



## What's our design about?

Is your heart on the verge of failure? Are you dissatisfied with the solutions your doctor has given you?

Don't worry, Heart2Go is your answer!

In ENGR 482, we were tasked to showcase our knowledge by creatively designing or modifying an artificial heart valve design.

The Heart2Go brings forth an innovative design which aims to modify existing heart valve designs and improve the longevity of the patient by reducing systolic backflow. The main factor it addresses is the time required for the valves to close during backflow. Since the faster the valves close, the lesser the volume of blood backflow, this design contains innovations which theoretically result in that.

Key features:

- Difference in height of orifice leaflets
- Leaflets slanted inwards at the top
- Leaflets slanted outwards at the bottom

## Different Sized Leaflets

One of our key features of our mechanical heart valve is that it consists of two leaflets, with varying heights, to reduce systolic backflow.

How?

The variation in the height allows the right leaflet to go over the left leaflet when closing which can be seen in Figure 1. As a result, blood won't be able to pass through the gap between the two leaflets called the center orifice.

## References

- <https://www.techbriefs.com/component/content/article/tb/techbriefs/mechanics-and-machinery/29923>
- [https://www.activebeat.com/your-health/leaky-heart-valve-symptoms-causes-and-treatments/?utm\\_medium=cpc&utm\\_source=bing&utm\\_campaign=AB\\_BNG\\_CA\\_DESK-SearchMarketing&utm\\_content=o\\_c\\_1319414725312566&scu\\_s\\_widget=kwd-82463620987291:loc-32&utm\\_term=mechanical%20heart%20valve&cus\\_teaser=&utm\\_acid=34003256&utm\\_caid=268030482&ver=desktop-refresh&msclkid=66f289caf02714cde96dd412172ad576](https://www.activebeat.com/your-health/leaky-heart-valve-symptoms-causes-and-treatments/?utm_medium=cpc&utm_source=bing&utm_campaign=AB_BNG_CA_DESK-SearchMarketing&utm_content=o_c_1319414725312566&scu_s_widget=kwd-82463620987291:loc-32&utm_term=mechanical%20heart%20valve&cus_teaser=&utm_acid=34003256&utm_caid=268030482&ver=desktop-refresh&msclkid=66f289caf02714cde96dd412172ad576)
- <https://fr.slideserve.com/sorley/new-trends-in-computational-solid-mechanics-powerpoint-ppt-presentation>
- <https://grabcad.com/library/on-x-heart-valve>
- [https://www.medicinenet.com/heart\\_how\\_the\\_heart\\_works/article.htm](https://www.medicinenet.com/heart_how_the_heart_works/article.htm)

## Leaflet Slanted Inwards

As shown in Figure 1, Heart2Go's orifice leaflets are slanted inwards at the opening of the valve.

This design feature allows the valve to close quicker than a straight-edged leaflet system when the left leaflet comes into contact with the right leaflet.

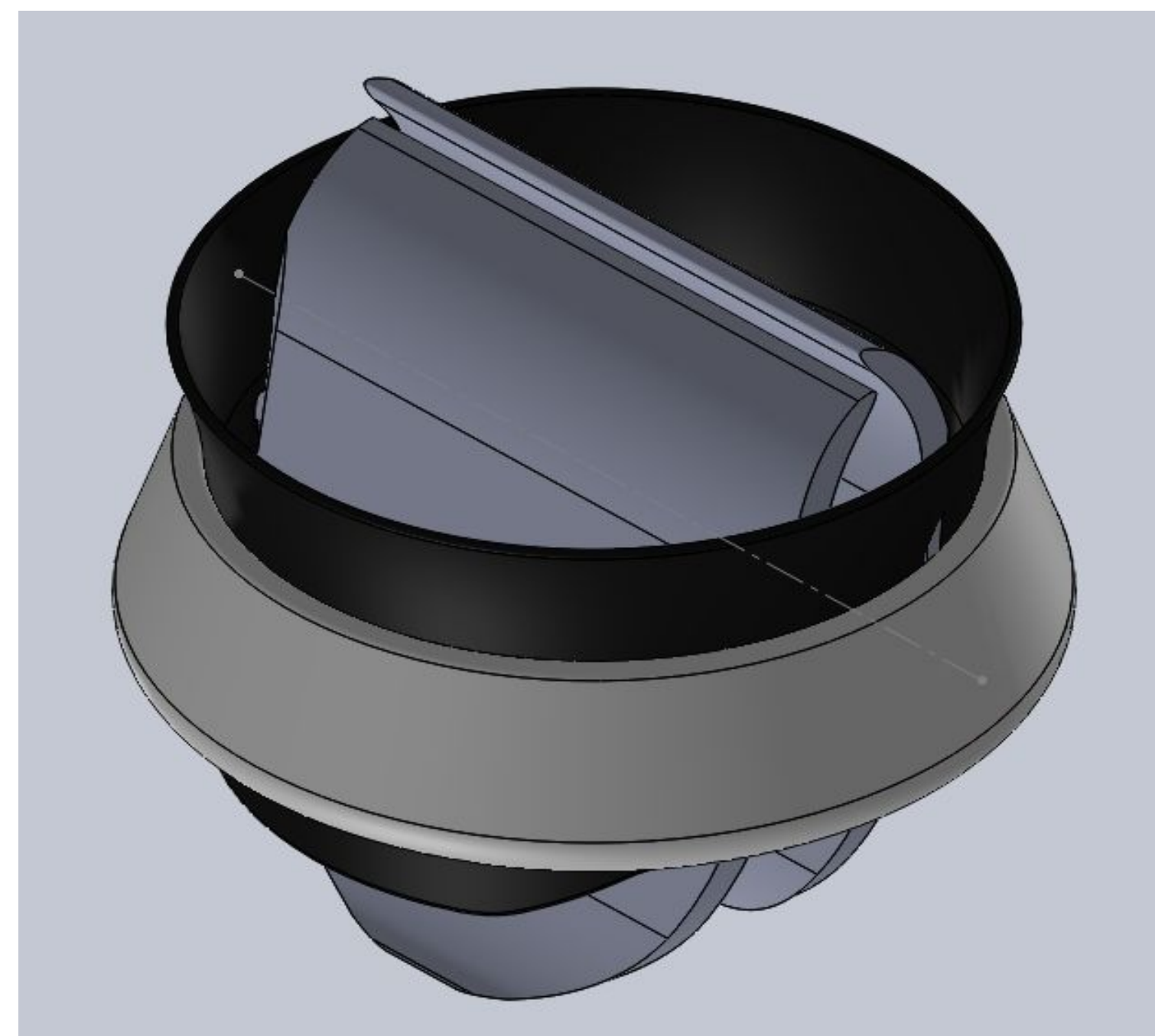


Figure 1: Heart2Go's Leaflets Slanted Inwards

## Leaflet Slanted Outwards

Just like how the top of the leaflets are slanted inwards, the bottom ends of the leaflets are slanted outwards. This makes them touch the inner surface of the housing chamber faster than in a normal valve which reduces closing time and, in turn, reduces backflow.

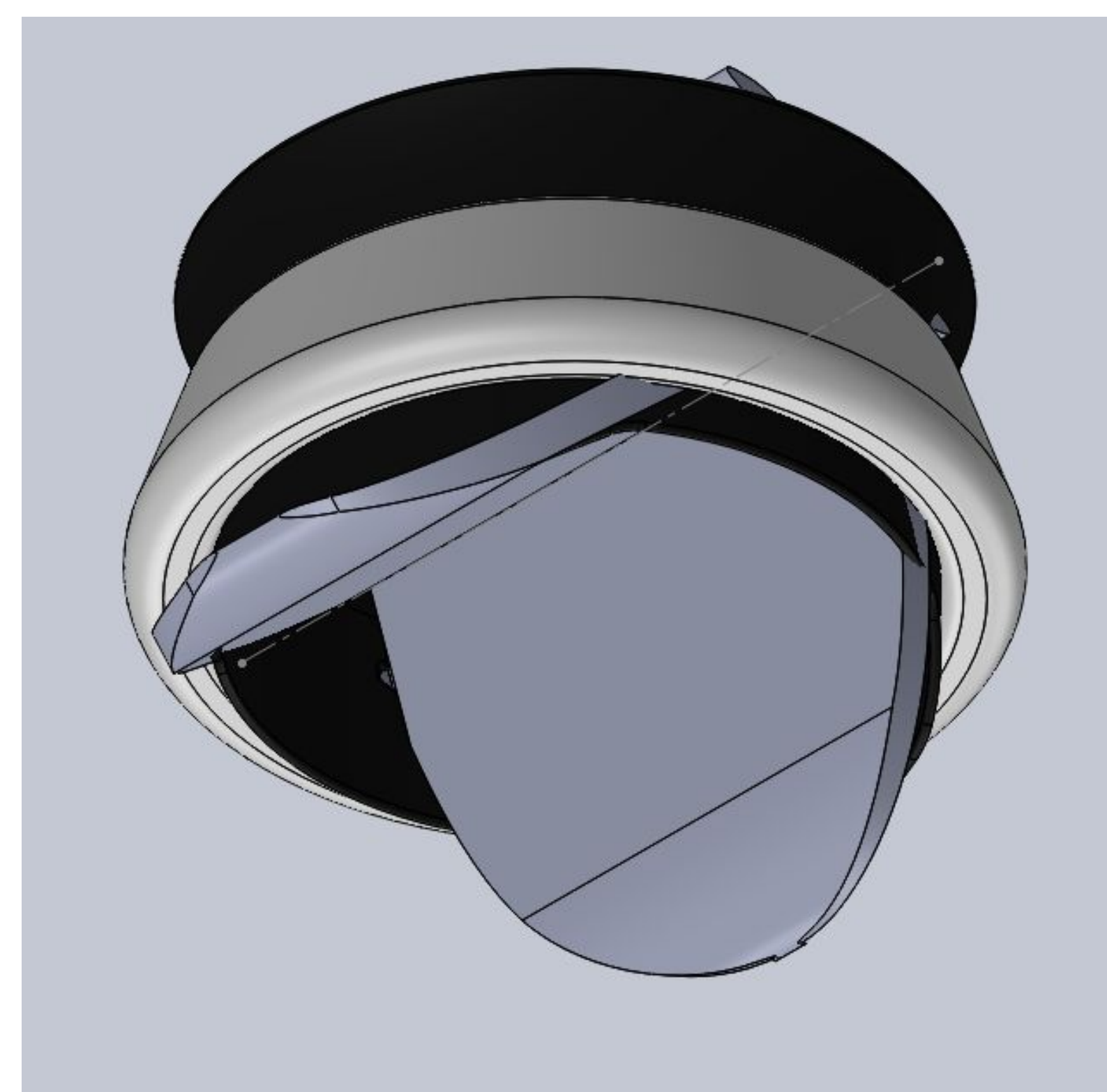


Figure 2: Heart2Go's Leaflets Slanted Outwards

## Components

This heart valve consists of only three components. There are no screws and the leaflets contain no sharp edges. The components consist of two leaflets and the housing chamber.

## Housing Chamber

The housing chamber is shown in Figure 3 on the right. The design of this valve was kept the same as the latest mechanical heart valves in the market. Its key characteristics are the fact that it's cylindrical in shape with the inlet diameter being a little wider than the outlet diameter.

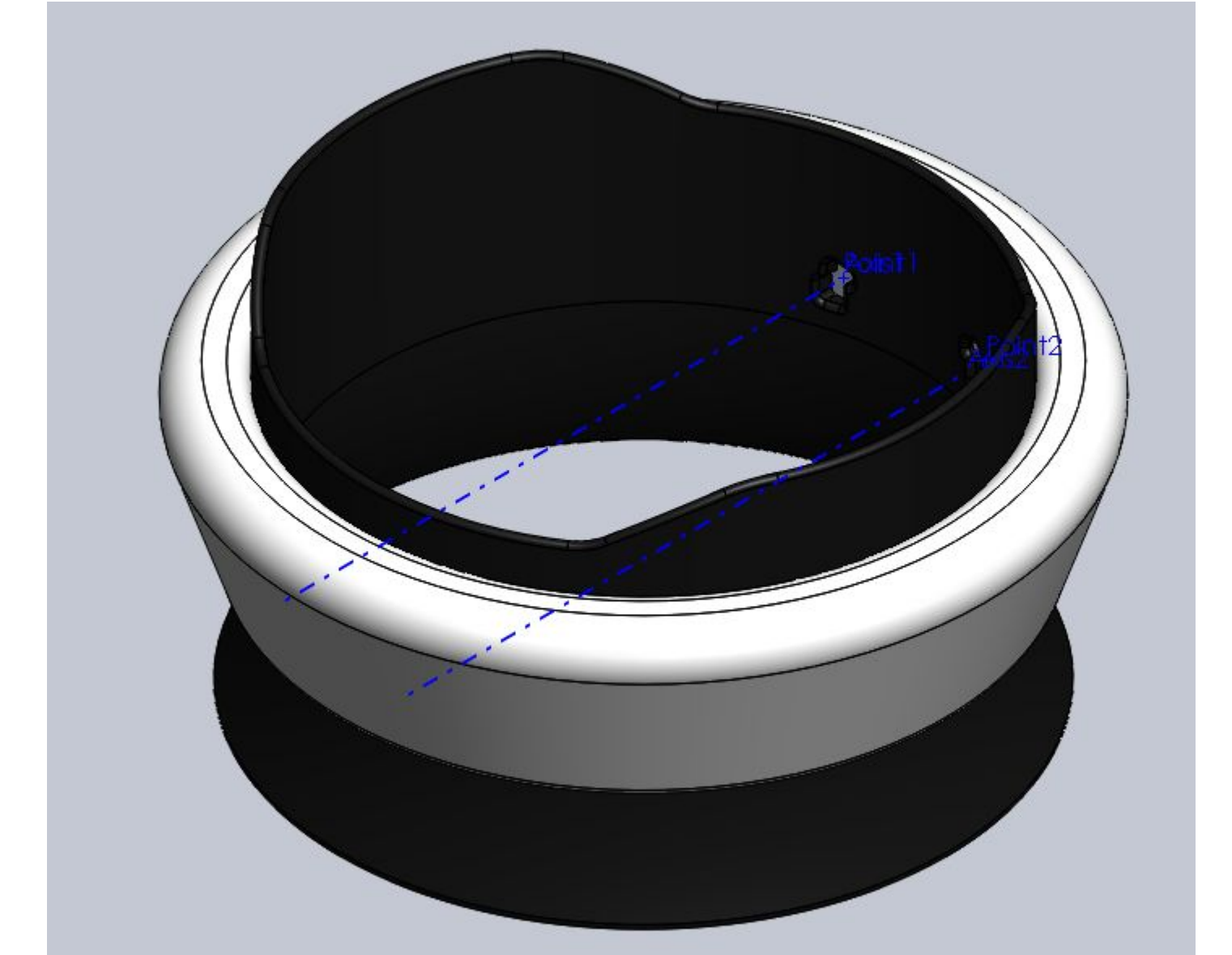


Figure 3: Housing Chamber for Heart Valve

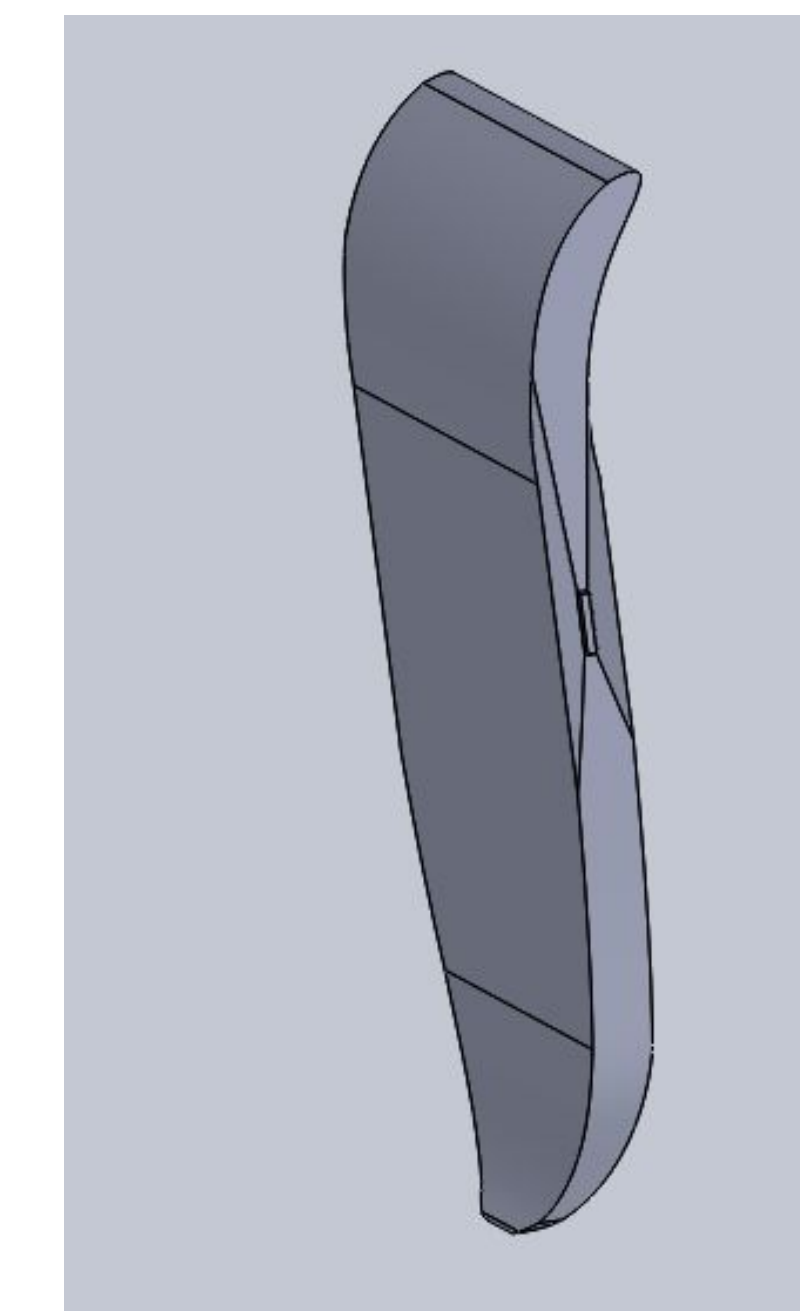


Figure 4: Left Leaflet for Valve

The leaflets have an S like shape. The curved edges on the leaflets provide a more laminar flow of the blood, thus reducing turbulence.

## Conclusion

Heart2Go offers patients with an out of the box design solution to combat the current problems associated with mechanical heart valves. Its key features include orifice leaves of varying heights and the "S-shape" curve to reduce excess backflow of blood. The curved edges on the leaflets also help achieve a low turbulence by creating smooth profiles for the blood to flow through.

## Acknowledgements

The following design would not have been possible without the support of Dr.Hadi and the research obtained from UBCO's Heart Valve Performance Laboratory (HPVL).