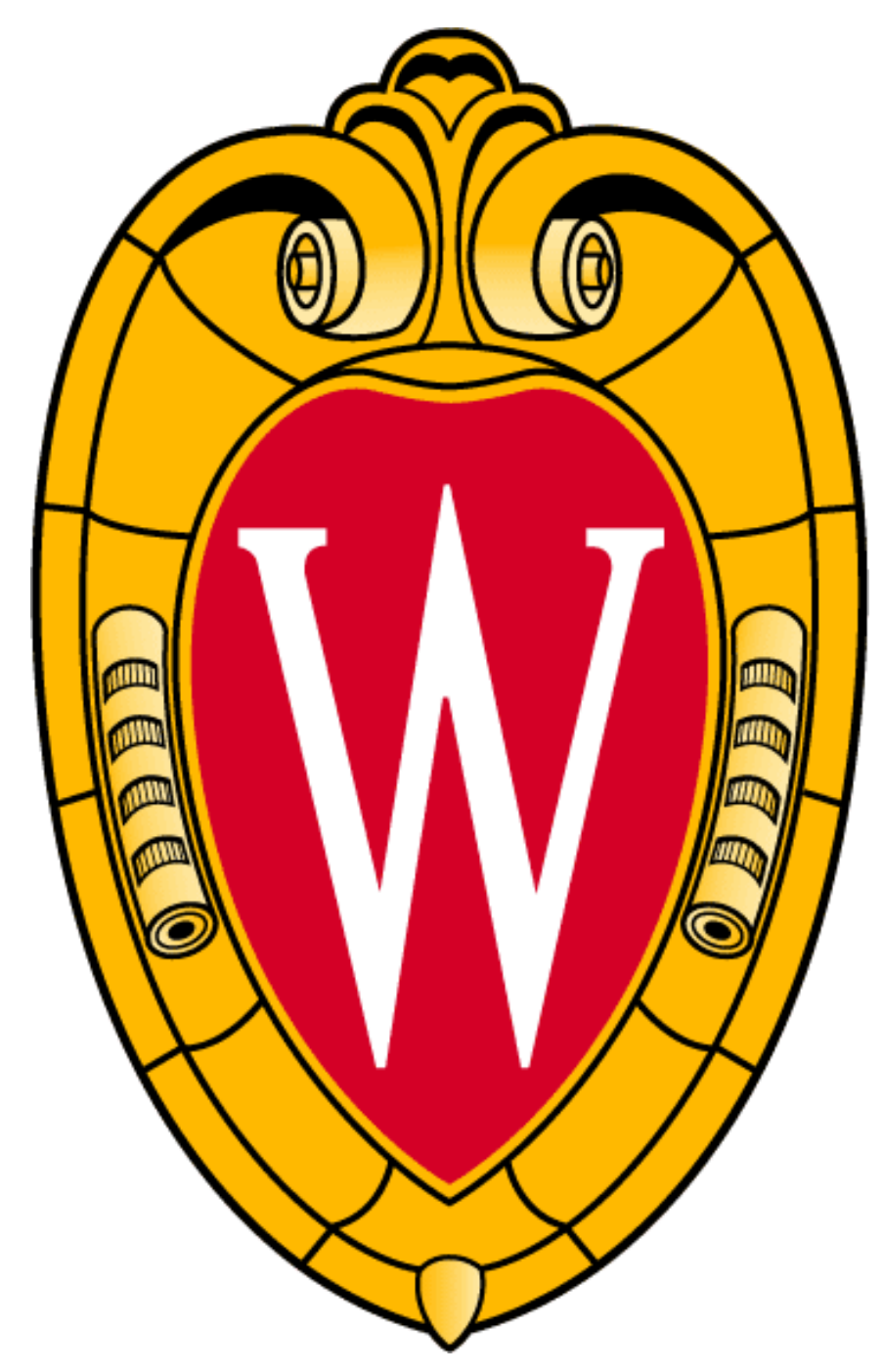




# Silicone Oil Applicator Device



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## Background

- Silicone oil aerosol spray is used by anesthesiologists and doctors
- Lubricant applied to inside and outside of tubes during surgeries
- Some lubricated devices:
  - Bronchoscopes,
  - Double lumen endotracheal tubes
  - airway exchange catheters
  - laryngeal mask airways



Figure 1 - Bronchoscopes are just one of many devices needing lubrication (www.images.dotmed.com).



Figure 2 – Rusch Silkospray used to lubricate devices (hillside-medical.co.uk).

## Problem Statement

- A different effective method of applying the silicone oil lubricant is sought
- Current method of application causes:
  - Slippery work environment
  - Risk for cryogenic burns
  - Release of particles into air that can be inhaled

## Design Requirements

Alternate method of applying the silicone oil must:

- Make use of current aerosol spray-Rusch Silkospray
- Not allow lubricant into external environment
- Prevent hazardous work conditions
- Lubricant tubes with 2.5 mm - 9 mm internal diameter
- Lubricate devices up to 13.7 mm outer diameter

## Final Design

### Final Design: Enclosed Box

- Completely retains spray in enclosed area
- Allows for lubrication of inside and outside of devices
  - 3 openings
    - 2 for coating outside of devices
    - 1 for coating inside of tubes
- Ridges “snap” box onto spray can
- Gaskets to prevent particles from escaping as outside of devices are coated
- Pull tab to close the opening used for coating the inside of devices
- Selection of material: Low-density polyethylene for the body (transparent); Latex-free Thermoplastic Elastomers (TPE) rubber for the gaskets.

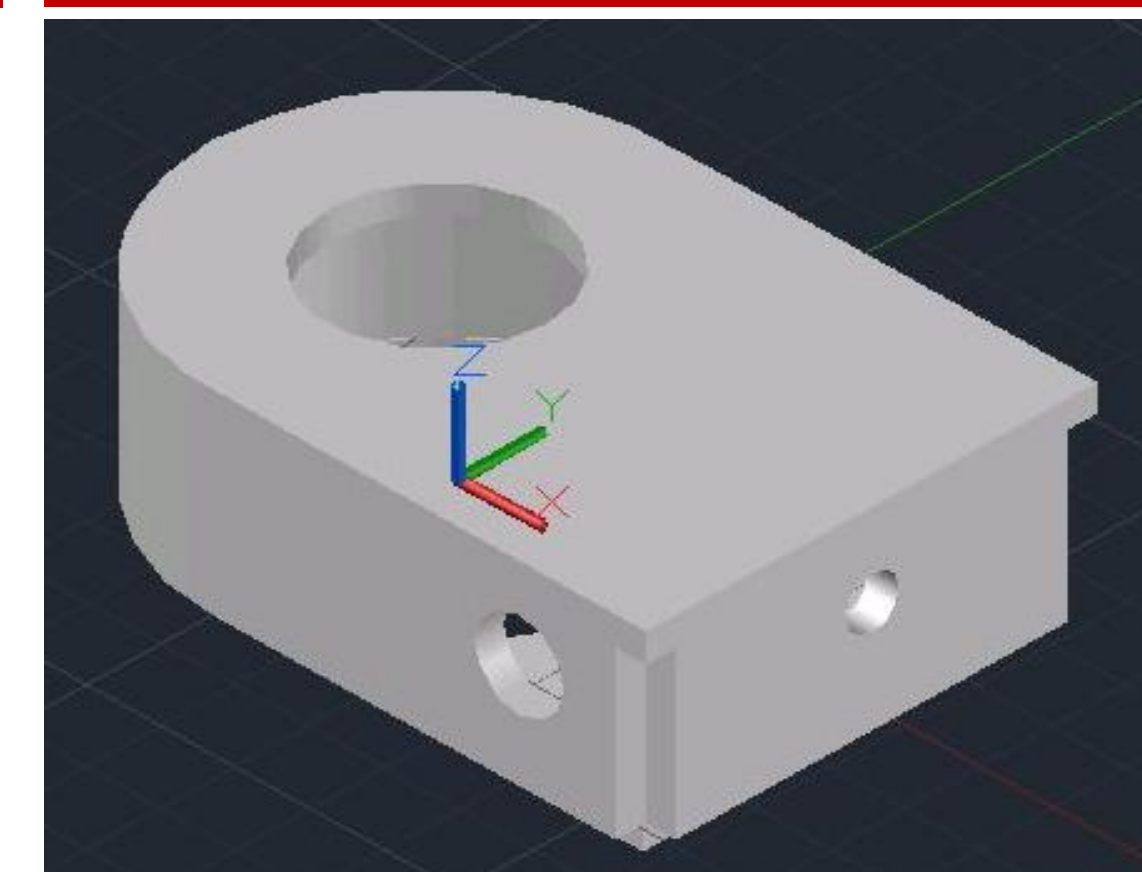


Figure 3 - AutoCAD drawing of 1<sup>st</sup> prototype.

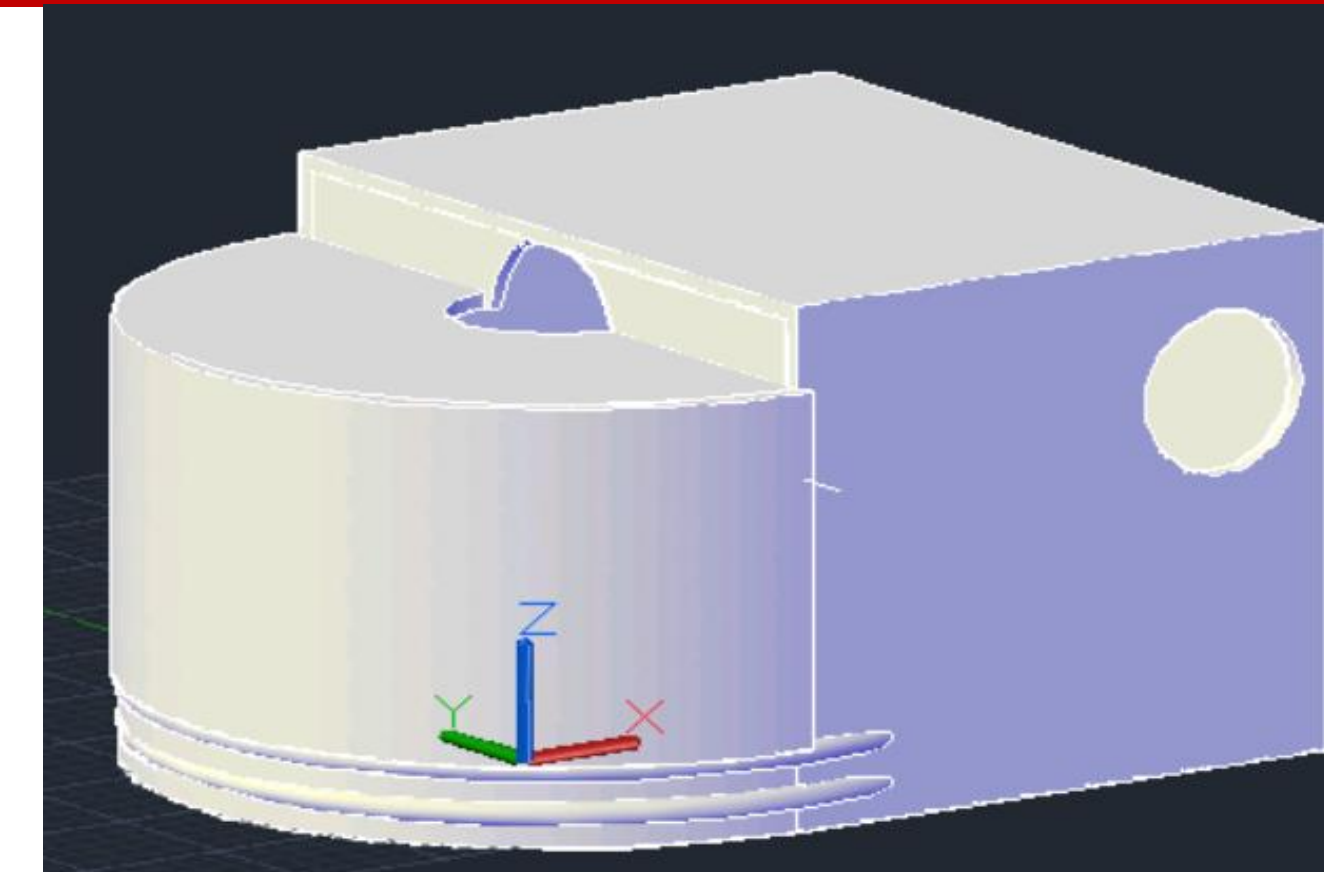


Figure 4 - AutoCAD drawing of 2<sup>nd</sup> prototype.

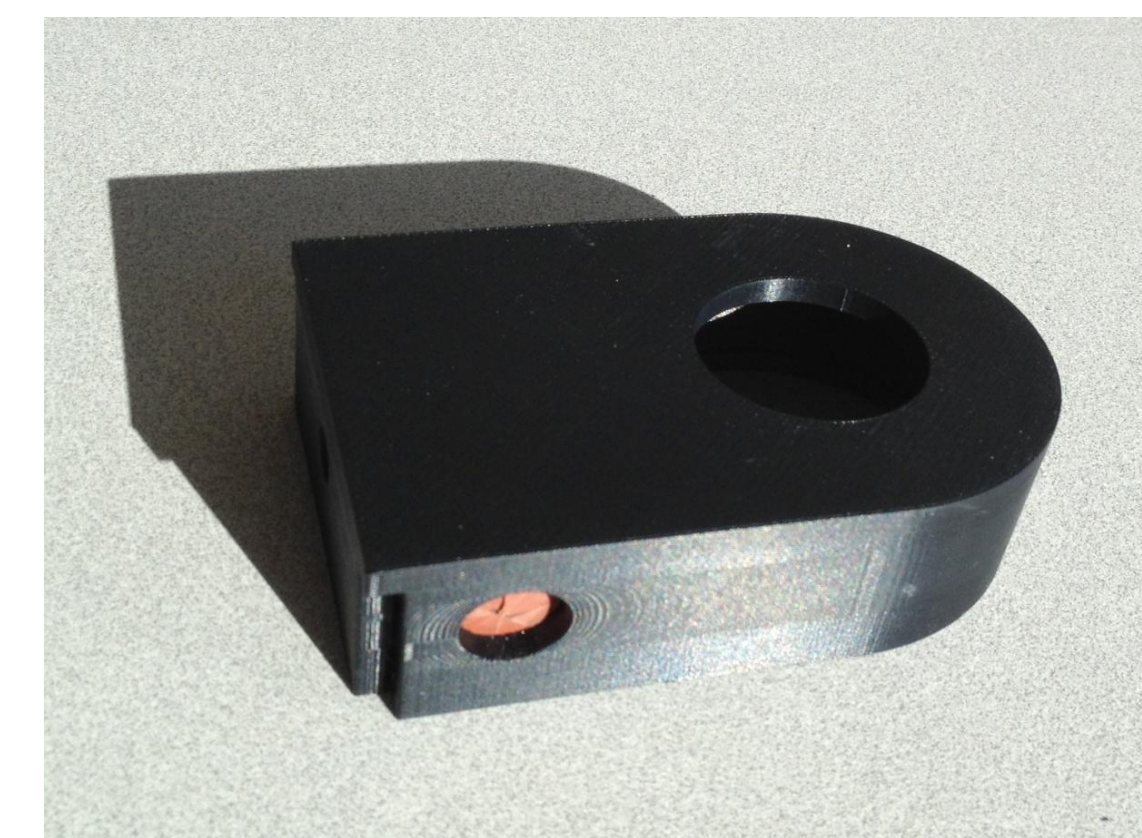


Figure 5 – First prototype made by ABS. The gaskets are made of gum rubber.



Figure 6 – Second prototype, made of ABS, placed on the silicone spray.

## Testing

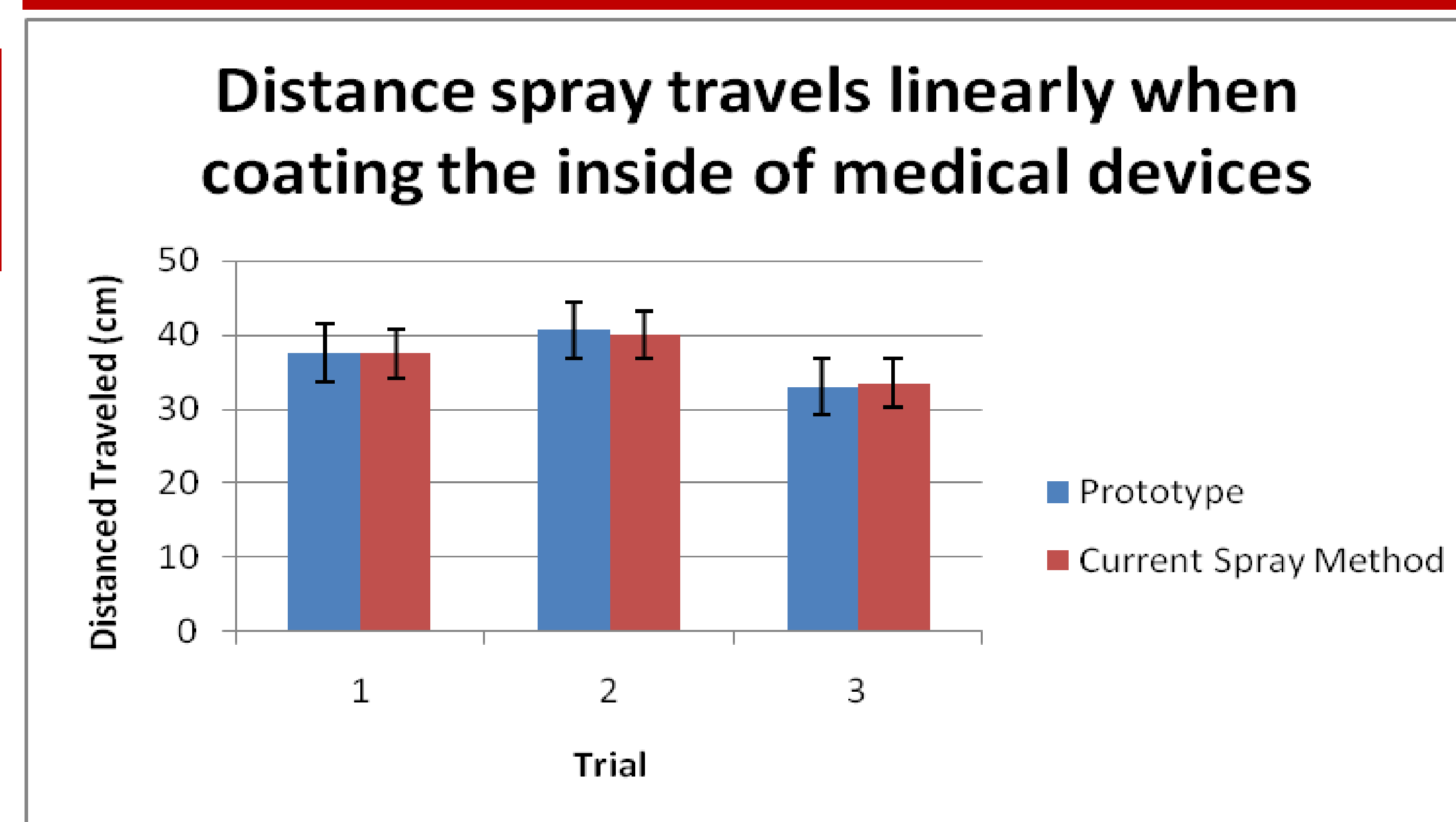


Figure 7 - The silicone oil was sprayed for 3 seconds and the distance that the spray traveled into a tube was measured. The spray needs to be able to travel 37 cm to coat the inside of the longest tube. **Our prototype was able to coat the inside of tubes as well as the current spray method.** Standard deviations are reported as error bars.

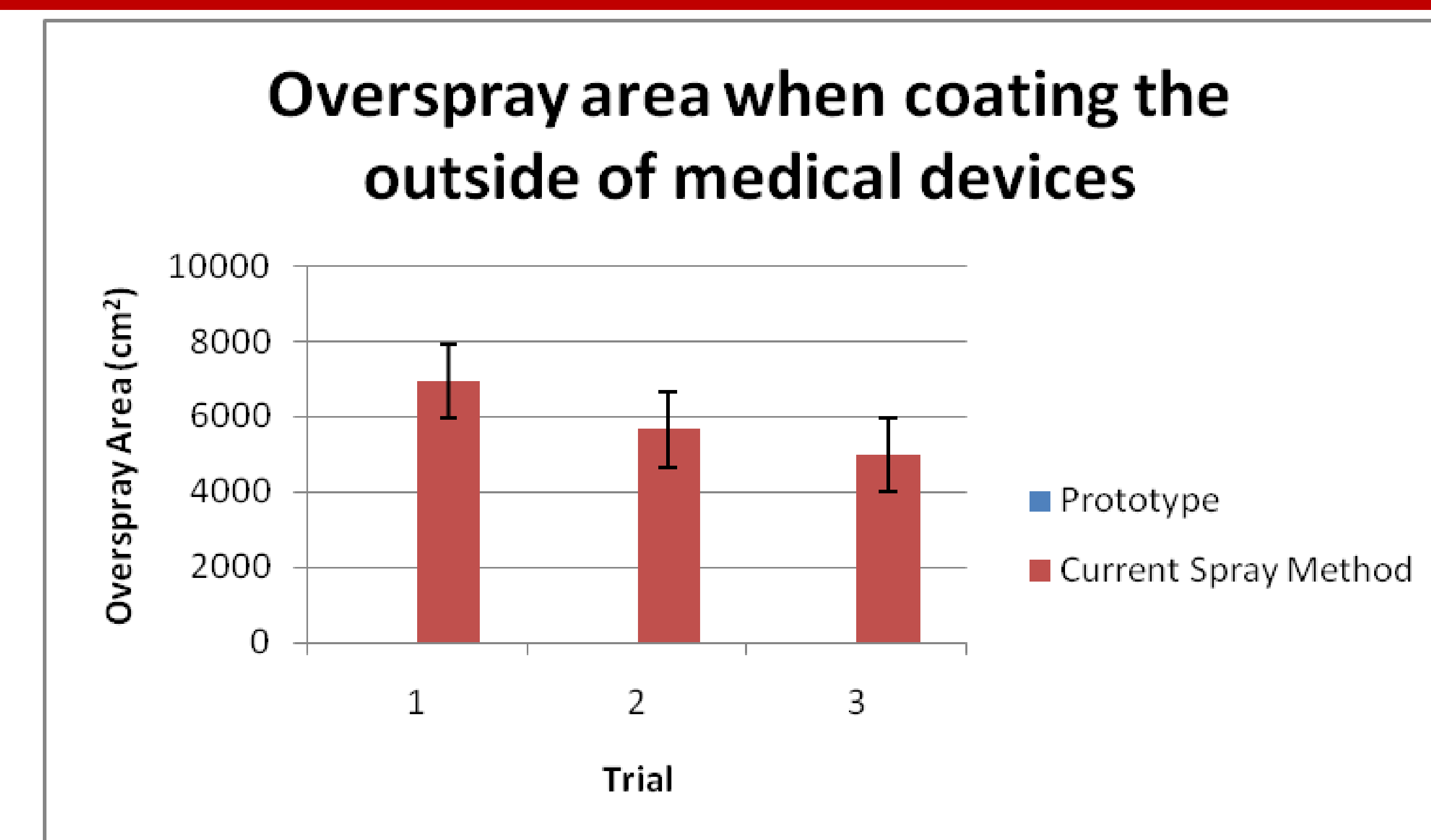


Figure 8 - The silicone oil was sprayed to coat the outside of devices and the area that the spray particles settled upon on the floor was measured. **Our prototype was able to coat the outside of devices with NO overspray area. The current spray method has an average overspray area of 0.59 square meters!** Standard deviations are reported as error bars.



Figure 9 – The silicone oil was sprayed onto a news paper held against the wall. The area of the spray was measured. The shape of spray area was idealized to be an ellipse.

## Future Work

- Manufacture the final product capable of being injection molded (2 parts that snap together)
- Determine FDA regulations for device
- Manufacture prototype with gaskets and pull tab over proper openings and test final product

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