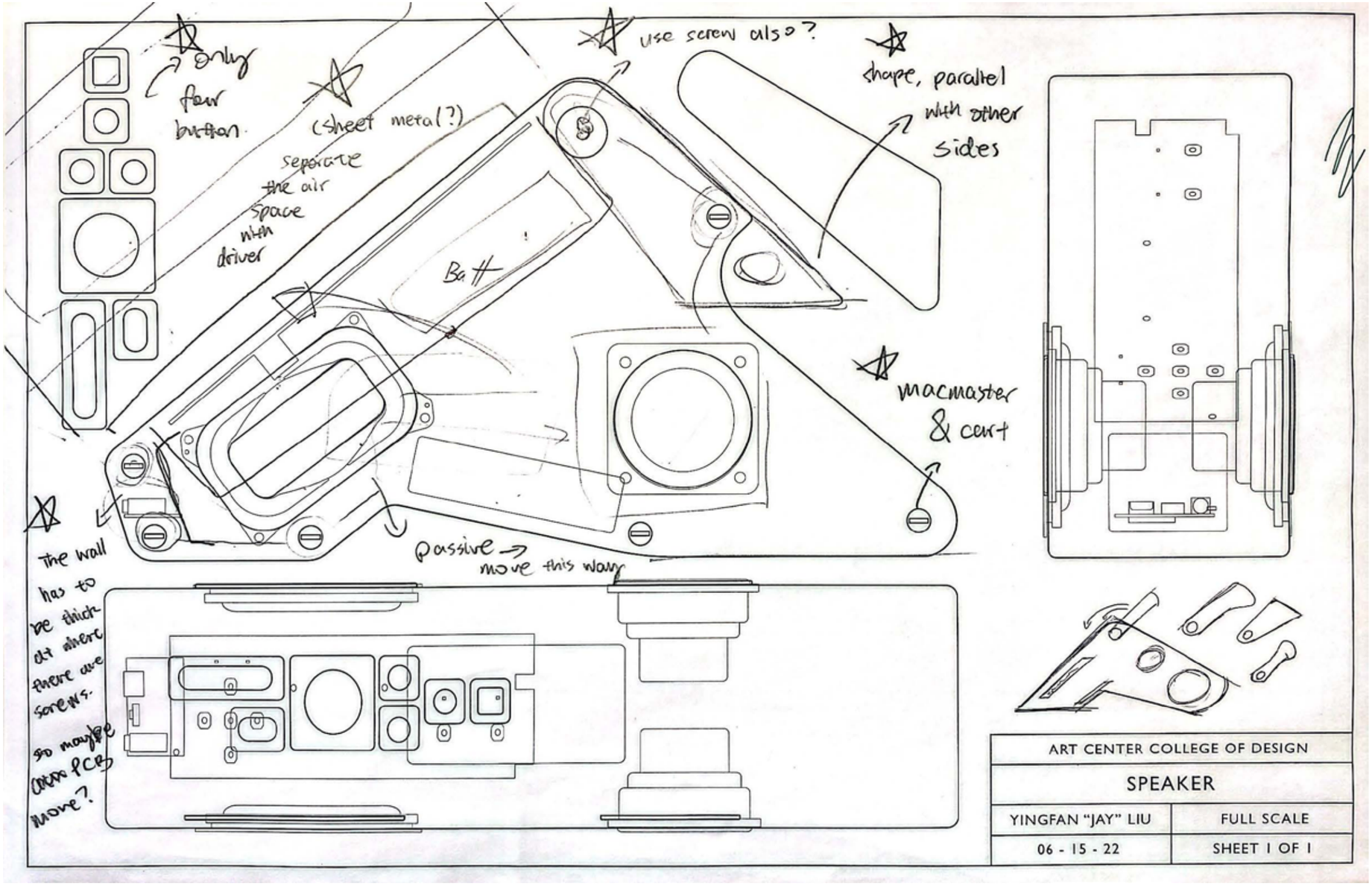
The other mock for week also explored how the internal parts will be placed inside the speaker.



Week 4

Speaker Design Mock-Up stage 2

Revision notes

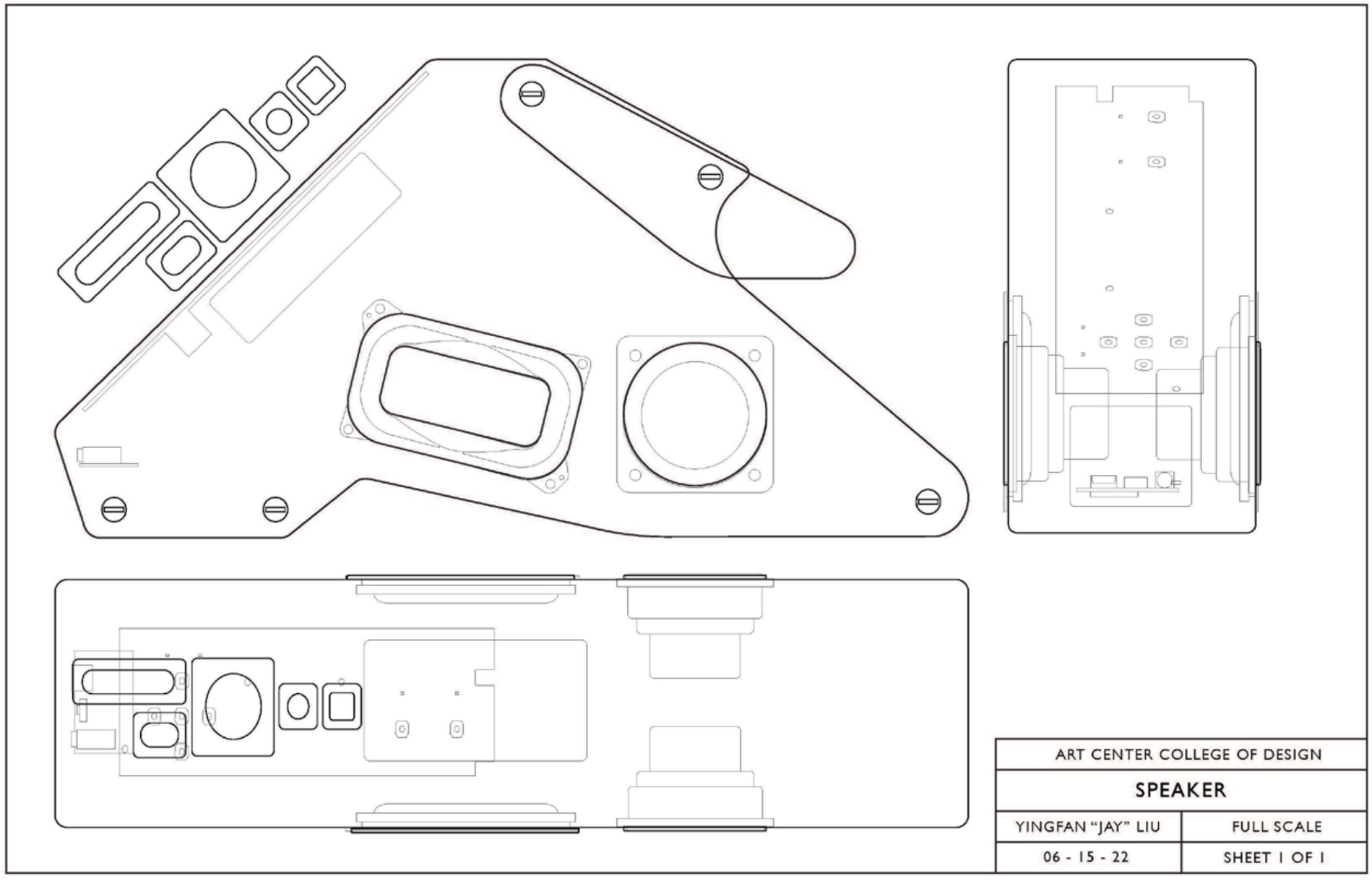


Week 5

Speaker Design Mock-Up stage 3

This is the first stage that I experimented all my previous thoughts on foam, which proved some them to be right and the rest to be undone through this material the tools in the shop.

- the placement of the passive driver has changed to fit the overall shape and leave space for PCB and battery.
- the amount of buttons has decreased to make the fingerboard under it more space.
- the shape of the handle corresponds with the overall shape more.

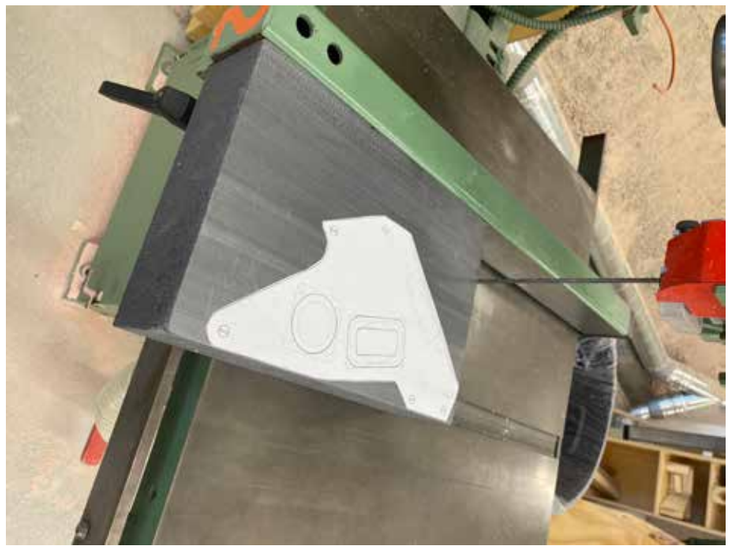


Week 5

Speaker Design Mock-Up stage 3

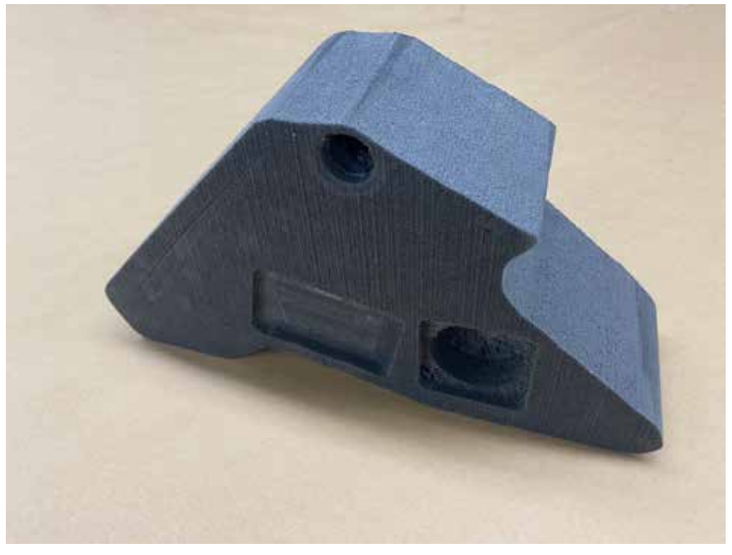
This is the first stage that I experimented all my previous thoughts on foam, which proved some them to be right and the rest to be undone through this material the tools in the shop.

Stick the paper template on the foam



Cut the foam smaller but still maintain
the rectanngular shape to put on the mill

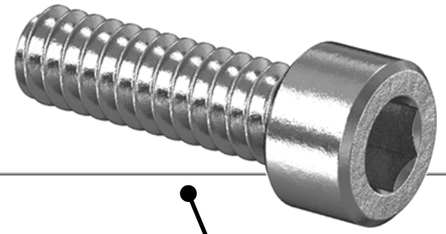
Mill the the holes for the drivers



Week 6

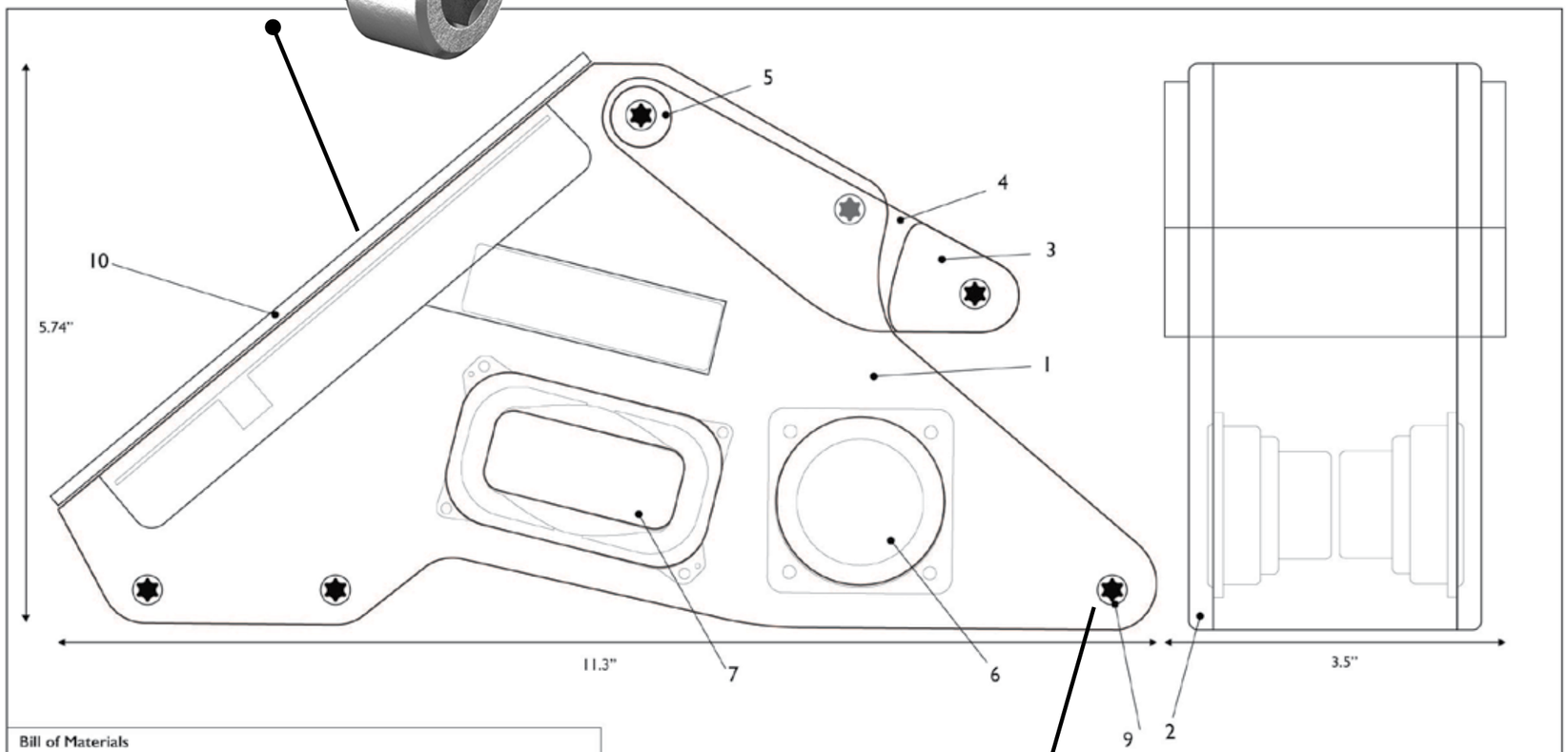
Speaker Detailed Ortho

Instead of having the battery directly attached to the back of the PCB, I decided to cut a relief on near passive driver so that the blank space that holds the PCB is not interfering too much with the pas-draiver.



4-40 3/8" stainless steel socket head screw

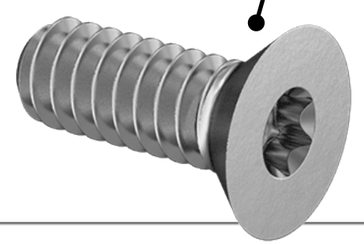
The is screw is used on the side panel to accommodate with the outlet on the same side.



Bill of Materials

Part #	Description	Material	Qty	Supplier	Type	Detail Sheet
1	Main Box	20 lb Foam	1	ArtCenter Shop	Sub-Assembly	
2	Front&Rear Assembly	Acrylic Plastic	1	ArtCenter Shop	Sub-Assembly	
3	Handle	20 lb Foam	1	ArtCenter Shop	Sub-Assembly	
4	Handle Assembly	Acrylic Plastic	2	ArtCenter Shop	Sub-Assembly	
5	Handle Internal	Wood Dowel	2	ArtCenter Shop	Sub-Assembly	
6	Driver	Various	2	Doss Speaker	Part	
7	Passive Driver	Various	2	Doss Speaker	Part	
8	Control Buttons Set	Acrylic Plastic	1	ArtCenter Shop	Sub-Assembly	
9	Flat Head Screw	Stainless Steel	14	McMaster Carr	Part	
10	Side Panel	Acrylic Plastic	2	ArtCenter Shop	Sub-Assembly	

Project: Speaker	
By: Yingfan "Jay" Liu	
Title: Exterior Material Specifications	
Scale: 1:1	Date: 6/30/2022
	Sheet #: 2 of 2
	Sheet Size: Tabloid



6-32 1/2" stainless steel hex flat head screw

This screw is used not only to hold the panel to the foam, but also a decorative piece to the exterior design.

Week 6

Speaker Detailed Ortho

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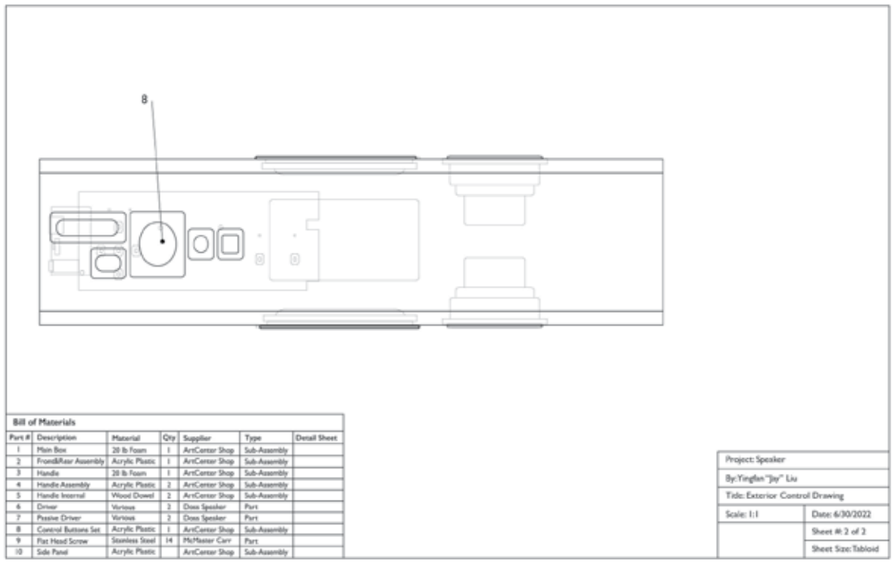
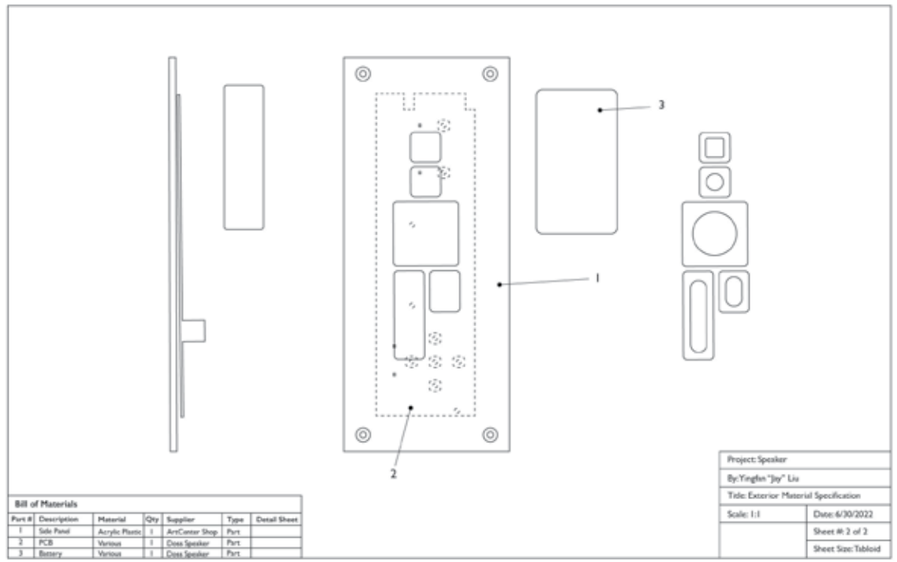
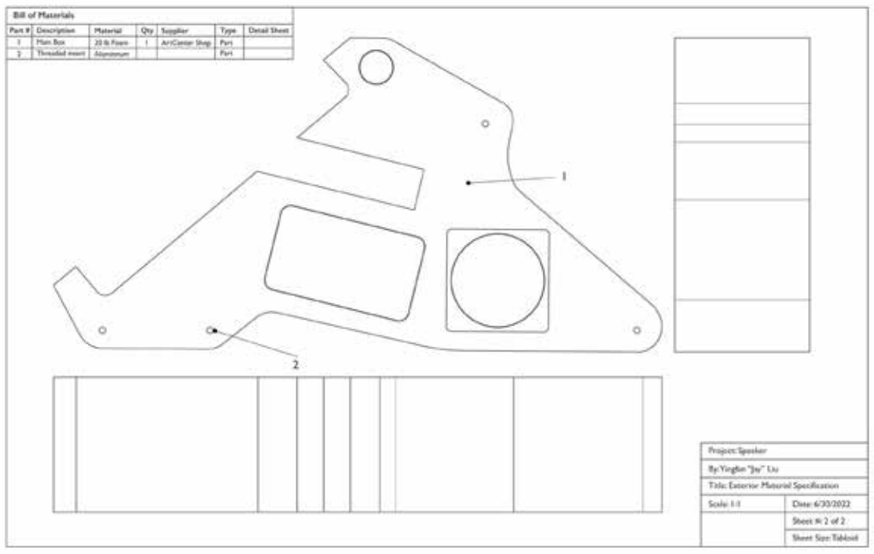
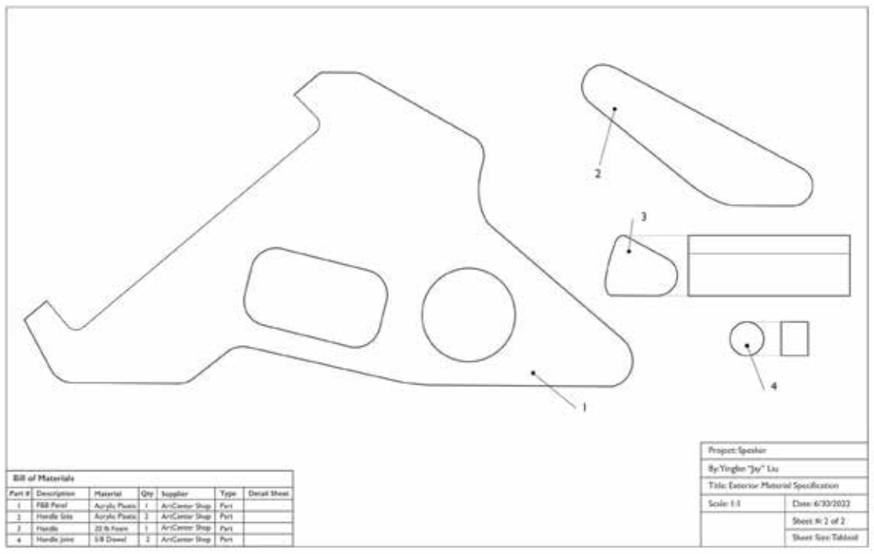






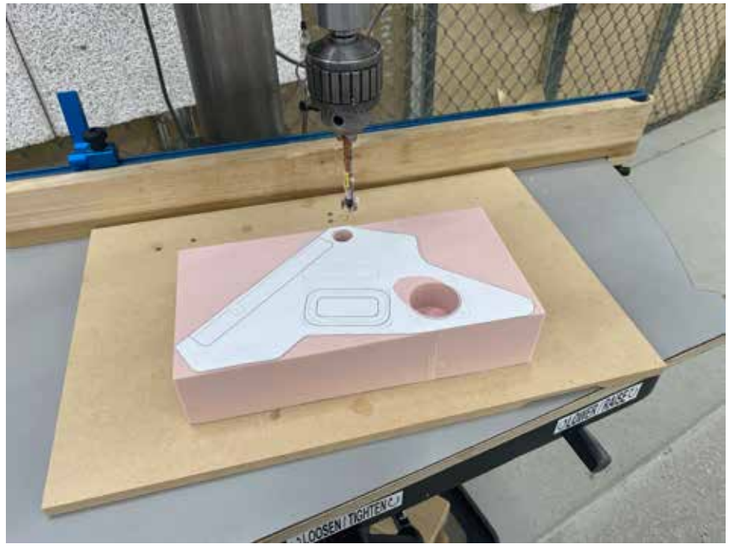


Week 6

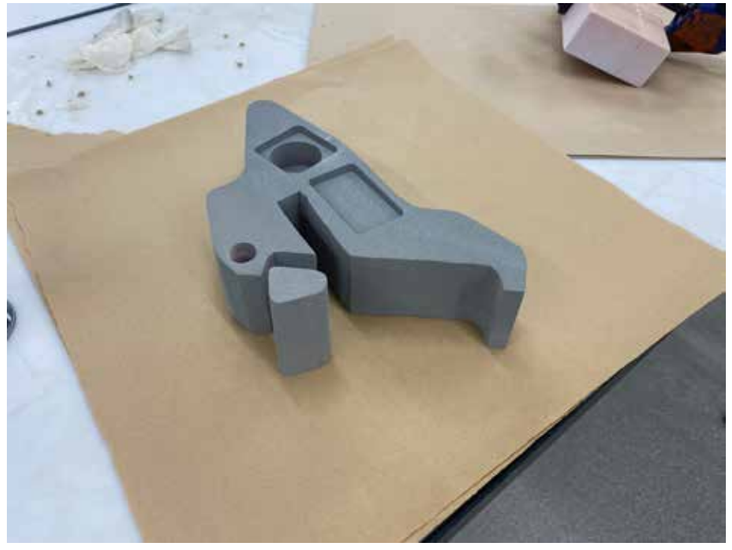
Speaker Design Mock-Up stage 4

This is a improvement stage upon the previous foam model.

Cut the foam to the size needed.



Drill the hole for the handle and the recess for the driver.



After all the milling and cutting, I paint the foam with grey flexible primer just to better show case the form.

Week 6

Speaker Design Mock-Up stage 4

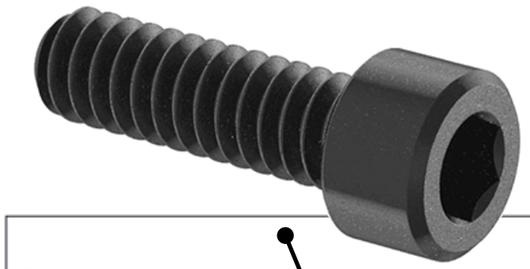
Problem still needs to be solved:

1. connecting the airspace between driver and pas-driver.
2. making the foam piece to match with the acrylic front and back panel.
3. find a space for aux PCB.

Week 7

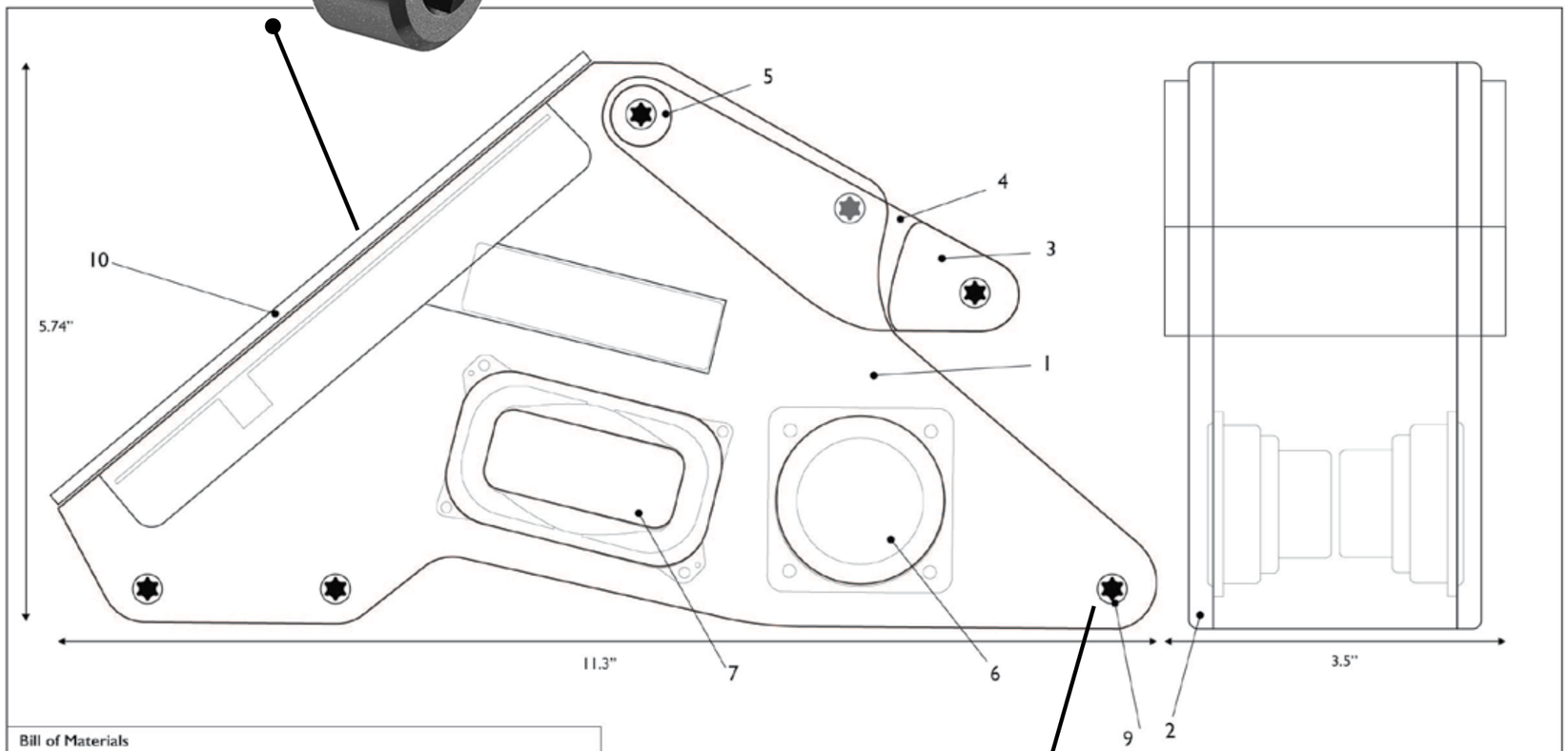
Speaker Detailed Ortho

Eventually I switch to all black oxide screws to match with my speaker's color.



4-40 3/8" black oxide socket head screw

The is screw is used on the side panel to accommodate with the outlet on the same side.



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Project: Speaker	
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Title: Exterior Material Specifications	
Scale: 1:1	Date: 6/30/2022
	Sheet #: 2 of 2
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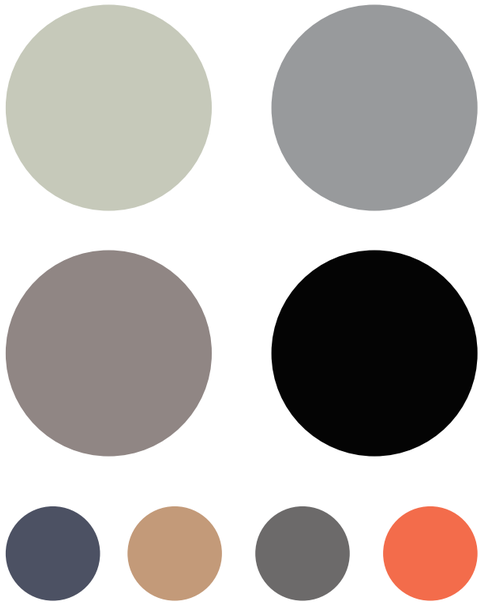
6-32 1/2" Black oxide torx plus flat head screw

This screw is used not only to hold the panel to the foam, but also a decorative piece to the exterior design.

Week 7

Color & Finish In-spirition



Week 8 - 9

Practice Speaker Process

The practice speaker gives insights and experience on techniques to making our own speaker at the end.

Primer the speaker using spray gun.

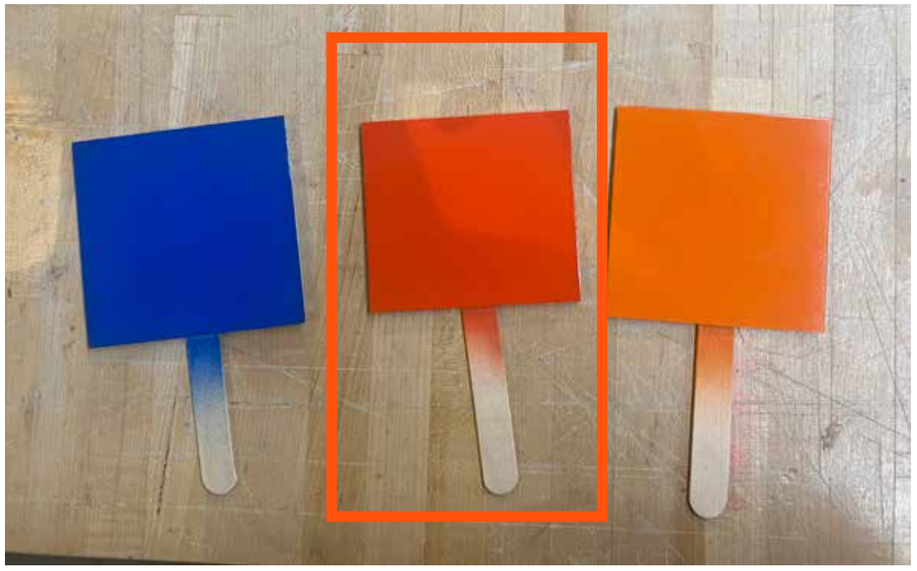
Bundling the speaker and make sure that there are no flaw or hole on it.

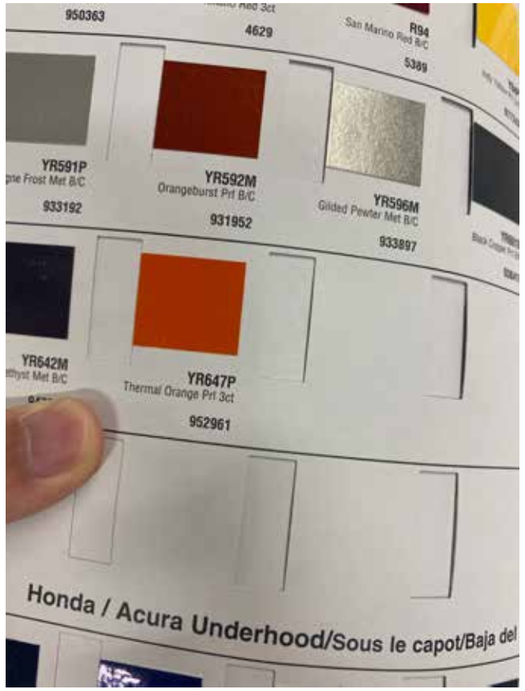
Week 8 - 9

Color & Finish In-spirition

After revisiting the overall shape and inspiration of my own speaker, I've pivoted to using bright color instead of low saturation ones.

The photo below is the test paints using Tamiya paint to decide whether use blue or orange for my final speaker model.



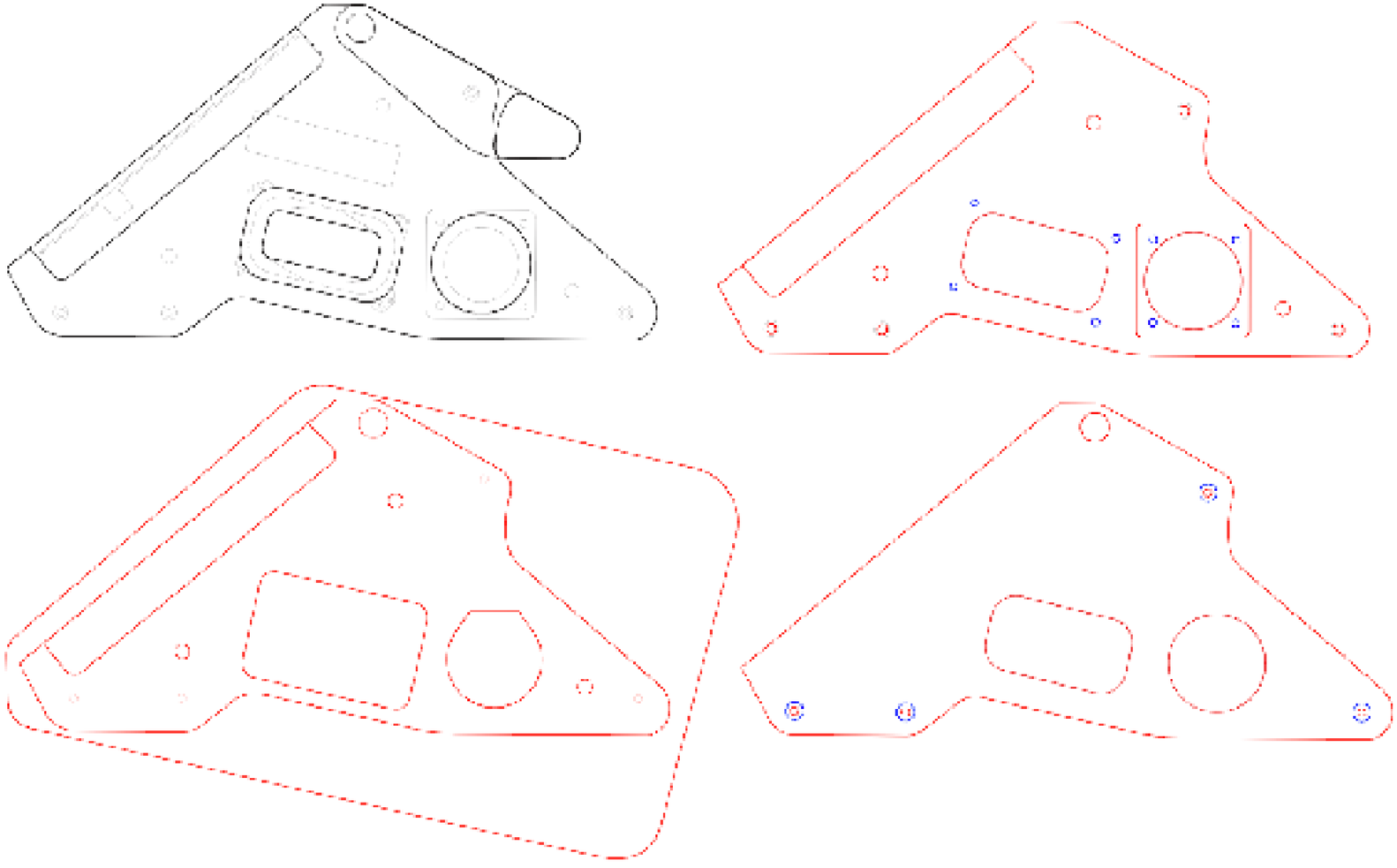


Week 8 - 9

Speaker Design Final Model

This is the final laser cut template for my speaker's foam piece and the two acrylic panel.

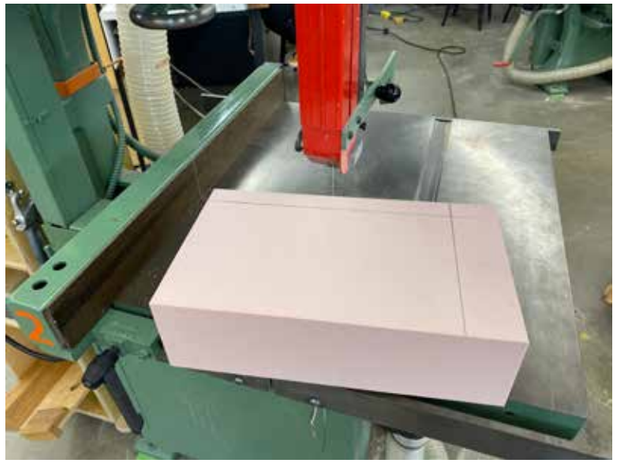
The one in black is the overall master template that each individual ones will follow.



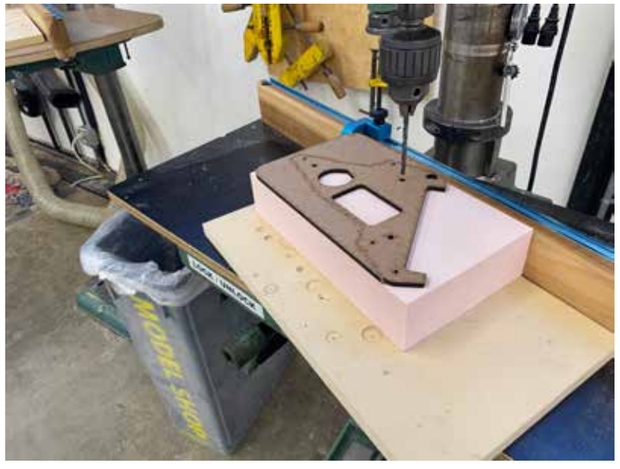
The template is for cutting foam to align with the passive driver pocket when milling it.

Week 10

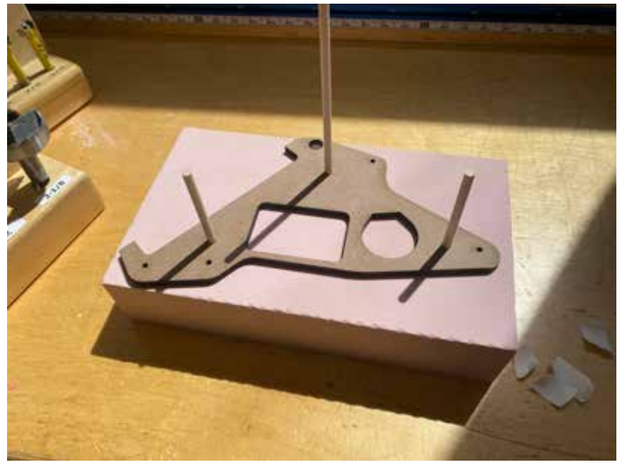
Speaker
Design
Final Model



Cut the foam to the dimension that I need.

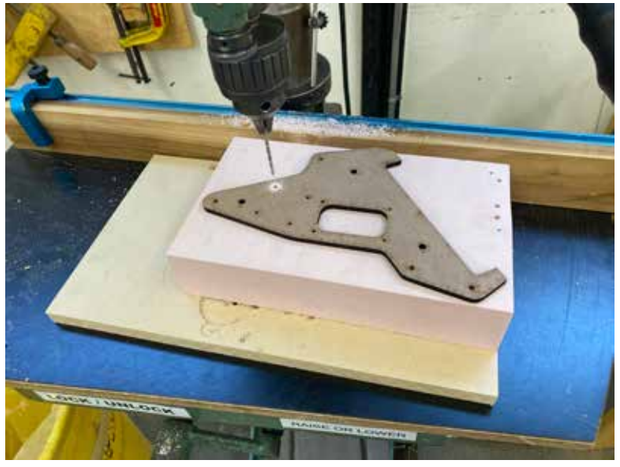


Drill the whole for aligning different template.

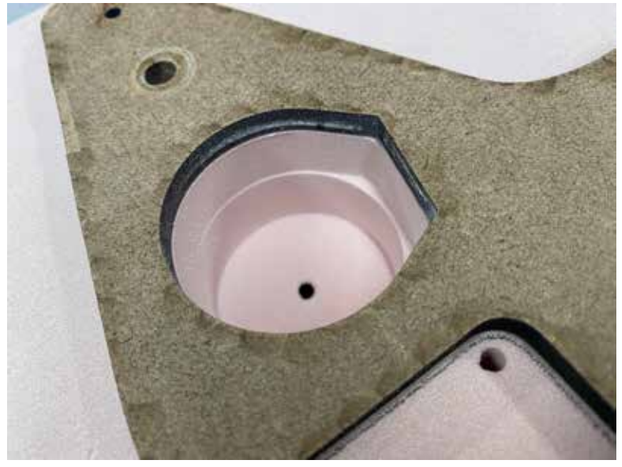


Making sure the dowel can fit into the holes.

Testing the bit size for the screw inserts.



Drill all the thread insert
holes based on the template.



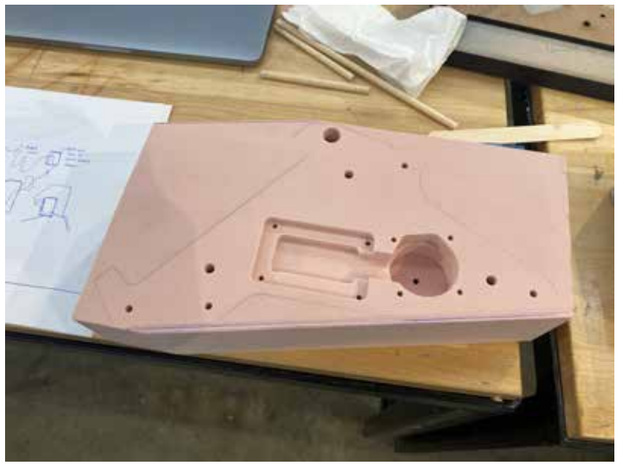
Drill the hole for the driver.

Week 10

Speaker Design Final Model

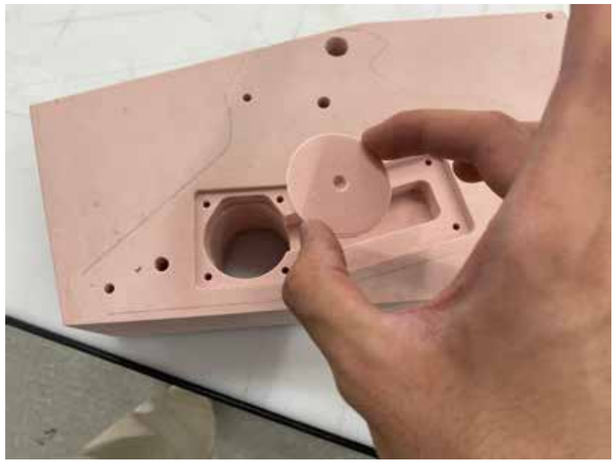
Milling the pocket for passive driver and the inner shared air space with the driver.

Making sure that the passive driver is tightly against the acrylic panel.

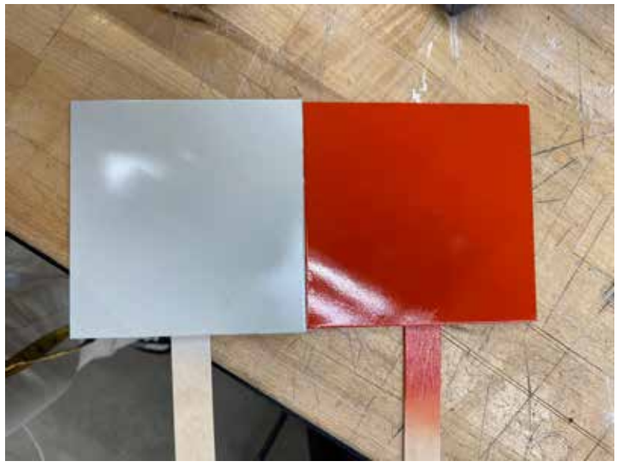


Cut the foam to in order to mill the pocket for driver.

Mill the pocket for driver.



I accidentally drilled a through hole between the two driver pocket, which I will put a foam sheet in between later.

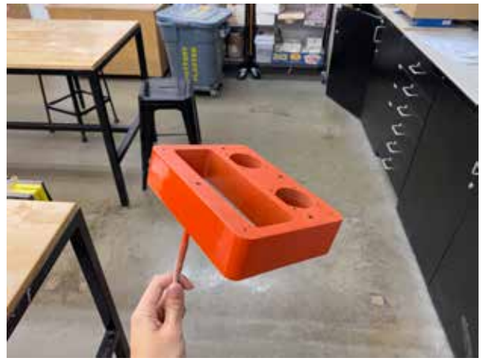


The final color that I will being using for my speaker.

Week 10

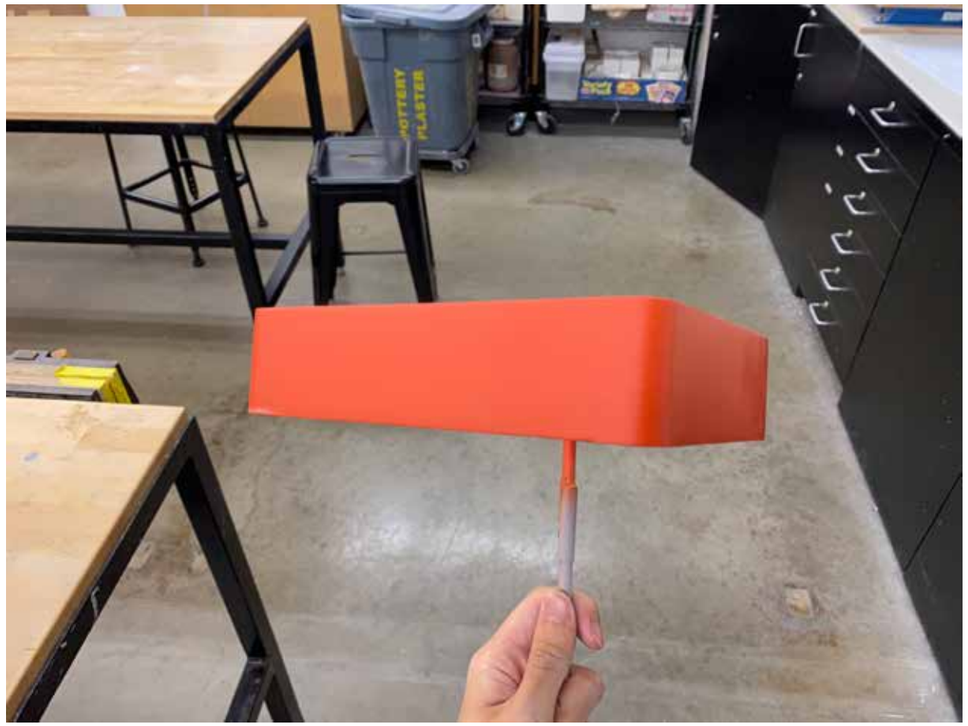
Practice Speaker Process

The practice speaker gives insights and experience on techniques to making our own speaker at the end.



I painted the practice speaker with the color for my final speaker just to test whether to choose glossy or matt finish.

Glossy

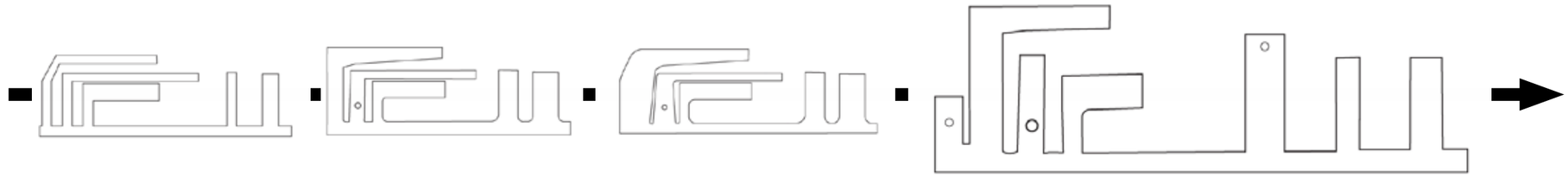


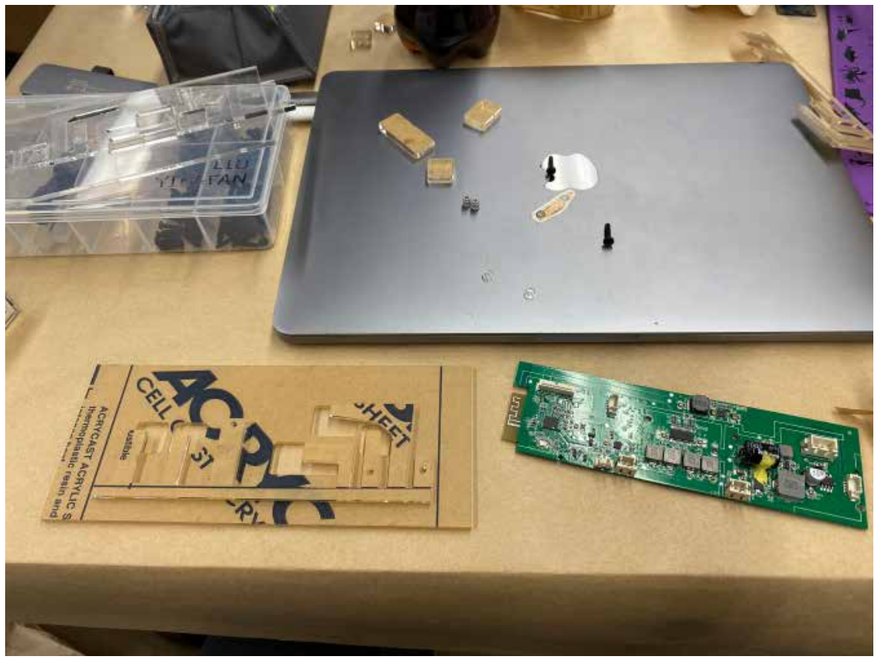
Matt

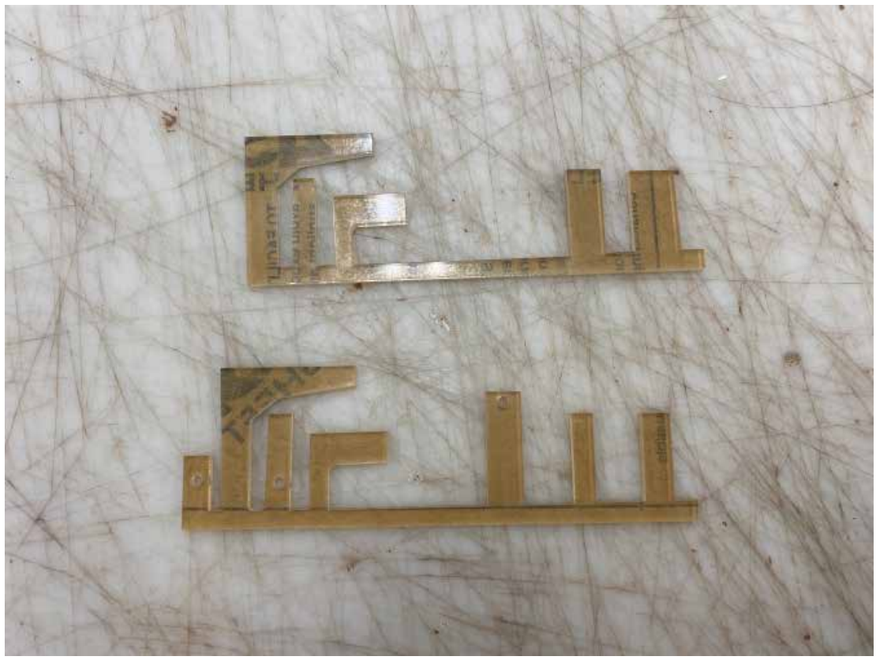
Week 11

Speaker Design Final Model

Creating Finger Board

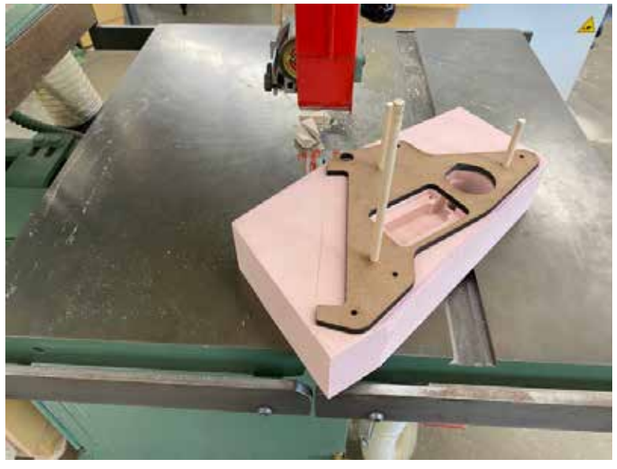




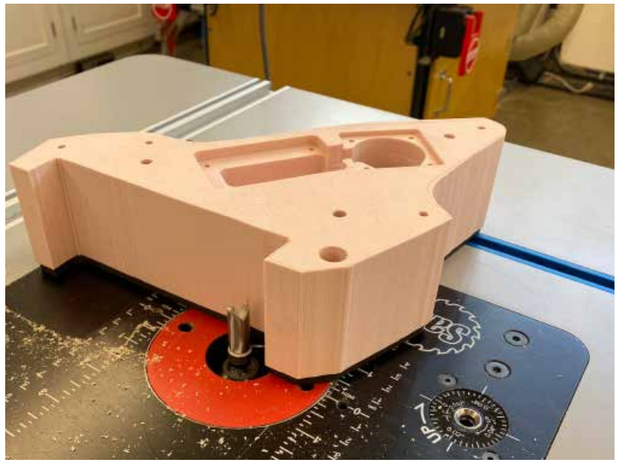


Week 11

Speaker
Design
Final Model

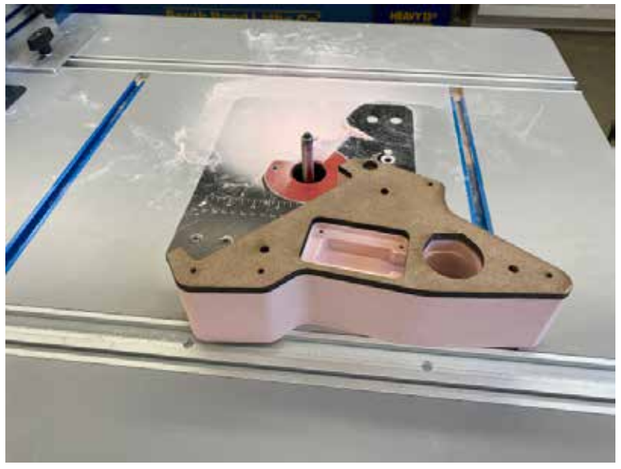


Roughly cutting the useless part of the foam.

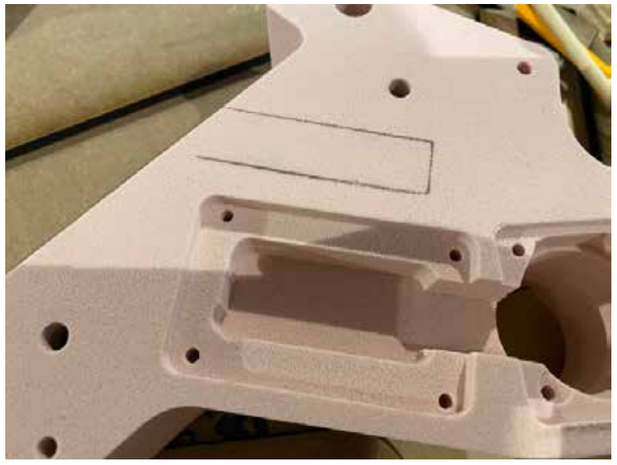


Route the bottom half of the speaker.

Flip around to do the other side.



Finished routing



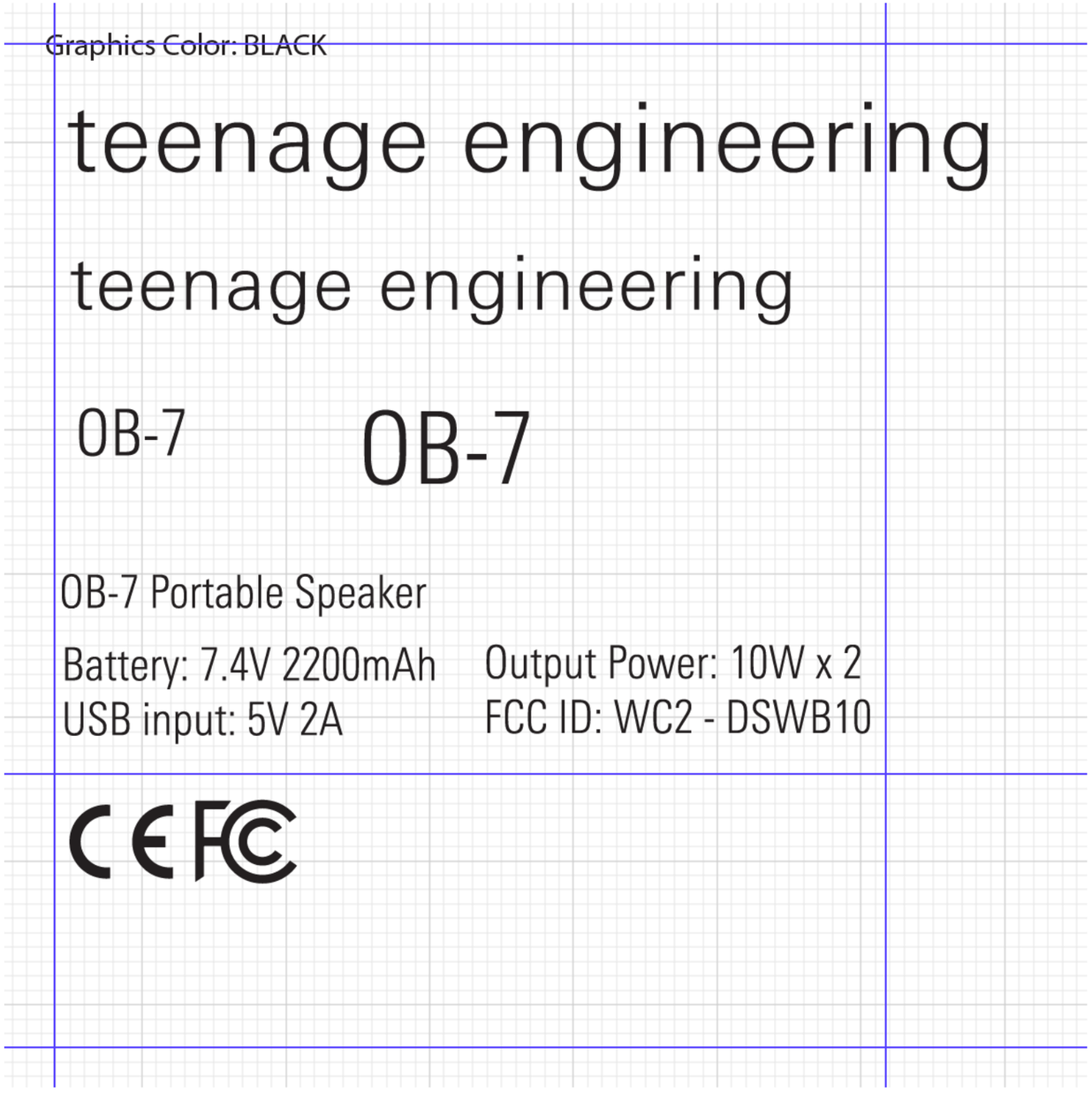
Cut the battery pocket.

Laser PCB mounting panel to test the fit of the PCB pocket

Week 11

Speaker
Design
Final Model

Decal



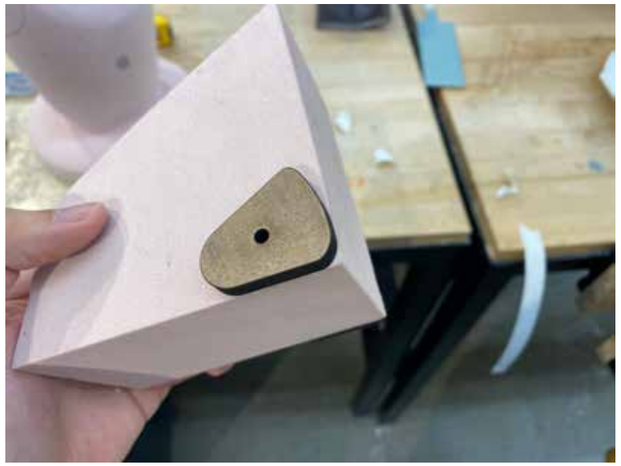
Week 12

Speaker
Design
Final Model

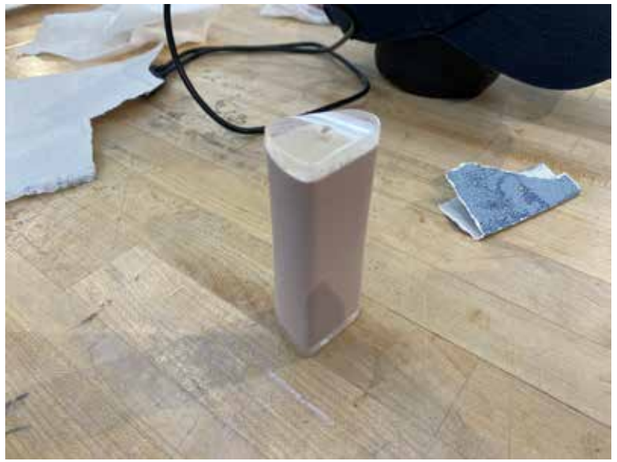
Roughly cutting the useless part of the foam.

Bundle the speaker, and primer again, I repeated this process 3 times.

Counter sink all the screw hole on the acrylic panel.



Make the handle foam piece



Sand it to the shape that I planned.

Mask the front and back acrylic panel for paintin-ng.

Week 13

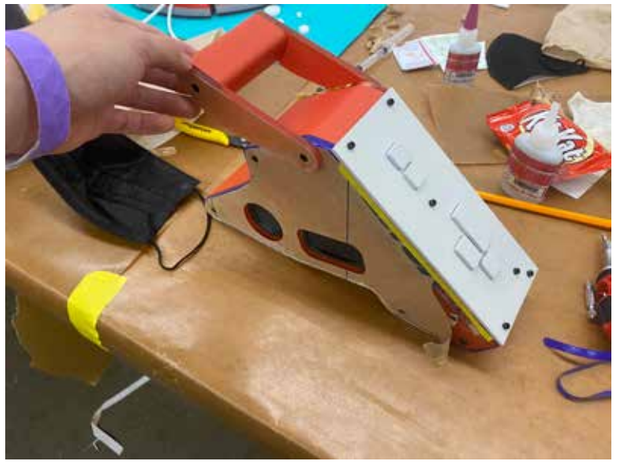
Speaker
Design
Final Model

Painting the foam

Painting the matt finish onto the paint.

Put in all the threaded innserts

Drill the threaded innset hole
on the handle connection dowel.



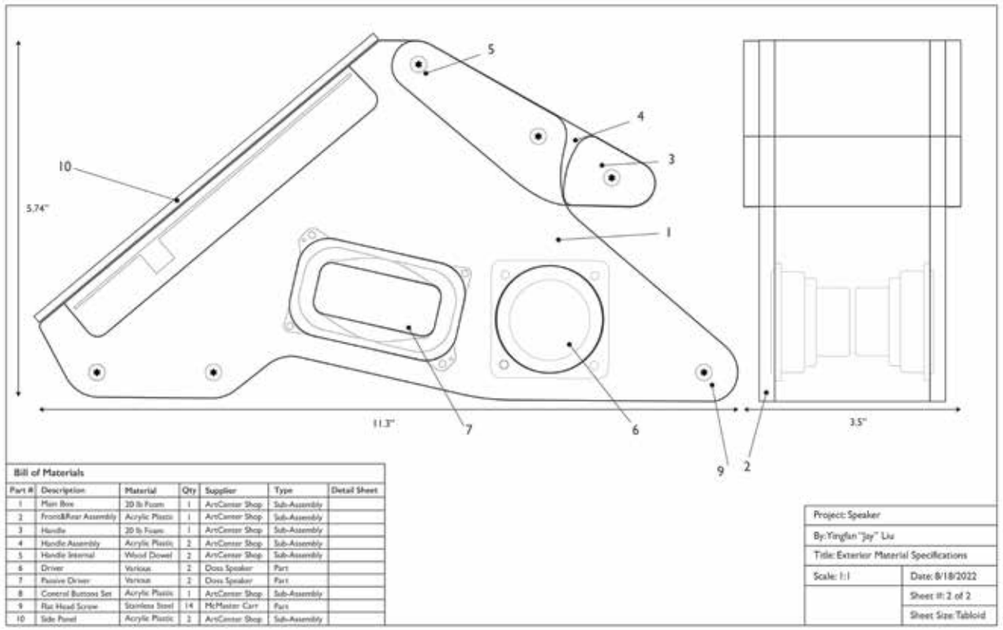
Making sure everything fits.

Final assemble.

Week 14

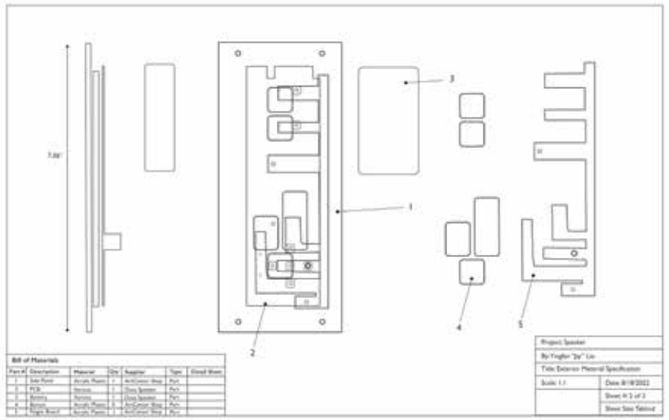
Speaker
Design
Final Model

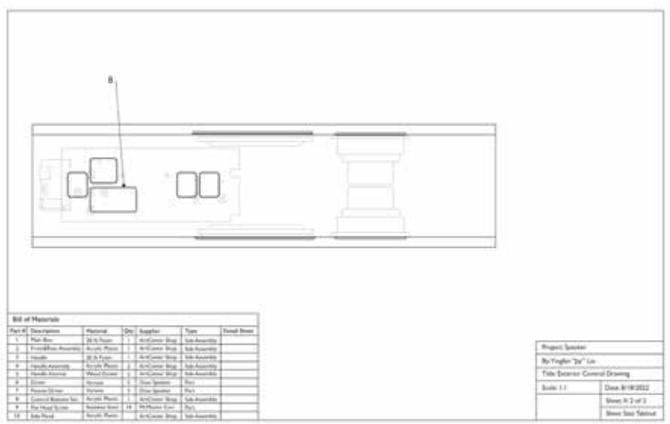
Final Controal Drawing

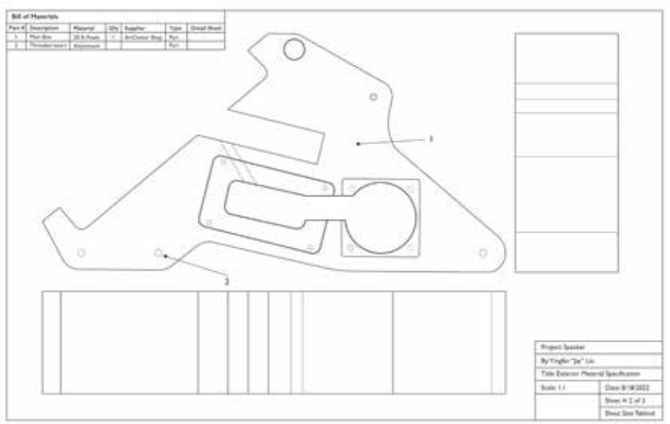


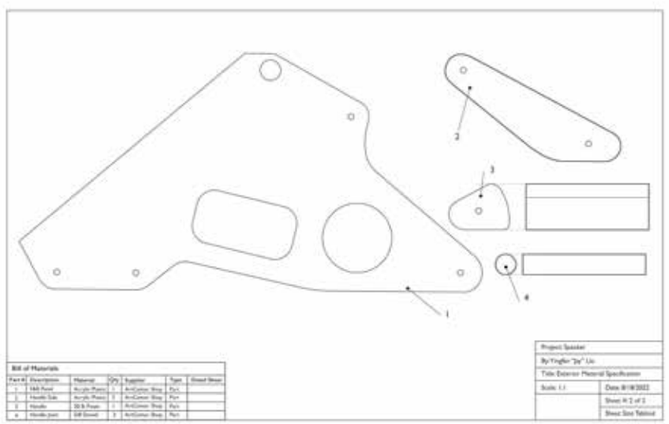
Bill of Materials						
Part #	Description	Material	Qty	Supplier	Type	Detail Sheet
1	Main Box	20 lb Foam	1	ArtCenter Shop	Sub-Assembly	
2	Front&Rear Assembly	Acrylic Plastic	1	ArtCenter Shop	Sub-Assembly	
3	Handle	20 lb Foam	1	ArtCenter Shop	Sub-Assembly	
4	Handle Assembly	Acrylic Plastic	2	ArtCenter Shop	Sub-Assembly	
5	Handle Internal	Wood Dowel	2	ArtCenter Shop	Sub-Assembly	
6	Driver	Various	2	Doss Speaker	Part	
7	Passive Driver	Various	2	Doss Speaker	Part	
8	Control Buttons Set	Acrylic Plastic	1	ArtCenter Shop	Sub-Assembly	
9	Flat Head Screw	Stainless Steel	14	McMaster Carr	Part	
10	Side Panel	Acrylic Plastic	2	ArtCenter Shop	Sub-Assembly	

Project: Speaker	
By:Yingfan "Jay" Liu	
Title: Exterior Material Specifications	
Scale: 1:1	Date: 8/18/2022
	Sheet #: 2 of 2
	Sheet Size:Tabloid









Week 14

Speaker
Design
Final Model

Presentation

Week 14

Speaker Design Final Model

Final shots

Week 14

Speaker Design Final Model

Final shots