Individual Work Summary

Transiting Exoplanet Survey Satellite

Abhinav Kamath

Requirements Review

- Poster Design
- Research & brainstorming on potential modifications
- Extensive research on communication systems: Approached experienced people in the field to gain insight
- Sought the approval of a Professor to make use of a DARPA-funded project in our modifications
- Initial research on the Piezoelectric ACS
- Introduced the final idea of optimizing downlink time

Preliminary Design Review

- Performed all the necessary geometric calculations with respect to the observation sectors to find the additional sky coverage that could be achieved
- Proposed the idea of the deployable antenna mast
- Research on prospective control systems (PID, LQG, Kalman Filters)
- Co-authored the PDR report

Critical Design Review

- Major analysis
- Assisted in the moment of inertia calculations for the spacecraft
- Illustrated what the spacecraft would look like after the modifications
- Simulated the spacecraft's orbital mechanics on NASA 42 (Opensource): Not included in the analysis for lack of relevance
- Formulated all the controllable & disturbance torques (due to the gimbal, gravity gradient, solar radiation pressure)
- Simulated the torques acting on the spacecraft (MATLAB) and determined the required behaviour of the piezoelectric ACS in terms of the counter-torque to be effected. All the code can be found here: `https://github.com/abhinavkamath/TESS`
- Found the upper-bound on the torque for the piezoelectric system to handle, which drove the design requirements of the piezoelectric system
- Apart from the initial sections of the report from the PDR - co-authored Section 4 (Major Analysis); authored Section 4.1.4 (Simulation results)

Systems Engineering

- Imbibed the principles of Systems Engineering in my approach
- Coordinated with other sub-system leads in making sure that all the sub-systems worked in conjunction, & in discerning the overall specifications of the upgraded spacecraft