The last four years at Carthage have been a major growth period for me. I went into my undergraduate career not quite sure what I wanted to do with my life, I just knew that I loved physics. Academically, I never really stood out in my class at the beginning of my time at Carthage. I did not have the drive I needed, it felt like I went to college because I was expected to go. As I tried to search for a way to get involved with research on campus during my first semester, none of my points of contacts were able to help. Not knowing the faculty at Carthage or what to do next, I almost gave up on Carthage and college in general. During the next semester as I was looking into other schools, I spoke with the professor for my astronomy course, Dr. Julie Dalhstrom. She led me to speak with the correct people about the research I was interested in and within a week I was part of the Microgravity Team on campus. Through this team I have been able to conduct research since my second semester of my freshman year and have found a love for Aerospace Engineering. As I am getting ready for graduation and applying to graduate schools to pursue my PhD in Aerospace Engineering, there are certain experiences at Carthage that have helped shape my career to what it is today.

The first project I joined was an iteration of the Modal Propellant Gauging (MPG) technology that has been the main focus of the team on campus since 2011. This payload was being prepared for flight on Blue Origin's New Shepard Vehicle in less than a year from the time I joined. Knowing this, I was extremely excited yet intimidated because I was amazed by the work the current students have done, but I joined this team with little to no experience. The professor leading the projects, Dr. Kevin Crosby, assured me that the point of this team is for students to learn and gain valuable skills that will help them succeed in the future. With this in mind, I experimented with each subsystem to find the one I preferred. After a few months, I became a mechanical engineer for the experiment and was started with small 3D modeling and Computational Fluid Dynamics (CFD) simulations tasks.

As the semester came to an end, I was awarded an Undergraduate Research Fellowship through the Wisconsin Space Grant Consortium (WSGC) to continue work on this project through the summer. Throughout the 10 weeks fellowship, I gained more of an understanding of the physics behind the project as well as the mechanical design. I worked with the lead mechanical engineer student in creating CFD simulations to be presented to engineers at NASA Johnson to show what we predict to happen during the New Shepard launches. As a result of this, I learned how to create and analyze CFD simulations in softwares such as SimFlow and Paraview. Seeing as there were design changes to the payload during this fellowship, I was given the task of updating the 3D CAD model to accommodate these changes. This allowed me to have my first look at the basics of 3D modeling in SolidWorks. At the end of the summer, my team and I presented the research at the Annual Wisconsin Space Conference and submitted a Proceedings paper that was published on the WSGC website.

At the end of this fellowship, I felt more confident in my mechanical abilities, but I was not yet given the opportunity to take much more responsibility. Throughout the next semester, I continued to work on the experiment in preparation for the December 2018 launch. In the weeks leading up to this, the whole team spent late nights in our lab working to get the experiment flight ready. For me, this was an extremely important part of my career. This was when I started to realize that these late nights did not feel like work, it was something I genuinely enjoyed.Myself and a few other team members were able to travel down to Blue Origin's West

Texas launch site to see the launch of New Shepard carrying our experiment. I believe that this was truly the beginning of finding a passion for Aerospace Engineering.

During the summer of 2019, I was awarded my second Undergraduate Research Fellowship to continue working on this experiment for its second Blue Origin launch in December of 2019. Over the past semester, I have worked my way to earning the title of Mission Team Lead. Most, if not all, responsibilities began to fall on me over this summer. This summer was when I was fully confident that Aerospace Engineering was the perfect career path for me and that I have a niche for research. At this point, I was in charge of the data acquisition (DAQ) system for the experiment as well as the mechanical subsystem. I learned how to work with the DAQ and to analyse our data in MATLAB. At the end of the summer, my team and I presented our research at the Annual Wisconsin Space Conference and published a Proceedings paper on the WSGC website.

The second New Shepard launch held a lot more meaning to me seeing as I was in charge of the project at this time. Being able to build, test and launch a successful experiment in a real-world setting is what pushed me to put my all into this experiment and the new experiments that were started on campus. In addition to the MPG experiment I started on, there were a few other projects that have started up during my time at Carthage. The most important project I will talk about is another iteration of MPG, called Modal Propellant Gauging - Propellant Refueling and on Orbit Transfer Operations. This was the first large scale project that my team and I had started from scratch. We were given a concept and told to come up with a design that would be able to fly on New Shepard. This was when I gained a great deal of engineering experience. There was a lot of throwing out design ideas because they were too complicated or would not allow for proper payload functionality. After months of design ideas, my team and I settled on a design and we were able to start the part sourcing process leading to ordering materials and the construction of the payload. Within about six months of completing the design, the payload was built and ready to be tested. This project helped me build more of a passion for Aerospace Engineering, gave me more 3D modeling experience and an idea of what it is like to build a payload in a real-world setting.

When it comes to 3D modeling, most of my experience came from the summer of 2020. During this summer, I was selected for an internship at NASA Kennedy Space Center to start a new iteration of MPG that will be testing onboard the International Space Station (ISS) in late 2021. I worked with engineers in the Advanced Engineerings Development Branch to design and model an experiment that will be placed in two payload lockers and sent to the ISS. The 3D modeling portion of the internship was mainly by myself with design reviews along the way. As a result of this, I learned how to use CAD software, more specifically AutoDesk Inventor, to create a design for this payload from almost nothing. 3D modeling is a large aspect of Aerospace Engineering and this internship helped me gain the experience and knowledge I need to succeed in this field.

As I move towards the end of my undergraduate career, I am applying to graduate school to pursue my PhD in Aerospace Engineering. Through my experience in the classroom and in the lab, I was able to find the career path that best suits my interests. I am extremely happy with my choice to stay at Carthage and join the Microgravity team. I would not be where I am today without the opportunities that were available to me on campus and through the WSGC.