Why Mechanical Engineering

I fell in love with engineering when I became a founding member of a FIRST robotics team that was started during my senior year of high school. When the FIRST season was over, I felt the need to continue building on my engineering skills. I began to experiment with model rocketry, which is still my hobby. I converted my longboard to be electric. I welded the motor mount onto the back truck and hooked a Turnigy electric motor to it. I used an electronic speed controller paired with a transmitter and receiver to control the acceleration and breaking of the board. I learned how lithium polymer batteries worked and hooked two 5000 mAh batteries in parallel to power it. I began to realize that I naturally gravitated to math and science in high school and constantly surrounded myself with various engineering projects. I knew I wanted to continue my education in mechanical engineering, but I did not know what I wanted to do with a mechanical engineering degree. I began to explore my options for a career when I picked up an unexpected past-time, reading.

Reading became a big part of my life in university. During my childhood, I hardly read required readings, let alone any kind of free reading. I started to replace all my time wasters including scrolling through Facebook and TV shows with reading. When people look at the bookcase in my room, they look at me like I am a crazy person. The first book I read, *Space Chronicles* by Neil deGrasse Tyson, sparked a huge transformation of the interests in my life. For most, it is scary to think of something so huge and complex. I see opportunity. I see an adventure waiting to happen. It empowers me to join the force for space exploration and be at the forefront of human adventure. Reading books that let me explore the universe continues to inspire and invigorate me. It fills me with hope for the future. It is what made me fall in love with astronomy, physics and ultimately, aerospace engineering.

To explain my interests, I must discuss the problems ahead. Flight is a wonder that has been a subject of research for hundreds of years. Most of our understanding of flight and testing of spacecraft has gone on in our atmosphere. Unfortunately, things change drastically from planet to planet when it comes to its atmosphere. Aerodynamics is a huge field with extreme unknowns of how spacecraft will act for different atmospheres. The Air Force Flight Test Center in Edwards Air Force Base provides some of the world's top aerodynamic and propulsion wind tunnels. I would love to be part of the research that is able to accelerate us, quite literally, into space more efficiently and reliably.

Space exploration is a very expensive endeavor. Reusability is a major problem that needs to be solved to enable space exploration to be financially feasible to both the country and the world. The engineering implications of rocket reusability requires strong research and development. The Aerospace Systems Directorate Air Force Research Lab at the Wright-Patterson Air Force Base is home to fuel research and rocket testing facilities that have extreme importance to spaceflight. I would love to play a role In the research that can make strides in alternative fuels and more reliable rocket engines.

Long-term space travel contains harmful effects to the people traveling to worlds beyond low earth orbit. They would be exposed to the strong solar wind during their travels that would otherwise be blocked from the Earth's magnetic field, like the International Space Station in low Earth orbit. We need to be able to protect our payload carrying explorers from this radiation that ionizes our cells and causes cancer. The Directed Energy Directorate & Space Vehicles Directorate Air Force Research Lab in the Kirtland Air Force Base maintains strong research in spacecraft structures and an assortment of methods

for spacecraft controls. Working for this facility or others like it will let me experience important research that has the capability of providing safer spacecraft for any payload leaving Earth.

What is so invigorating about the space industry is that some of the greatest challenges of humanity are in front of us. The problems listed above are core issues in the space industry that have significant interest to me. The three facilities I have chosen to be considered for will be able to provide the research that I would look forward to participating in every day.

Objectives and Goals

Earning exceptional grades in all my courses is crucial to my long-term goals as a mechanical engineer, but it is also crucial to apply classroom knowledge directly to engineering projects. During my second semester of my freshman year, I founded UNH Students for the Exploration and Development of Space (SEDS). UNH SEDS is a chapter within a nationwide organization that promotes aerospace engineering projects, business competitions and community outreach/events. By being the CTO, I am responsible for managing all tech leads within projects and making sure every member, including the less experienced, are participating. I was disappointed by the management of other engineering organizations in getting students from all grades involved. I think it is crucial to have cross-grade learning within an organization so once you are a senior, you have had 4 years of valuable hands-on experience. As a current sophomore, I have established a life and routine that includes excelling in the classroom, applying my knowledge and creativity to my club and spending any remaining free time tinkering and free reading. I have also committed to a physics minor in addition to my major courses because of my deep interest in astronomy and aerospace engineering.

I have abandoned many of my life habits to ensure that I am doing everything in my power to reach my dream, to pursue my passion. I take life as a series of steps, each step getting you closer to your final goal. I want to be on the forefront of space exploration and aerospace engineering. I want to be able to contribute to making humans a multi-planetary species and pushing the bounds of what is currently possible. The SMART program will allow me to join the aerospace industry directly after my studies at UNH and would be invaluable to my future endeavors. The Department of Defense does outstanding research in rocket propulsion, aerodynamics and spacecraft structures, all topics I am very interested in. The Air Force Flight Test Center at Edwards Air Force Base provides some of the world's top aerodynamic and propulsion wind tunnels. The opportunity to work on aerodynamic and propulsion testing is directly related to what I am interested and passionate about. The Aerospace Systems Directorate Air Force Research Lab in the Wright-Patterson Air Force Base contains fuel research and rocket testing facilities that have extreme importance to spaceflight. The reason I founded UNH SEDS and why I am leading rocket propulsion is because I am mesmerized by rocket engines. The Directed Energy Directorate & Space Vehicles Directorate Air Force Research Lab in the Kirtland Air Force Base provides strong research in spacecraft structures and an assortment of methods for spacecraft controls. The Kirtland Air Force Base would provide the chance for me to work on engineering projects that are fascinating and complex, engineering wise.

The DoD will provide me with a chance to get into the thick of industry research that will allow me to get hands on experience in the world of aerospace engineering. Air Force departments house the best testing facilities in the world and provide direct research correlated to my interest in rocket propulsion, aerodynamics and spacecraft structures. I will be able to learn what it truly means to be part of a high functioning engineering group and be able to contribute my skills and teamworking abilities to wherever I am assigned.

Leadership Experiences

My first major leadership experience was peculiar. In high school, I founded Clipper Chicken Club (CCC). CCC allowed students to socialize with each other outside of school hours. Once a month, 70-100 students from all years would pile into a restaurant and share a meal together. As founder, I planned all outings and community events. When I entered university, I founded an aerospace organization, UNH Students for the Exploration and Development of Space (SEDS). As of this writing, we have 25 active members from six different majors actively working on putting a multi-stage rocket 15,000 feet in the air. With running weekly meetings, managing all engineering subgroups and leading rocket propulsion, it has quickly turned into a part time job.

Clipper Chicken Club- Founder and President: 2015-2016
Reference: Danny O'Leary - Member: 603-319-7035

UNH SEDS– Co-Founder, Chief Technical Officer and Rocket Propulsion Lead: March 2017-present

Reference: Mark McConnell – Advisor: mark.mcconnell@unh.edu

Volunteering Experiences

It was volunteers who made me fall in love with science and engineering. Every other Saturday night, I volunteer at the UNH Observatory where I assist in running public viewings. UNH STEMbassadors is an initiative of the UNH College of Engineering and Physical Sciences that organizes students to travel ravels to schools around NH and provides activity programs to inspire the next generation of STEM students. SEDS Outreach is currently creating lessons in model rocketry for students in middle school where we will design, build and test a model rocket together.

UNH Observatory – Volunteer: February 2017-present
Reference: Domenico Andreoli – Manager: da1056@wildcats.unh.edu
Twice a month

UNH STEMbassadors- Robotics Team Member: September 2016-November 2017
Reference: Brooks Payette – Advisor: brooks.payette@unh.edu
All-day outreach program once a month

UNH Students for the Exploration and Development of Space (SEDS) Outreach – Group Lead: 2017-present Reference: Mark McConnell – Advisor: mark.mcconnell@unh.edu
All-day outreach program once a month

Teamwork Experiences

Teamwork is instrumental to almost every job. All three experiences listed below have let me peer into a wide variety of group cultures. My research position over the summer had deadlines that had a direct effect on my team. UNH LunaCats, a robotics organization, enabled me to learn from more experienced members and transfer that knowledge directly to other members in the group. My a cappella group, Not Too Sharp, offers a completely different aspect to teamwork by giving me a chance to work with students outside of engineering and sciences.

UNH Institute for the Study of Earth, Oceans, and Space – Research Assistant: 2017
Reference: Mark McConnell – Research Advisor: mark.mcconnell@unh.edu

UNH LunaCats – Electrical Team Member: 2016-2017
Reference: Alfred Odierno – Electrical Team Lead: ajo1005@wildcats.unh.edu

Not Too Sharp – Bass Singer and Beatbox: 2016-present
Reference: Whitman Constantineau – Business Manager: 603-793-3575