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High-Tech Sustainable Electric UTV Interdisciplinary Senior Design Team

Project Management Reflection

For my senior design team, I had the honor of being the Project Manager for the High-Tech Sustainable Electric UTV Interdisciplinary Senior Design Team. Our goal this semester was to design and build modifications onto an existing electric UTV platform so that it can accept multiple energy sources as well as create the necessary controls and equipment to safely and sufficiently control and operate the additional energy systems. Throughout the course of the semester, I learned valuable skills on risk management, time management, and leadership.

Early on I was made aware that risks needed to be communicated, and a contingency plan is always necessary. To communicate the various risks associated with this project I utilized a heat map. This heat map is a standard way of showing risks and their impact along with the possibility of them occurring. To communicate risks effectively, I learned it was better to say a risk was still high, even if I knew a team was addressing it and that I had to keep the risk high until it was tackled fully. Doing this practice made sure teams did not become complacent and lessen their work. The harder aspect of risk management is contingency. Contingency is a way to always be ready in case the risk comes to pass. An example of this is that our tires looked old and worn. We began looking for tires and making sure we could afford buying new ones so that when the tires did pop, we could have them changed in a few days. For this project, a fair amount of our risks went unrealized and had little impact on the final product. We managed to keep risks low through effectively communication and catching problems before they even began.

With any big project, time management plays a key role in its success or failure. The major issue involving time management arose after the Final Design Report (FDR) due to limited space and limited accessibility. All seven teams needed access to the vehicle for final modifications and assembly, which meant that we had to ensure each team got adequate time with the vehicle. To manage our time accordingly, we broke down how the vehicle will be assembled into three phases: energy systems, electrical systems, and cosmetics. Breaking down the assembly into three phases allowed the teams to assemble their parts offsite and then attach it to the vehicle during their turn in the shop. It also communicated to the teams that getting the energy systems on the vehicle was crucial for the electrical systems teams to do their jobs. We almost did not get all of the electrical systems working due to small delays in the energy systems as well as delays in the electrical systems. We succeeded largely due to the hard work and perseverance of a select few individuals that went above and beyond their roles in the final weeks to ensure the vehicle would be completed before the deadline.

Throughout this semester, we had assignments on leadership to help our understanding of leadership roles in engineering. While I had prior leadership training through the Civil Air Patrol, I learned and applied skills in leadership from the classroom and prior experiences. In the Civil Air Patrol, I learned a skill known as delegation that I was able to apply to as project manager of this project. On the surface, delegation seems like a habit of a lazy leader as you are giving tasks to others that might seem like the job of yourself or another individual, but you are giving individuals tasks that are more suitable for their skillset and allows for a more evenly distributed workload. Delegation allows for a smoothly operating team so that no individual is too overworked or underworked. I also learned that establishing

communication and hard-set objectives early on greatly streamlined our senior design team. A few members of the project management team would monitor and oversee their own designated group of teams. I was in charge of the electrical teams, and our team planner was in charge of the energy systems. This allowed us to tackle smaller problems within our own set of teams without having to involve the whole project management team and slow each other down with problems that can be handled within an individual team.

Overall, our senior design project was successful and showed that large senior design teams broken up into individual teams can be a major success for the Mechanical and Aerospace Engineering department, provided that they are appropriately managed. The department has typically tried to avoid using large senior design teams in the past as large teams tend to run into issues with organization and cooperation, but our success demonstrates that large teams can be just as productive as smaller teams. I will state that I could not have managed the team without the assistance and support of faculty and the sub-team leaders. The sub-team leaders are a huge part of the reason we were so successful, and this project could not have been completed without them. In the end, we modified a Polaris Ranger UTV to accept solar energy and a propane generator for power, have multiple sensors to collect data and a user interface to display all of the collected data and allow the user to manage the electrical systems.