

Design of a Less Deafening Hair Dryer

Team 6

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Presentation Overview

- **Project Scope**
- **Design Considerations**
- **Concept Designs**
- **Future Plans**

What's The Problem?

Hair Dryers are TOO LOUD!

- Average operating sound level of 85 dBa
- Noise induced hearing loss begins at 85 dBa
- Annoyance for those sleeping
- Adds to noise pollution in salons



Goal: Design and Build a Quieter Hair Dryer

Project Description

- Objectives

- Design and build a working prototype
- Produce a business model for product

- Prototype Goals

- Safe
- Quiet
- Effective
- Inexpensive
- Commercialization

Project Constraints

- Budget \$1,500
- Must generate less than 70 dba of sound pressure
- Heat that reaches user must be less than 120° F
- Weight must be less than 2 lbs
- Max Dimensions (10 in x 10 in x 4 in)
- Must contain ground fault circuit interrupter
- Components must withstand max temperatures



Hair Dryer Breakdown

- Simple electromechanical device
 - Air Moving Component
 - Motor
 - Heating element
 - Power Source
 - Safety measures

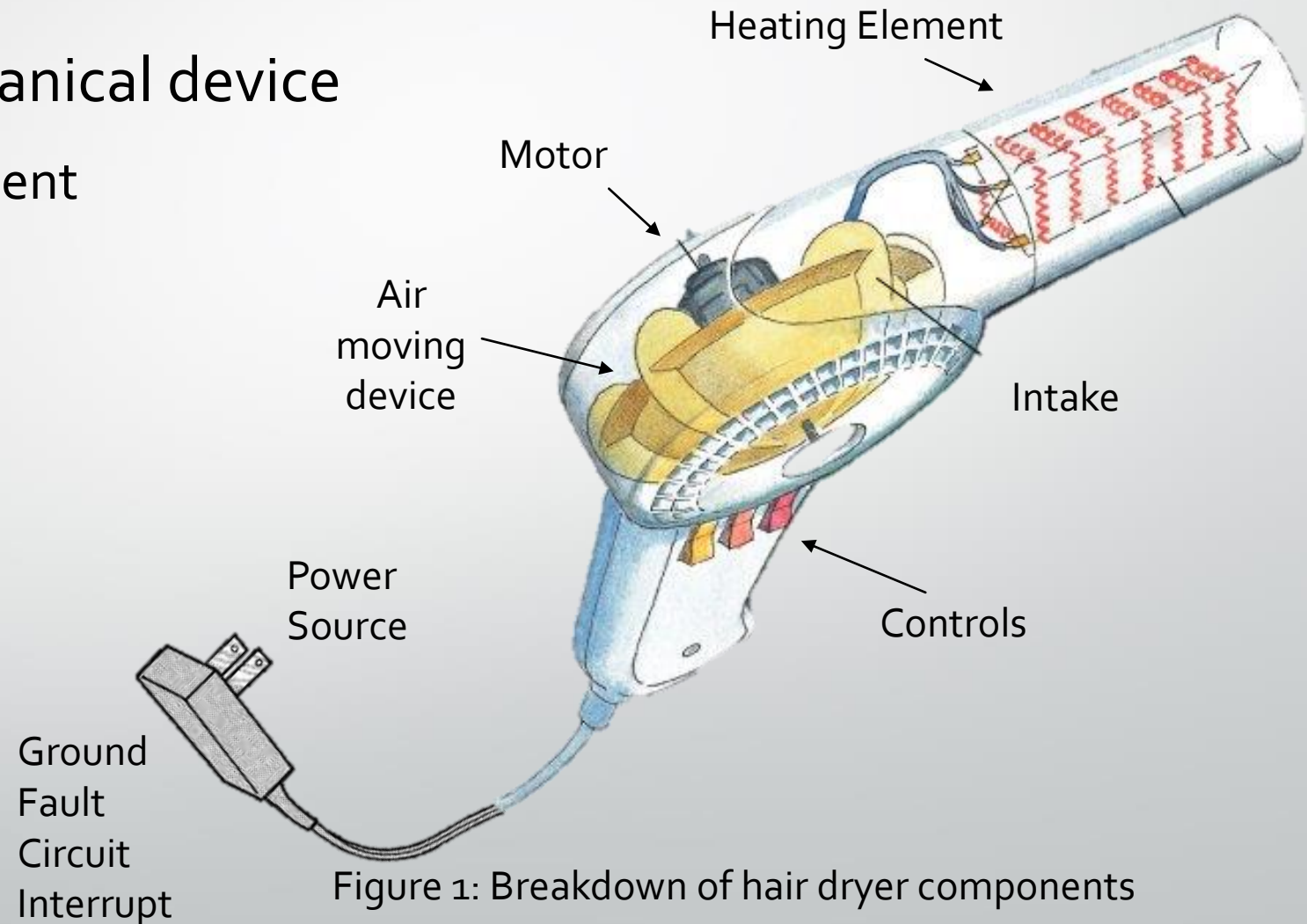
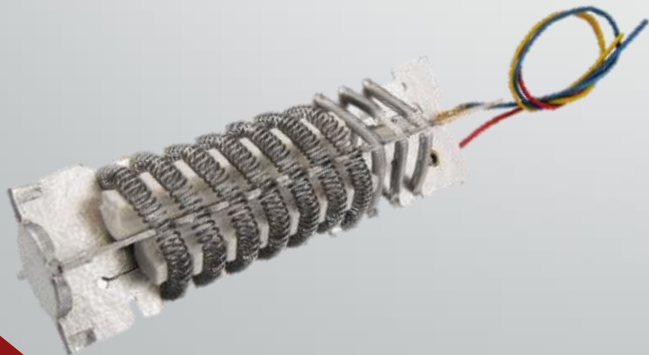


Figure 1: Breakdown of hair dryer components

Focal Points of Design

- Circuit

- Power source
- To the Motor
- Heating element
- Ground Fault Circuit Interrupt



- Body

- Motor housing
- Effective air flow
- Switches



- Mechanical

- Air mover
- Motor



House of Quality

Correlation:
 10 – High
 6 – Med
 3 – Low

| | | ENGINEERING CHARACTERISTICS | | | | | | | |
|-------------------------|----|-----------------------------|---------------|-----------------------------|--------------|-----------------|-----------------|-------|--------------------|
| Customer Requirements | CI | Air Supply Source | Air Flow Rate | Convert Electricity to Heat | Temp Control | User Protection | Electric Supply | Motor | Material Selection |
| Quiet | 10 | 10 | 6 | 0 | 0 | 0 | 0 | 6 | 3 |
| Dries Effectively | 10 | 10 | 10 | 10 | 10 | 0 | 3 | 6 | 0 |
| Ease of Use | 6 | 0 | 3 | 6 | 3 | 0 | 0 | 0 | 0 |
| Operates Safely | 10 | 6 | 0 | 3 | 3 | 10 | 6 | 6 | 0 |
| Lightweight | 6 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 10 |
| Ergonomic | 3 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 3 |
| Variable Heat Settings | 6 | 0 | 0 | 10 | 10 | 0 | 0 | 0 | 0 |
| Variable Speed Settings | 6 | 6 | 10 | 0 | 0 | 0 | 3 | 10 | 0 |
| Affordable | 3 | 6 | 0 | 0 | 0 | 3 | 3 | 6 | 3 |
| SCORE | | 332 | 247 | 226 | 217 | 109 | 117 | 294 | 108 |
| Relative Weight | | 20% | 15% | 14% | 13% | 7% | 8% | 18% | 7% |
| Rank | | 1 | 3 | 4 | 5 | 7 | 6 | 2 | 7 |

Table 1: House of Quality Matrix

Noise Sources

- Motor
 - Brushed vs. Brushless DC
 - AC motors
 - Vibrational Effects
- Air intake
 - Inlet cover
 - Turbulent flow
- Open casing
 - Openings allows for noise to escape more easily



Concept Design 1

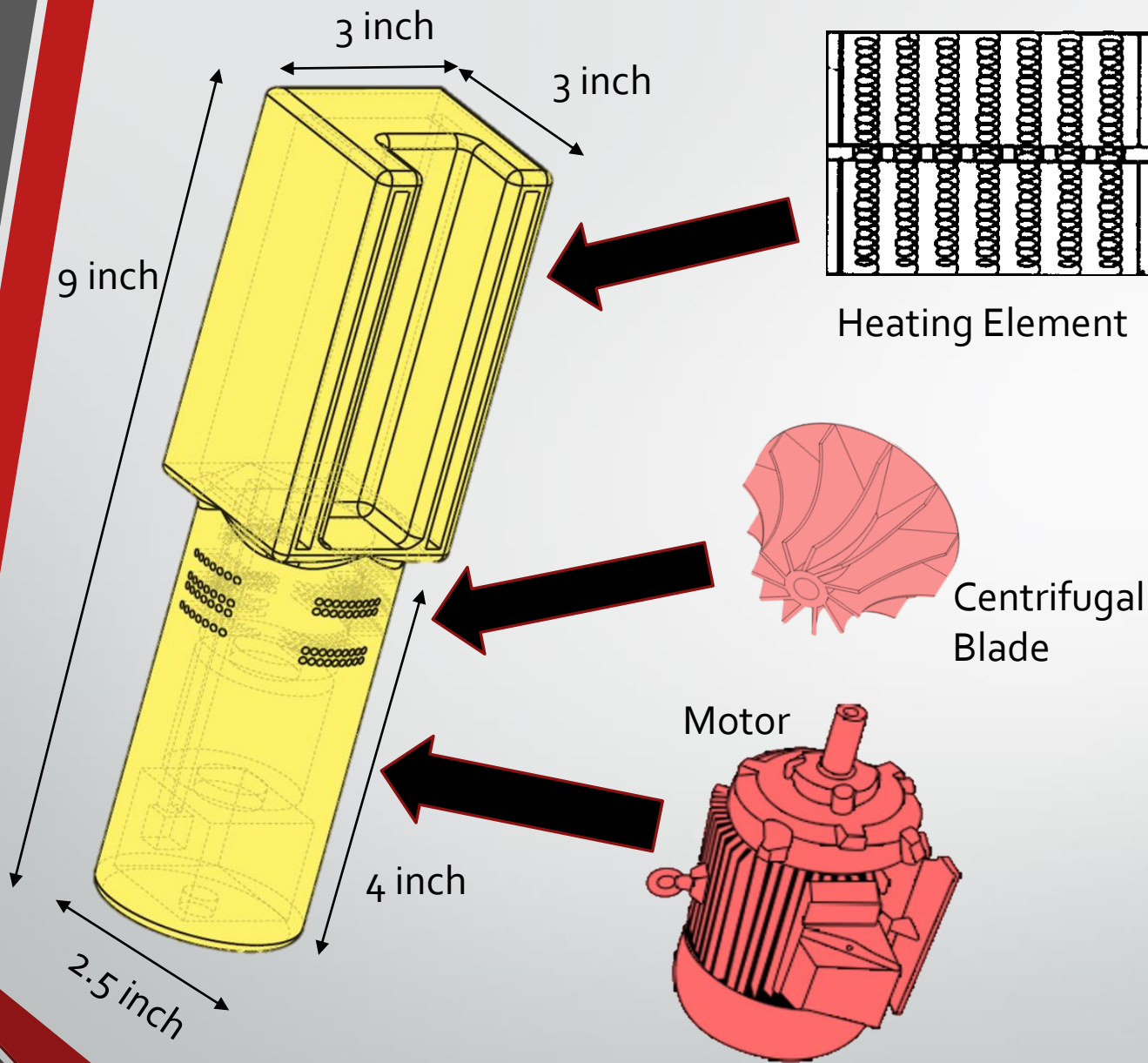


Figure 2: Schematic View of Design 1

- Bladeless fan design
- Centrifugal blade
- Flat heating element
- Plastic outer casing
- Two air way concentrator
- Sucks Air in through handle
- Motor in handle for vibration control & sound deadening
- Shoots sheet of air

Concept Design 2

- Straight through design
- Centrifugal blade
- Sucks air from bottom
- Controls on the side
- Radial heating element
- Condenser nozzle
- Motor in middle for vibration control & sound deadening
- Heat insulate cylinder for hand protection

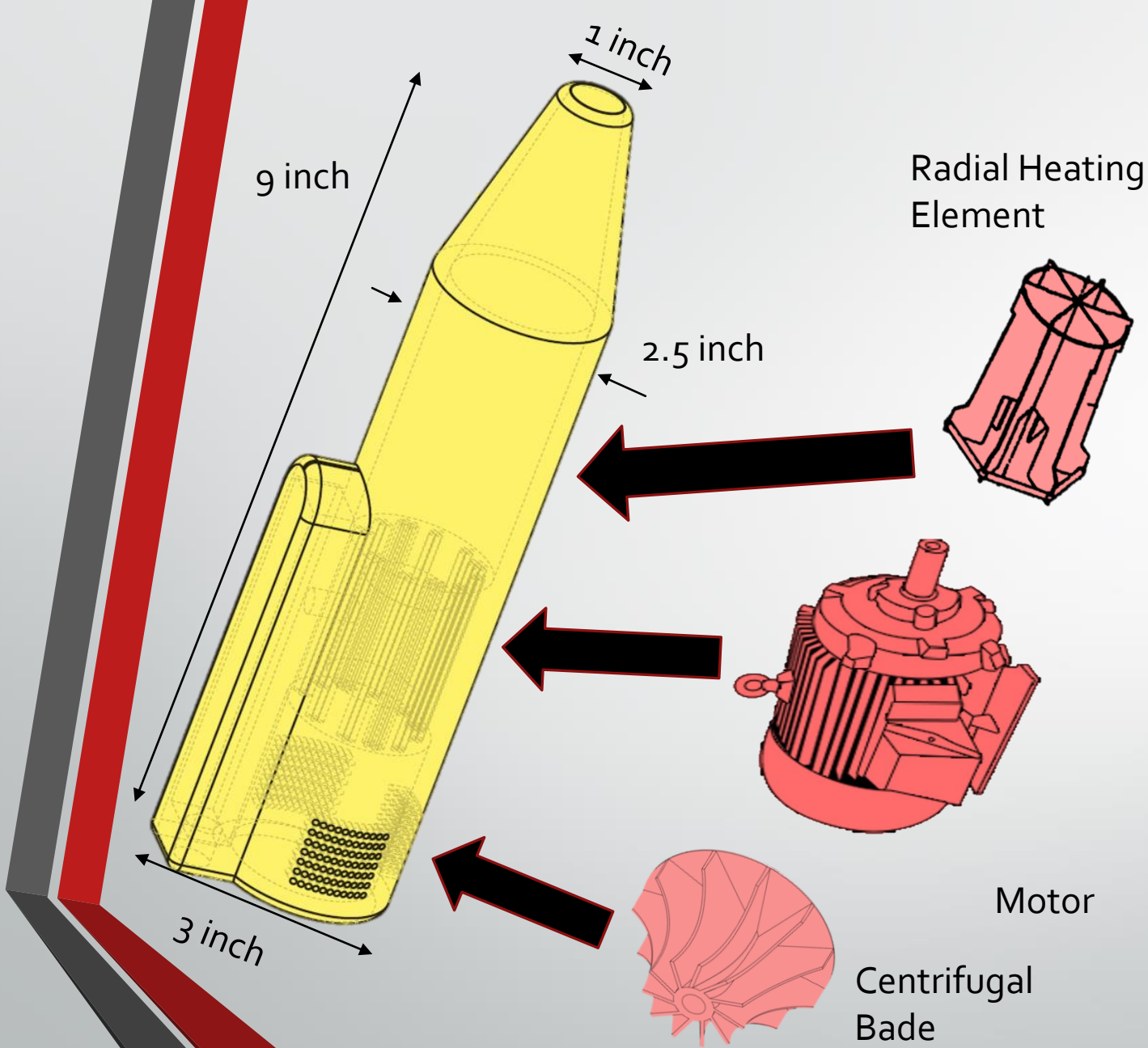


Figure 3: Schematic View of Design 2

Concept Design 3

- Air is sucked into top
- Utilizes radial blower wheel
- Motor in handle for vibration reduction & sound deadening
- radial heating element
- Compare to industrial floor dryer
- Shaft connects motor to air moving device

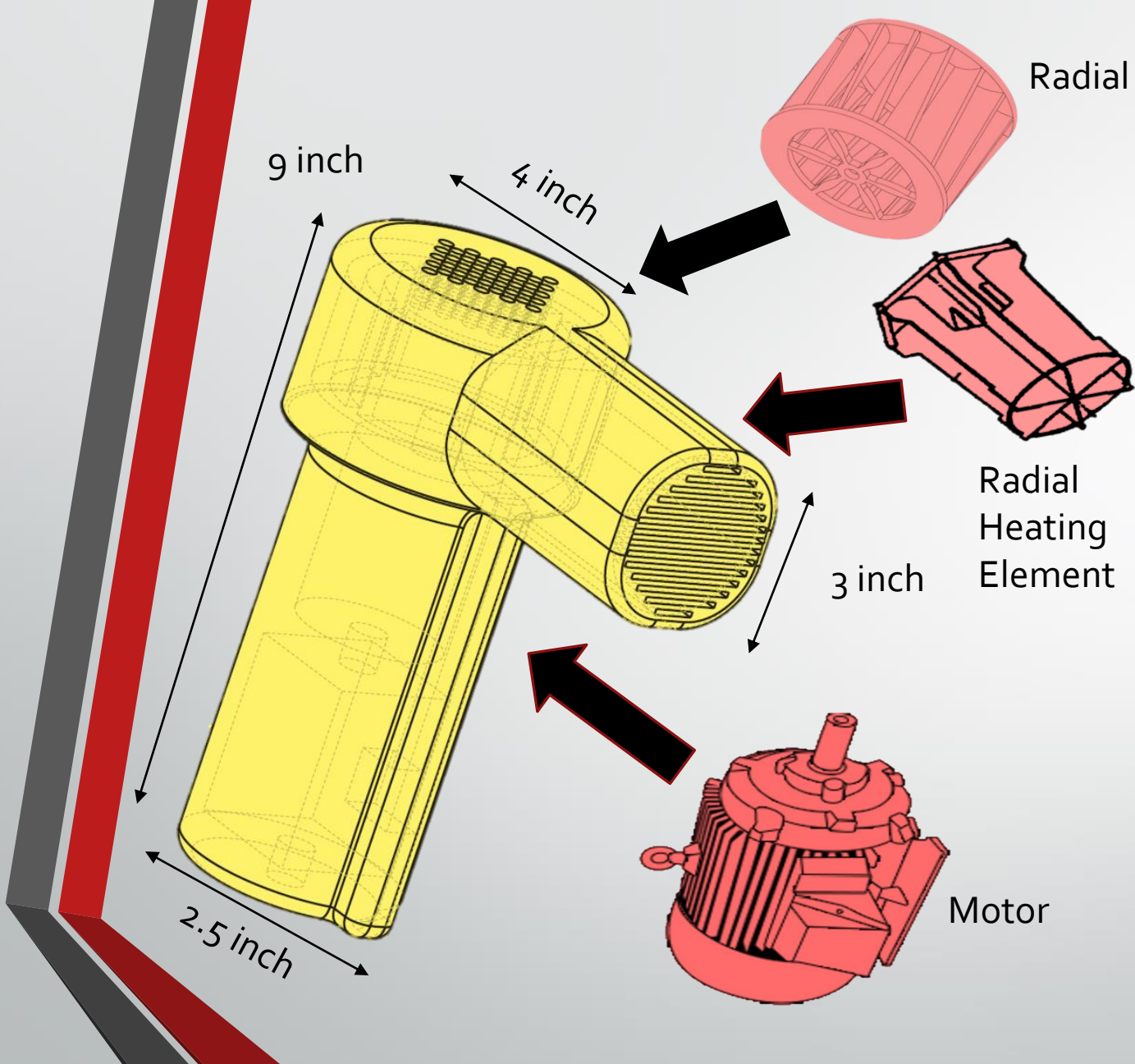


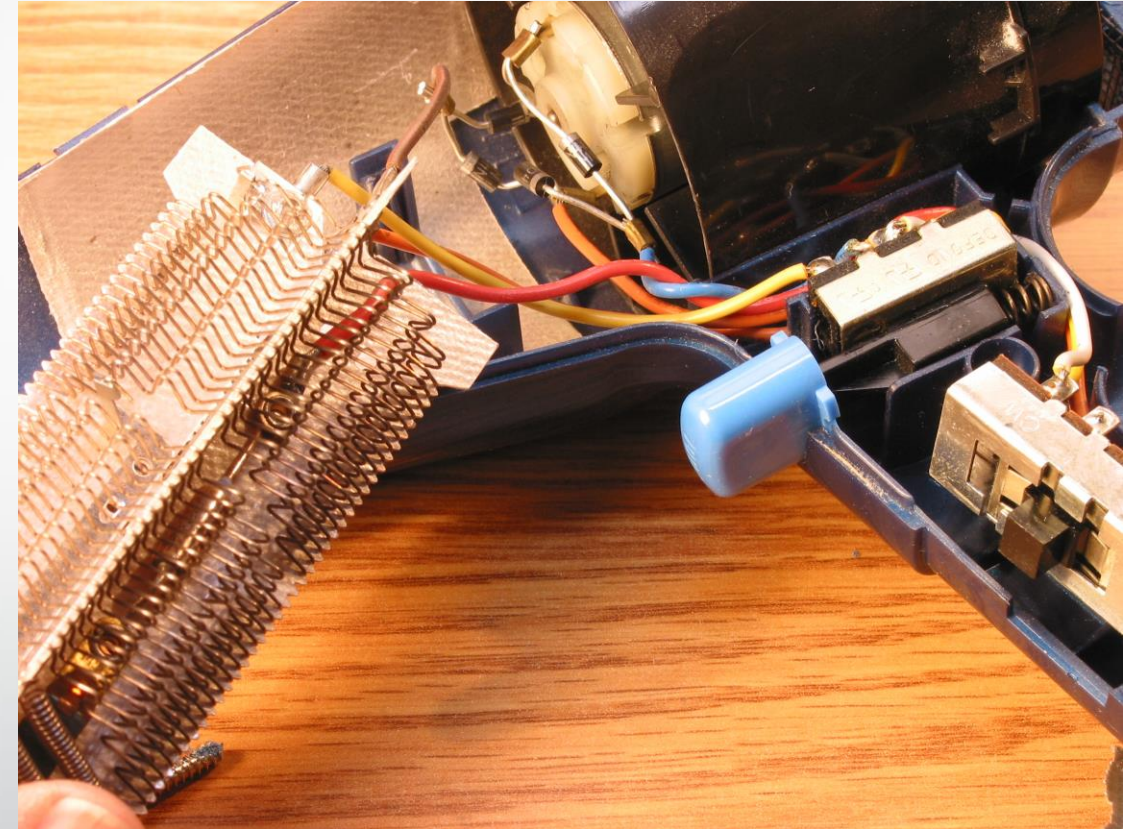
Figure 4: Schematic View of Design 3



Figure 5: Industrial floor dryer

Design Challenges

- Design for Manufacturability
- Design has Sufficient Safety Measures
 - Ground Fault
 - Bimetallic strip
- Ways of cooling AC & DC motor
- Sound insulate motor
 - Vibration control
 - Insulate motor



Gantt Chart

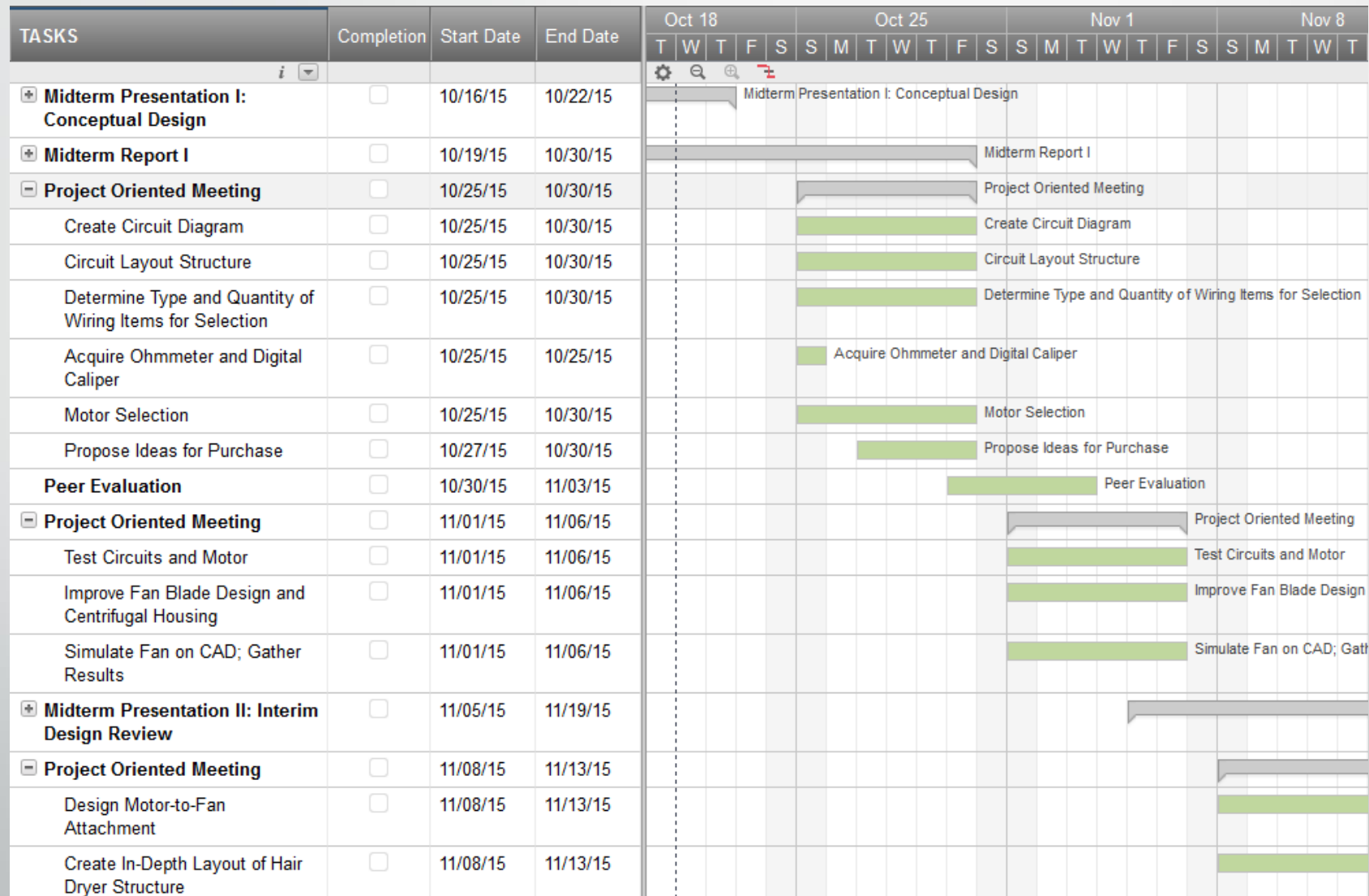
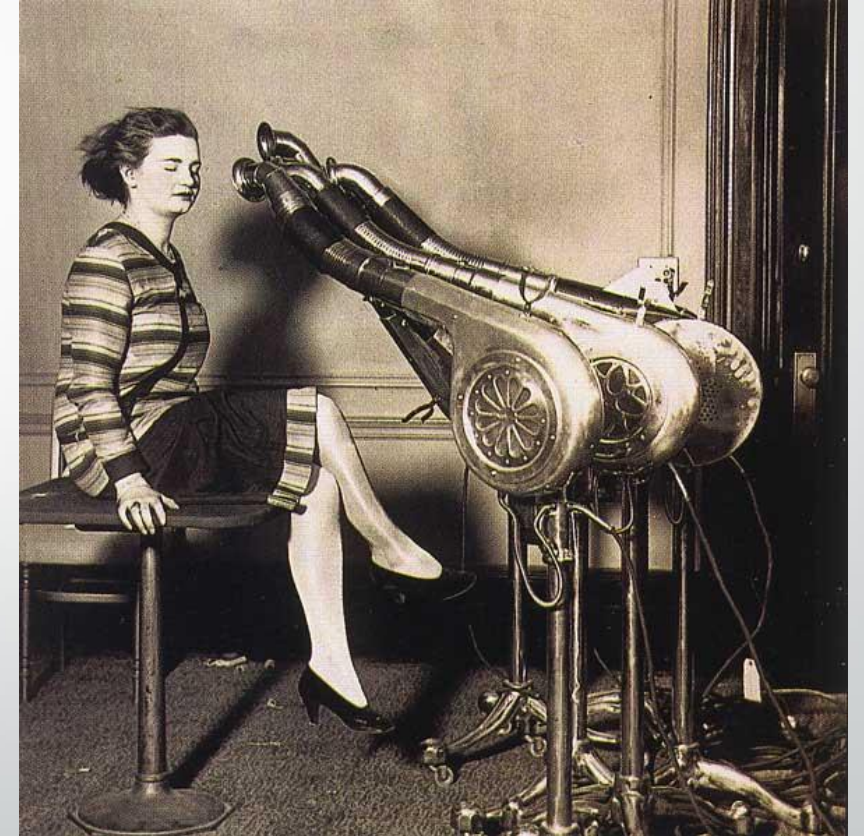


Figure 6: Gantt Chart

Upcoming Plans

- Commit to a Concept Design
- Create Schematic of Circuitry
- Layout and build circuit components
- Choose a Motor
- Propose Purchase Items
- Look into 3D printing (Blades & Body)



Resources Assignment

- Mark – Team Leader
- Peter – Treasurer and Web Design
- Shawn – Lead ME
- Kiet – CAD Design



Questions?

References

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