



WESTERN ENGINEERING SATELLITE TEAM

Monthly Report

October 2020

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SUMMARY

The Western Engineering Satellite Team seeks to become one of the most technically-complex, undergraduate design teams at any university with the goal to design, fabricate, test, and operate a small satellite over a two-to-three year period. This will culminate in the spectacular launch of a 3U CubeSat that will prove that Low Earth Orbit (LEO) is readily accessible to undergraduate students and will continue to maintain Western University at the forefront of the aerospace industry.

The team's executive diligently prepared over the summer break to officially open this brand-new team to students in semester one of the 2020/2021 academic year. While the operations side is aiming to provide financial, marketing, administrative, and regulatory support, the design team seeks to build the vast majority of satellite components in-house. This will ensure members of the team achieve a high degree of education on satellite design and construction which adheres to both of the strong principles motivating this project: academic excellence and collaborative innovation.

COVID-19 restrictions are something that has and continues to present significant challenges to not only students' educations, but also to their extracurricular activities. This was no exception for us, as we repeatedly hit roadblocks affecting our plans. Forming a design team that can only meet virtually, with students who struggle to find free time as-is, during the height of a global pandemic, is no easy challenge - but neither is building a satellite. We pride ourselves on attempting difficult tasks - *going the extra mile* - because we intrinsically desire to push the boundaries on what we are capable of doing as students.

The following document outlines the first month of progress of *The Western Engineering Satellite Team* and details our plans for accomplishing this difficult task.

"Curiosity is the essence of our existence."

- Gene Cernan

OPERATIONS

External Affairs

Community Outreach:

The community outreach team has developed some preliminary goals and begun assessing public interest of potential outreach initiatives. Initial goals of the group are:

1. Conduct all outreach initiatives in a virtual or socially distanced setting to ensure all COVID-19 rules and regulations are followed while prioritizing everyone's safety.
2. Especially focus on reaching out to communities who are significantly affected by COVID-19 by providing an interesting, informative distraction from the monotony of quarantine.

In accordance with the second goal, the group has reached out to local retirement homes to gauge interest in presentations on space and satellites. This outreach has been received well with many homes saying it will appeal to their more intellectual guests.

Moving forward, we hope to reach out to local high school science teachers who taught current club members in the past. With a more technical focus on specific design challenges relating to their curriculum, these presentations should be well received by the teachers.

Licensing:

Although we are currently in the beginning stages of the design phase, we would like to acquire basic amateur radio operating licences before the end of the next semester (April 2021) specifically for members that will be closely involved with the ground station and communications. It is our sincere hope that we are able to provide all members of the project with an opportunity to obtain an amateur radio license in the future (perhaps through an agreement with the university), however this is not a requirement for the project to proceed.

Internal Affairs

Transitioning to online education was a difficult adjustment for everyone. Starting a club during the times of COVID-19 is not ideal, but students need a sense of community now more than ever. The marketing team created a lot of excitement about the club online about recruiting sessions in November - which went off without a hitch. The Western Engineering Satellite Team was able to recruit a total of 60 students from the Undergraduate Engineering student body. Since joining the club, students have been encouraged to join different design and operations sub-teams to see what peaks their interest. Moving forward, the internal team will be reaching out with each of the members to see what design sub teams they want to commit to and in which ways our club can improve.

Marketing

The Marketing team has been hard at work providing outreach to Western's student body. Using platforms such as Instagram, Facebook, Twitter, and LinkedIn the team has made sure that people know what is WEST. This month in Marketing we have been working on finding tasks for our respective team members. This includes developing a team for website editing, creating a team to design merchandise, and a team to run the social media accounts. Team members have brainstormed different ideas and then brought those ideas to their respective subteams as listed above.

Finance

In October, the finance team took significant steps to secure funding for the first year of club operations. We expanded our preliminary budget created in September and completed an application to obtain funding from Western Engineering. This application included supplementary applications to highlight our mission and goals as a new club. We are currently collecting team fees and beginning to build up funding for early club expenses. This month, the finance team will be focusing on creating industry contacts and finding potential sponsors to support our club.

DESIGN

Attitude Determination and Control System (ADCS)

During October, the ADCS team organized a Fall Research Plan to delegate specific areas of study to individual team members. We are currently tackling areas such as sensor selection, actuator selection, external torques and satellite dynamics. This plan is allowing the team to efficiently learn through individual research and the sharing of knowledge during meetings. We will use this research as we make design decisions. Our subsection is also working on preliminary Matlab simulations as we research.

Communications

This month the Communications team focused on component research and simulations. We are comparing our link budget to the capabilities of readily available transceiver chips in order to make the best choice. Currently we are exploring different MATLAB toolboxes in order to simulate every aspect of the communications system, from antenna performance to atmospheric loss.

Structures

This month in structures, we created our first design and 3D print of a cubesat model. This model will be used for the demo cubesat. Additionally, we amalgamated specifications for our cubesat into one document to aid with the future redesign of our current preliminary model. After completing the specifications document, our subsection started collecting designs of previous cubesats that we like and will be discussing pros and cons of each design in a future meeting.

Electrical Power System (EPS)

This month the EPS team became more comfortable with the components used in the electrical power system. This was done using various pre-existing literature, such as research papers, Youtube tutorials, and notes written by the EPS Lead. A preliminary power budget is being developed to start analyzing and comparing different components. This will help move the component selection process forward and allow other subteams to make progress in their respective fields.

Command and Data Handling (CD&H)

This month for Command and Data Handling, we focused a lot of our efforts on component selection. We looked at papers that other CubeSat projects have published and analysed their criteria. Soon we should be able to start designing a board in order to test our secondary processor. As well we are familiarizing ourselves with Core Flight Systems (cFS) software in order to start developing for the primary processor.

Payload

The payload subsection made progress this month in selection of our camera and what specifications are required for the camera. We also shared papers concerning interesting payloads from past cubesats with each other to spark creativity and ideas for the secondary payload. We plan to meet with other teams to determine the amount of space in the cubesat for our primary and secondary payload.

Analysis

This month the analysis team focused on researching background information needed to understand the potential orbit of our cubesat. We are also currently researching cubesat orbit simulation methods and tutorials in Matlab. We have started compiling a list of potential risks that we may encounter throughout the planning, constructing, and operating of our cubesat.

FUTURE PROJECTIONS

While formal education will continue to remain a priority for all students, both design and operations teams are expected to rapidly increase development speeds in the coming weeks. By the end of November, many key candidate components in design sub-teams will be narrowed down to a small shortlist. At the same time, the team will be reaching out to the community to promote aerospace and share our knowledge and passion with like-minded individuals. To ensure a strong foothold in the Western community, we will increase our social media presence and take advantage of the purely-virtual environment to establish ourselves as a successful team.

Many funding decisions are to be made in the coming weeks which will allow our design teams to begin rapid prototyping of their respective sub-systems. A long term goal is to have an early iteration of the satellite completed by the end of the academic year (May 2021). This is only possible if we prepare our bill of materials and manufacturing requirements before the end of this calendar year (December 2020). While the exam period in the beginning of December will inevitably lag development, the remainder of December will allow for comprehensive reviews to take place and final selections to be made.

The future for *The Western Engineering Satellite Team* is very promising and we look forward to expanding our industry support by increasing sponsorship and subject-matter experts that we can collaborate with. While the roadblocks may seem mountainous and the finish-line many tireless weeks away, we have an army of motivated students dedicated to pursuing this ambitious project.

Ad Astra.