

Current Status

The S-CUBED ADACS was designed to use miter gears to transfer torque from the Polulu motor to the reaction wheel. The design of the shafts was not completed due to the lack of necessity. The gear train is completely done and designed. The gears are accurately placed in the CAD model to have 100% engagement (fully meshed). Since the teams were told to stop prototyping once COVID-19 came to the US, our team switched completely into documentation mode to make sure we left good notes for the next team.

Work to be completed

The shafts must be designed to have a close slip-fit with the gears so they can slip onto the shaft without difficulty or insufficient lateral slop. The gears must also have a set screw at least to get the gears from rotating under load. A press fit is not sufficient for torque transfer in this scenario. The current design has a bearing embedded in the plate; this is not the best way of putting in a bearing. The bearing should have a shoulder to sit on at the bottom of the plate. This will ensure the perpendicularity of the wheel axis to the plate. The easiest way to implement this design change is increase the thickness of the plate to 0.375" (from 0.250") to create a 0.125" lip (you must still have a hole in the plate for the torque transfer shaft from the gear train to the wheel). Then sit the bearing on that surface and it will maintain stability during operation.

Final Product

The final product of this effort is the ADACS test article for the CubeSat frame. This momentum wheel will be able to spin up to 1000's of RPM without instability based off the integrity of the design. This test was intended to provide testing data to prove the validity of the control model that was developed for S-CUBED.