Engineering Details:

While deciding how to design the gyroscope, we considered what a lightweight top design would look like for our rotor. After doing some research into gyroscope designs, we found that a top made with two circles perpendicular to each other with the rotor connected to a shaft in the center was the most reliable design. Having gimbals that were too bulky appeared to be less common in the examples we saw. Keeping this in mind, we designed our top to have two circular gimbals with rounded cap screws on either edge to allow for a 360-degree range of motion for the gyroscope. The rotors themselves were designed so that the center was lightweight compared to the edges, as having more mass near the edges of a rotating object creates more angular momentum. The two rotor designs presented in this booklet provide examples of how this can be achieved in the design.

Given that the size of the entire gyroscope was constrained to be within a 3.5in x 3.5in cube, we determined that the maximum diameter of the outer gimbal would be 3 inches and that the rounded tips that extend off would be 0.14 inches. The inner gimbal had a diameter of 2.8 inches with small tabs extending to connect it to the outer gimbal. The shaft is attached to the inner gimbal via insertion into an attached set screw and the rotor is connected to shaft with force fit tolerances. This ensures that when the shaft is spun by the attached string, the rotor will spin freely in the inner gimbal creating an “orbiting” motion of the gyroscope about the screw caps. There was no design variation implemented when designing two rotors as we intended the gimbal design to be applicable to any rotor that is compatible with the shaft. The shaft is designed as a force fit for a basic hole diameter size of 0.125 in, so this is the only design requirement necessary for a custom rotor to be compatible with the design.