

May 2020

Project: Illinois Space Society Hybrid Rocket Engine Project

Dear Student Sustainability Committee,

The Spring 2020 semester has been extremely successful despite challenges faced by complying with COVID-19 regulations. We made significant progress preparing to test our Hybrid Rocket Engine system for its June 2021 launch at the Intercollegiate Rocket Engineering Competition (IREC) in New Mexico.

Over the course of the semester the team continued development of our propellant feed system. The feed system delivers the oxidizer from the oxidizer tank to the combustion chamber (where the oxidizer combusts with a fuel). The combustion chamber consists of several valves that are used to control the flow and serve as redundant safety measures. SSC funding was used to procure components for the feed system and we completed the assembly of these elements. In addition, the main ball valve, which provides flow control for the main oxidizer, was designed, manufactured, and assembled. The project is now ready to begin the testing phase.

A comprehensive testing campaign of the entire engine must be completed before next year's launch. To accomplish this challenging goal, the team established an important partnership with Zucrow Laboratories of Purdue University, the largest academic propulsion laboratory in the world. Zucrow provided advice based on years of propulsion testing experience which improved both the performance and safety of our engine. Zucrow laboratories will also be hosting all of our future engine tests. On February 8th, the team visited the Laboratory, met with Zucrow team members, and planned two separate test dates, one in late March and one in April. Both tests were postponed and will be rescheduled as soon as COVID-19 guidelines allow.

Significant development work went into creating procedures, safety analyses, and Piping & Instrumentation Diagrams (P&ID's) for different types of tests in different conditions. This work has left us well prepared to hit the ground running when we are able to resume testing. Work in several other areas has also seen great progress. Utilizing the down time afforded by COVID-19, designs for manufacturing a flight oxidizer tank, thermal protection system, custom fuel grain, and the nozzle have seen improvements. Additionally, electronic and avionics systems have also seen significant progress this semester as we developed our ability to control flow devices, such as valves, and to collect pressure data.

Our team has had two separate abstracts accepted to submit manuscripts to be published as part of the AIAA Propulsion and Energy Conference. Documenting our work in a conference paper is one of many ways our team is standing out among other collegiate engineering project teams. In the spirit of free and open information, we have also created a public wiki page to document and share our work with others. This page can be found at the

following [address](#). The page is designed to be actively and regularly updated as a team resource, with substantial information published there already.

Most importantly, the team has nearly doubled the number of active members involved in the project and we have recruited an accomplished set of advisors from across the country. Thanks to the SSC and other individuals contributing to our project, we have the skills, knowledge, and funding to continue to develop our hybrid rocket engine and spread the use of environmentally friendly propulsion technology.

Thank you again for your continued support,

Andrew Larkey
Project Co-Lead
Illinois Space Society Hybrid Rocket Engine Project