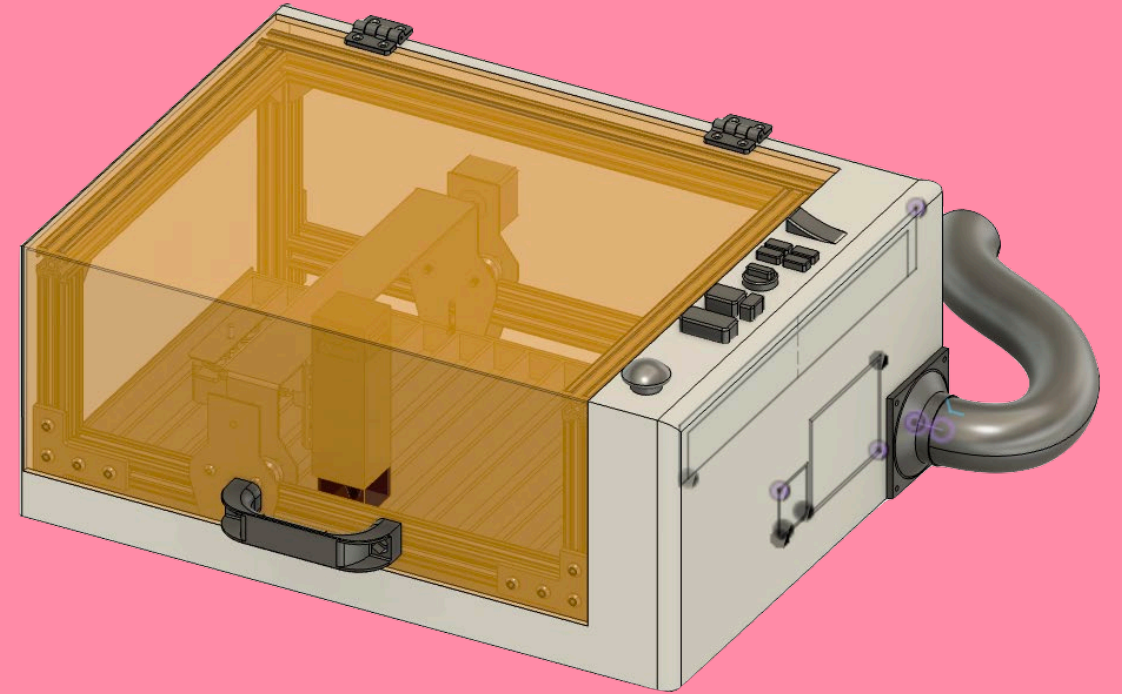


# INLINE

The Software-Free Laser Cutter

Pink Team, 2.009 Fall 2023

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# Meet Owen the Office Worker

creative, but  
doesn't have  
much space to  
make things

great at  
drawing but  
limited cutting  
skills



Loved art in school,  
now a white-  
collar worker for  
the money

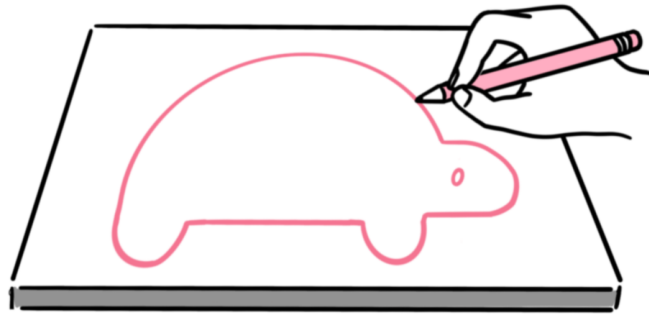
not comfortable  
with software

doesn't have  
time to learn  
new skills

1. Get Material



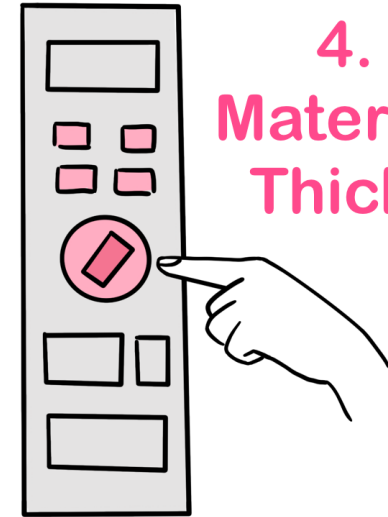
2. Draw on Material



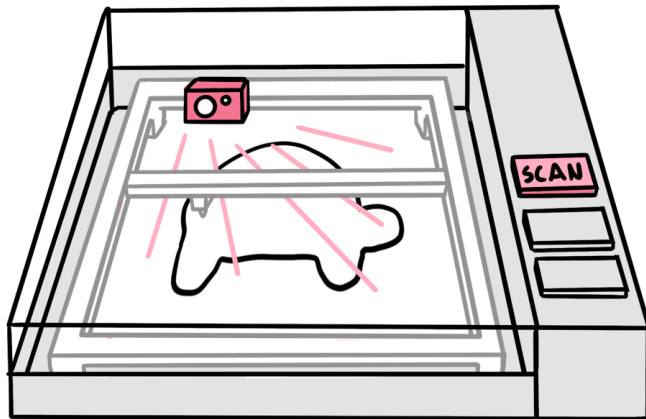
3. Place Material in Machine



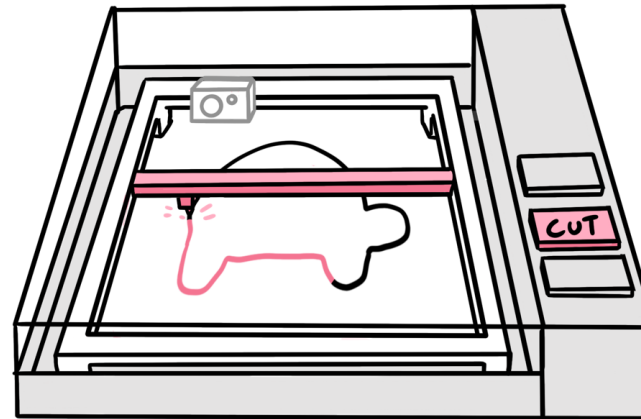
4. Set Material and Thickness



5. Scan



6. Cut

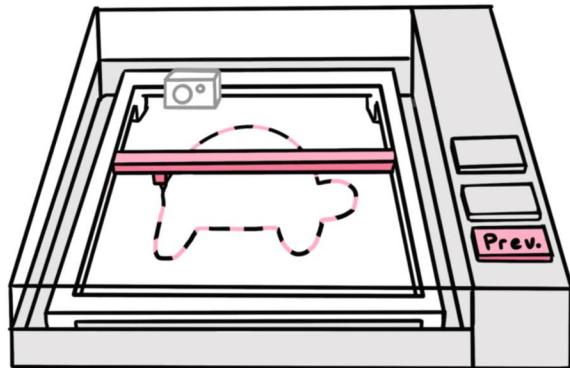


7. Done!



# Additional Features

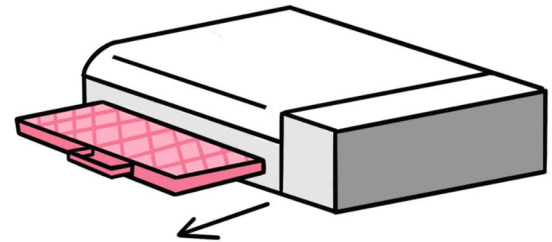
Preview Cut



Emergency Stop



Removable Cutting Bed





# User Interface

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1. On/Off



2. Materials



- Paper
- Fabric
- Cardboard
- Wood

3. Thickness



Cuts up to 1/8"

5. Project Preview



Light beam shows cutting path

Takes Photo

4. Scan



6. Cut

Motor and Laser Startup

Questions & Concerns?

Emergency Stop

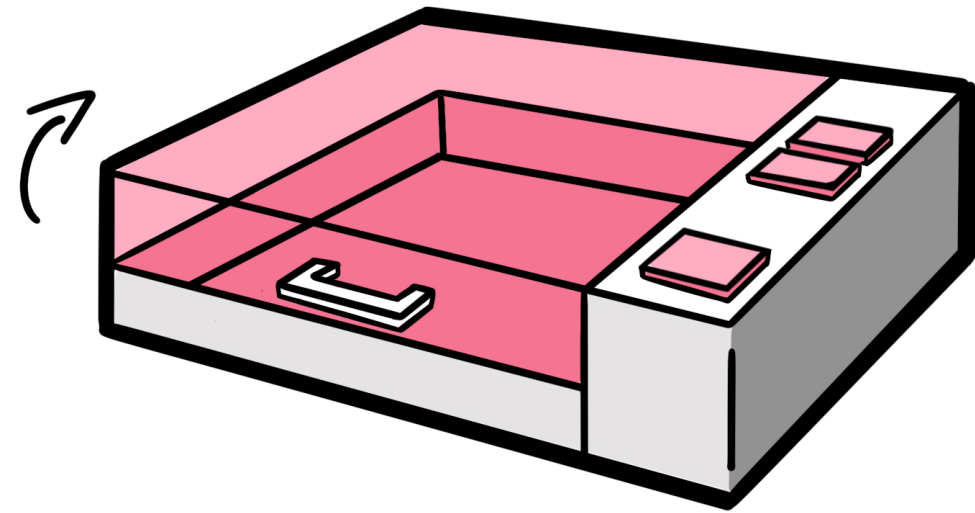


# Assembly Design

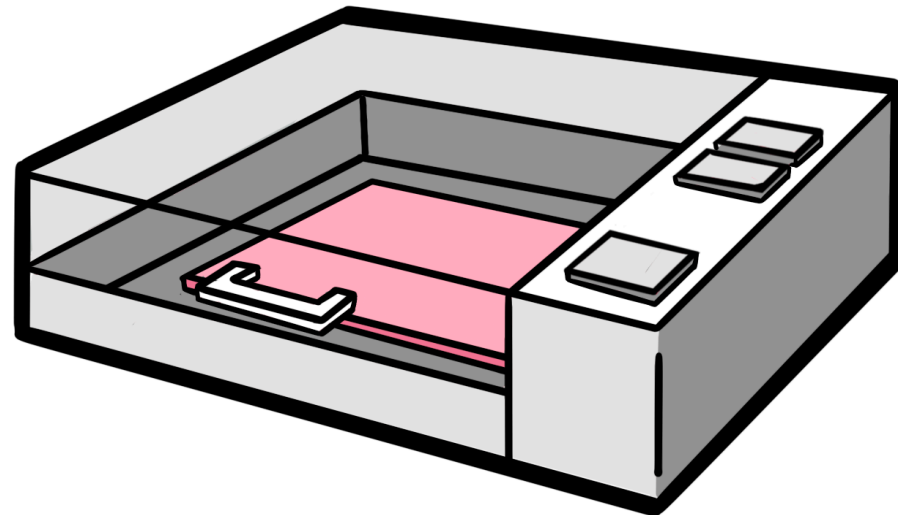
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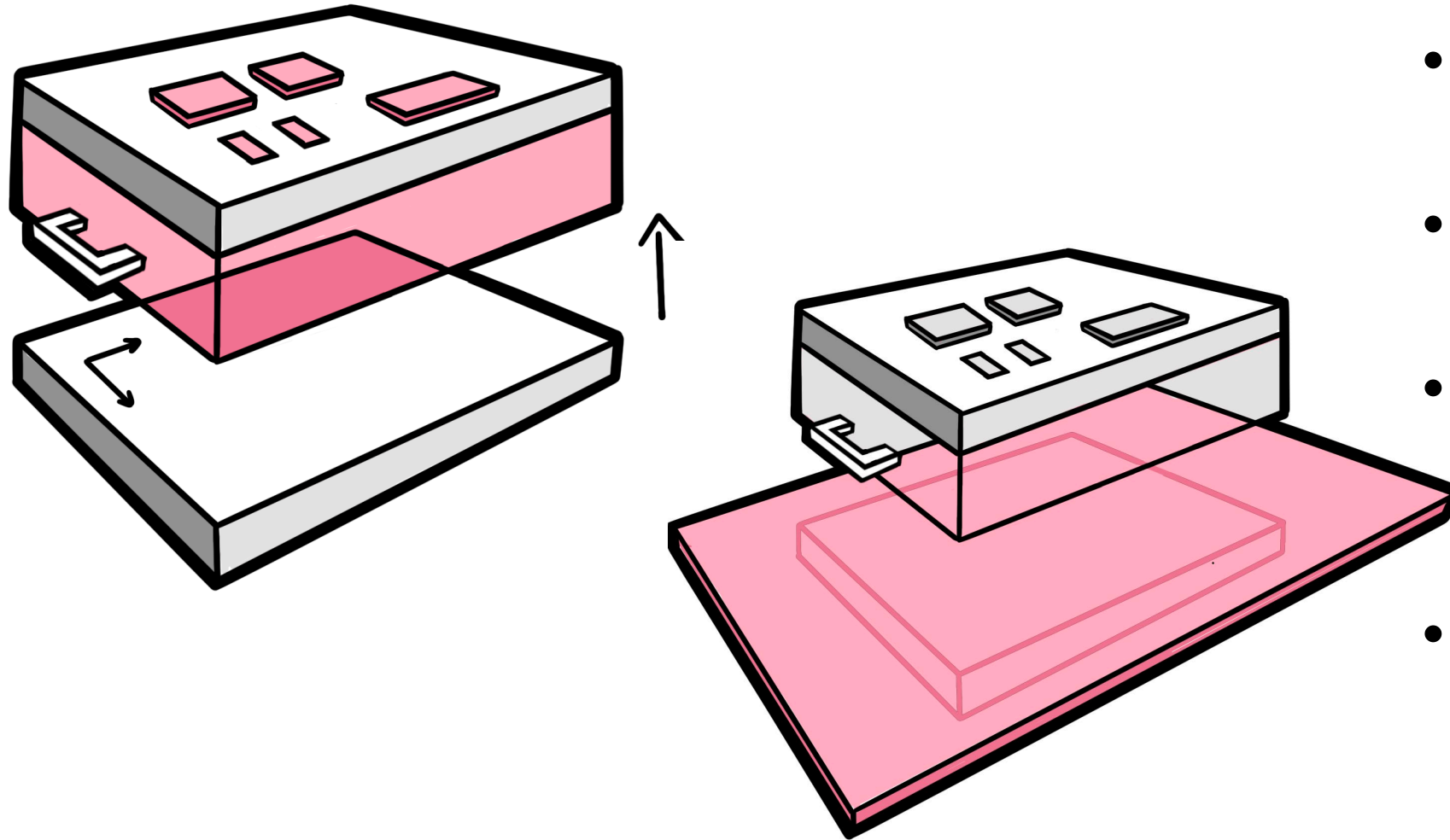
# STANDARD BAY FORM FACTOR



- Cuts 12"x18" materials
- Lift lid to place material into bed
- Tried and true form factor



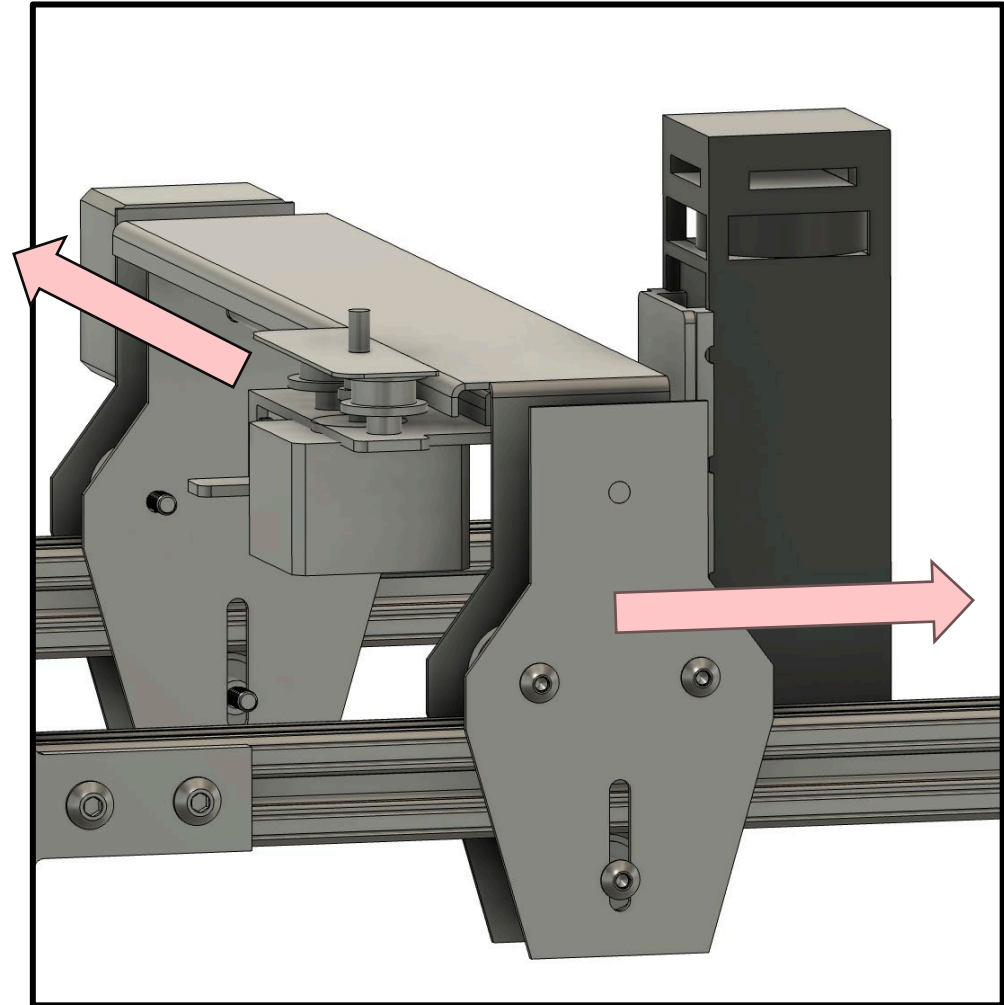
# REMOVABLE BED FORM FACTOR



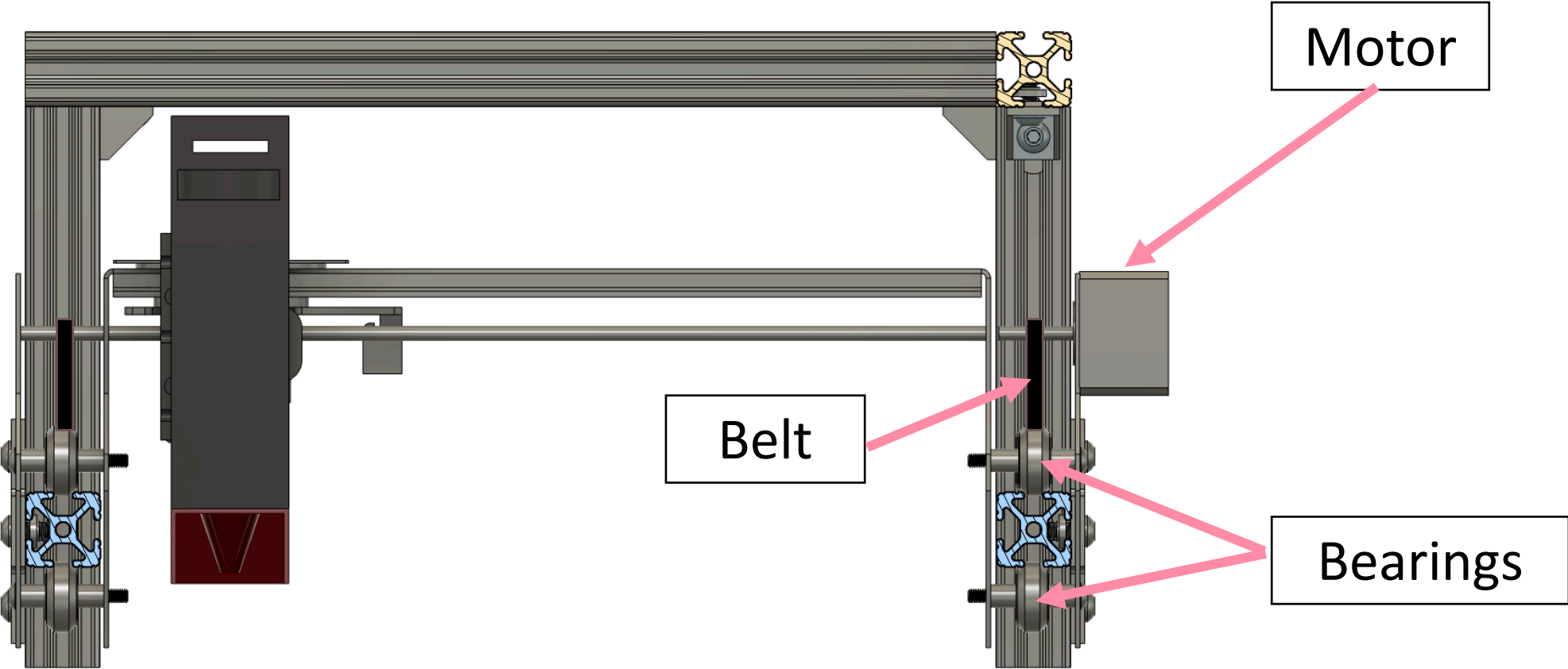
- Lift gantry and place on material
- Capable of cutting materials of any size
- Stitches cuts together for cutting large designs
- Magnets used to align cutting bed

# GANTRY DESIGN

- 2-axis belt driven gantry movement
- Powered by stepper motors
- >3 in/sec movement capability



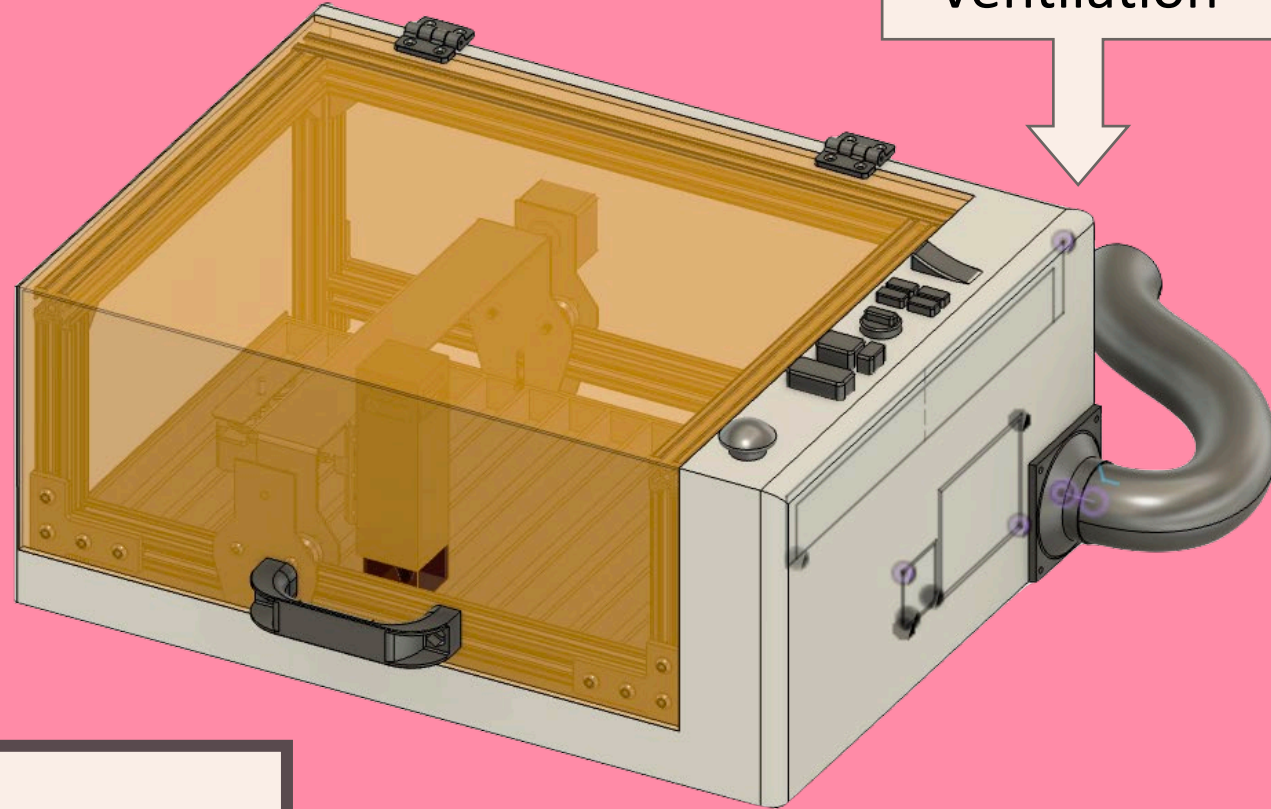
# GANTRY DESIGN



# SAFETY FEATURES

Filters out the 445nm wavelength of light coming from the laser

Orange Filter



Ventilation

1. For rooms without windows: Charcoal HEPA filter

2. For rooms with windows: Vent hose attachment

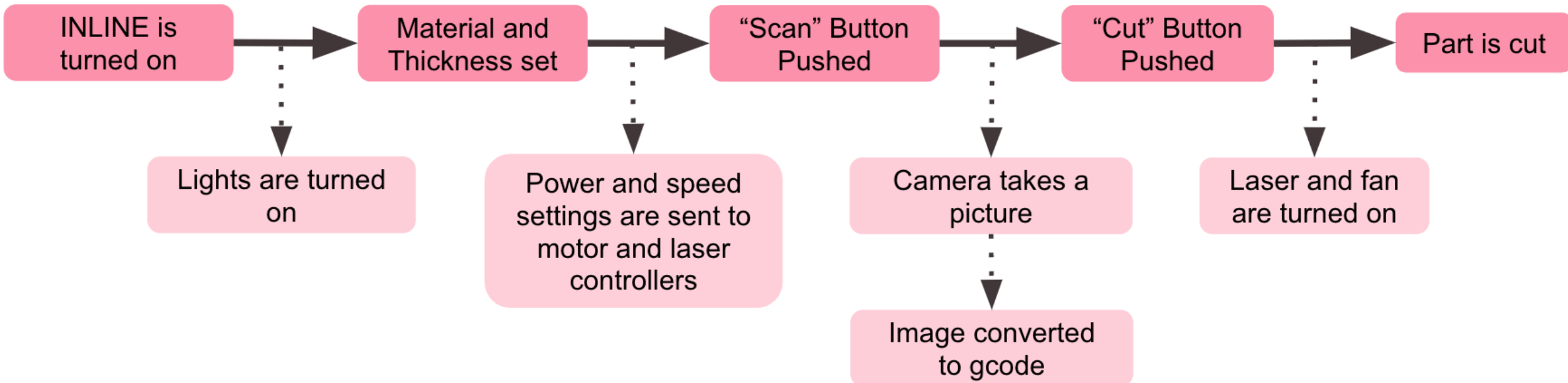
3. For well ventilated workspaces: our fan alone is sufficient to clear the immediate area of fumes.

Questions & Concerns?

# Image Capture

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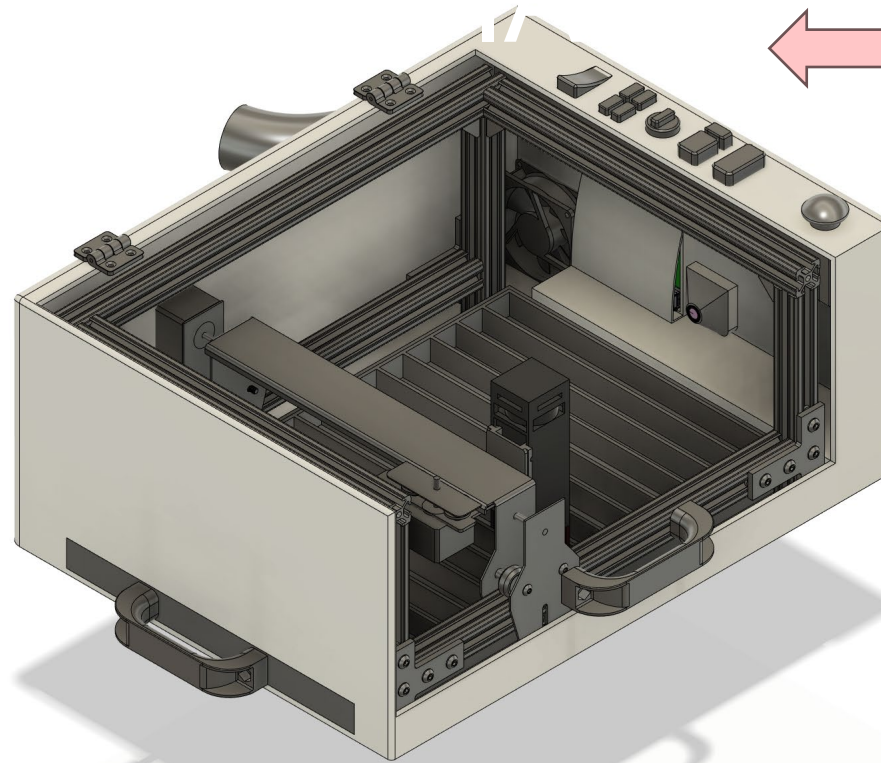
# SYSTEMS DIAGRAM



# IMAGE CAPTURE SYSTEM

Camera

Available image processing libraries allow us to take photos at an angle



Electronics

PCB and other electronics housed in right side

Lights

Ultra bright LEDs for crisp photos



# SOFTWARE CONCERNS

## **Ensuring our image processing yields smooth cut-lines across varied line sizes**

- Extract centerlines from our high contrast images, which would allow us to 'smooth' the traced line

Thoughts?

## **Accounting for the varying levels of contrast between our user's markings and the cut material**

- Ambient lighting, line size, line clarity, and other factors can make it difficult to develop an algorithm that consistently finds center-lines across different materials.
- Solution: users draw with a special kind of marker, such as one with UV ink, and then have a blacklight illuminate the inside of our laser cutter

Testing	Test Procedure	How is it measured?
Cutting speeds and laser power	Vary speeds and power on various types of materials	Binary test
How markers and lighting affects image quality	Vary lighting and markers (Black lights with UV markers)	Quality of SVG output
Optimal camera position in assembly	Vary camera positioning and frame conversion algorithms	Accuracy of image in relation to its physical form

FINAL COMMENTS?