Letter from the Chief Engineer:

Hello reader!

Welcome to our Spring 2019 SARP newsletter! You’re joining us at an exciting time, as we are in the middle of a busy manufacturing and testing phase, having completed internal and external CDRs (critical design reviews). Even with some delays due to that snow we had back in February, we’re still on track for our IREC (Intercollegiate Rocket Engineering Competition) goals. Many of our subteams are testing their components right now, including mechanical tensile testing, avionics range testing, plasma generation testing (yes, we did make plasma!), and pressure vessel proof testing. We will be conducting our first full-scale static fire test of the year very soon, which will be the first major verification of our rocket’s performance.

It is my hope that this newsletter will give you an exciting perspective of what our team is hard at work at this year. I know I’m excited for what’s to come the rest of the year and in the future, with new projects in development such as a parafoil rocket-recovery system and a composite-overwrapped pressure vessel (COPV) for our oxidizer tank.

We’ve certainly got our work cut out for us as we design, build, and test our way to the IREC Spaceport America Cup in June. I hope you enjoy following our rocket and team’s development during these last few months.

Thanks for reading!

Jess Grant
Chief Engineer

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Member Spotlight:
Jimmy Ragan — Propulsion Lead

This quarter, we’d like to highlight Jimmy Ragan, SARP’s propulsion lead and a current senior in the Aeronautics and Astronautics program here at UW. Jimmy has been in SARP since his freshman year, and he’s spent his undergraduate career working on all sorts of aeronautics engineering programs, including assisting with the development of a materials science platform for the International Space Station and developing a spectrograph for UW’s Astronomy program.

As the head of SARP’s propulsion subteam, he leads a group of over 50 other students in the development of the engine, fuels, and propulsion controls for this year’s rocket. Jimmy took the position this year because he wants to provide other undergraduate students with the experience of working in a team, the opportunity to gain hands-on engineering experience, and a chance to try out some interesting experimental projects.
Highlight: Propulsion Subteam

One of SARP’s teams is the propulsion team, responsible for providing our rocket with the thrust it needs to fly. The team develops, manufactures, and tests everything, from the physical motor structure to the fuel grains. This year, Propulsion is working on a hybrid motor, which uses solid paraffin wax as fuel and liquid nitrous oxide to ignite it. This motor will produce around 1200 pounds of thrust, enough to launch the rocket and its payload tens of thousands of feet into the air. The subteam itself is divided into twelve projects, with subteam lead Jimmy Ragan overseeing the integration and assembly.

Actuated Ball Valve Assembly—Used to control the amount nitrous oxide moving to the combustion chamber, in order to modulate thrust.

Bi-Propellant—An experimental engine that will be used for future competitions. The team plans to develop a liquid oxygen and ethanol rocket next year.

Combustion Chamber & Nozzle—The part of the rocket where everything ignites.

Fuels—Fuel is mixed into fuel grains, which can then be used in the propulsion process. This year, a paraffin wax fuel grain is being used, and the team continues to test fire various additives to determine optimum performance.

Ground Operations—Equipment that must be used on the ground, such as the umbilical fueling mechanism and refrigeration shed.

Ignition—Mechanism that ignites the hybrid fuel, creating the combustion reaction that provides thrust.

Injection—In order for the engine to work efficiently, the injection system atomizes the oxidizer so that it spreads evenly throughout the chamber.

Oxidizer Tank—Stores the oxidizer (nitrous oxide) at high pressures (~800 psi) inside the rocket that will be used in combustion.

Remote Fill—The system that allows the ground crew to fuel the rocket from a safe distance of over half a mile away.

Theoretical Modeling—Computing the performance of the propulsion system based on available data.

Thermal Protection Systems—Ensures that the rest of the rocket is protected from the heat of the combustion.

Static Testing—Responsible for setting up the thrust stand to hold the rocket down during static fires to measure the thrust.

The propulsion subteam has already completed the integration of all of these components, and conducted a cold flow firing test with all systems on April 5th. This was the first time the SARP team saw the entire rocket’s propulsion system at work.
Now that we are a quarter into 2019, everyone at SARP has been working hard constructing the physical components of the rocket and assembling them into the final product. As the teams finish machining and testing their individual components, the rocket itself is finally taking shape. Here are some of the highlights of the manufacturing process.

Photo Credit: Vanessa Khauv, Kim Luu, and Quentin Roberts

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Website: https://www.sarpuuw.com/
Facebook: https://www.facebook.com/uwsarp/
Instagram: https://www.instagram.com/uwsarp/
Preparing the propulsion system for a mock static fire test

A carbon fiber layup of the rocket’s main body tube

SARP Bowling Night

The actuated valve bay

The SARP team at an All-Hands meeting

Photo Credit: Silas Chu
Thank you to everyone who helped us out this year! If you are interested in sponsoring or donating to our team, please contact us at sarpuw@gmail.com.