

**Fall 2021 HPV
Exhibition Capstone
Section 001- 21Spr06**



Postmortem

Abel Aldape

Preston Berchtold

Martín Dorantes

Trent Todd

Capstone 486C – 2021

Project Sponsor: Perry Wood

Faculty Advisor: David Willy

Introduction

The Human Powered Vehicle capstone group is tasked with designing and manufacturing a recumbent tricycle to be used as an exhibition for local schools. After a summer away from the project, the team will perform a postmortem on the 1st semester's performance. The team charter will be used to assess if goals and expectations were met, and overall project performance will also be discussed. Finally, the team will analyze any problems encountered, and propose solutions for the second half of the project.

Postmortem

The team had two core goals at the beginning of the project, first to effectively communicate with our client Perry Wood, and second to use the previous four years of education to design and construct a child sized recumbent tricycle. The team's logistical manager reached out to Perry once a week, but rarely received correspondence. Although we believe we made ample effort to communicate with our client, the team will be utilizing an in-person communication approach with Professor Wood for the remainder of the project.

The Team Charter's specific goals related to the competition aspect of the project, but shortly after the start of the semester the scope was changed from a competitive vehicle to an exhibition for students attending middle school. Through this change our team continued striving for excellence and maintains a prominent level of professionalism. Lastly, the team set a goal of earning an A in both semesters and succeeded in the first half of the project.

Meetings were held consistently throughout the spring semester. The team kept to the scheduled day and time to meet unless it was communicated that there were other obligations that required it to be rescheduled. Communication within the team was exceptional and allowed for flexibility and openness within the group.

The goals of each meeting were to ensure each member was present and able to contribute ideas to the project. The team performed open forum discussions to encourage brainstorming from all members. Decisions were made from quantitative analyses like Pugh charts, decision matrices, and a QFD (Quality Function Deployment). This method worked well to visualize what aspects of each design would positively or negatively affect the project. For decisions that could

not be quantifiably analyzed, the team would vote on which design to move forward with. The team has been successful in making decisions thus far, so the option for a pros/cons list as stated in the charter has been unused.

The Team Charter states that group accountability was to be a mutual team effort. All submitted work was to be performed to the highest standard, anything short would be recognized and reflected in peer reviews. The team established a 48-hour notification timeframe for members to ask for help as they realize a task would not get done on time. Fortunately, this was not an issue the team ran into the spring semester; deliverables were all submitted in a timely manner. The team never had to reach out to Dr. Willy for strategies on fixing an issue with a team member, but only during phases where the team struggled to receive communication back from the client.

Coping strategies for any member that failed to complete high quality work would be reflected in their peer reviews. The team agreed upon how much effort was to be expected in a senior capstone project. The group understood at some point differing opinions and ideas may cause conflict. When conflict arose, the established strategy was to take a pause from the discussion and reevaluate the quantitative work. This collective agreement allowed the team to establish an elevated level of project performance and created a productive transition from the spring to fall semester.

Most of the project's performance was positive and is validated through the teams' grade in the course. Communication and teamwork contributed the most to project success. Tasks and assignments were delegated throughout the team, and all team members had a voice in assignment breakdowns. The team consistently submitted high quality work in the calculations, design of the tricycle, and the website. The team aims to maintain the level of professionalism and quality of work that we presented in the first semester capstone.

Thankfully, the team had only a couple of negative aspects of project performance. The main was related to communication with our client Professor Wood. The team and specifically our logistics manager did an admirable job in reaching out but was never able to consistently receive responses. We will be moving forward with a new in-person communication approach that will hopefully remedy the situation. Some team members also preferred working on the project closer to the deadline than others, which did create issues when it came to proof reading and final deliverable touch ups. The team has decided to set harder deadlines to ensure we have ample time to make any necessary corrections before submitting. This will help prevent future roadblocks that may occur during the fall semester.

Roadblocks encountered during this project include issues with client communication and availability, which led the team to have to reach out to other faculty to get answers on project details such as our budget. Another issue the team encountered was with the CAD (Computer Aided Design) work, there were logistical and communication issues when trying to split up the modeling work between multiple team members, as parts were dependent on other part dimensions. COVID restrictions did not help when the team, as they were forced to work remotely, causing difficulty to communicate ideas when working on the CAD model. Machine shop training was another bottleneck as the slotted times conflicted with team members schedules or never receiving confirmation after signing up. Two of the team members have signed up for a machine shop lab, which alleviates the training issue for the fall semester. The team has begun creating and executing improvements that will help for a smoother fall semester.

This semester the team hopes to improve in some of the areas that caused problems last semester. A significant improvement that can be made is to try and have more in-person meetings and interactions, this will hopefully help a lot with client communication and engagement. While also eliminating some of the other communication issues, such as CAD work which can now be done side by side in-person, which will help keep this project advance faster and minimize dimensional errors in parts. Another area that the team is improving on is learning the hands-on manufacturing skills needed to construct this project, this will be accomplished through two of our team members taking the manufacturing processes class and lab which will help jump start manufacturing or the human powered vehicle.

The team studied several technical lessons throughout the semester, either through self-teaching, class assignments, or general mistakes made in the project. These developments help propel the team forward in their knowledge and understanding of technical skills. For example, the team lead: Abel, gained technical skills through understanding SolidWorks Weldments and Simulations to better enforce the safety factor within the HPV. Martín, the logistics manager, self-learned the programming and framework for the website, while also exploring material selection methods. Preston, the financial manager, investigated gear factors and drivetrain criteria within ASME (American Society of Mechanical Engineers) standards and continued to explore safety evaluations. Trent, the manufacturing engineer, has continued learning SolidWorks to prepare for the additional modeling work needing to be done, while also investigating the steering subsystem and its geometries through use of Ackerman steering equations and overall system dimensions to ensure proper fitment. The team is most importantly looking forward to learning the machine shop. Within the machine shop, the team

believes several skills, such as welding and pipe bending, will continue to develop the team's technical skills.

Conclusion

Overall, the team feels optimistic about the upcoming semester. The team believes to have completed most of their goals set forth by the Team Charter, while also staying unified as a team. Several changes incurred throughout the semester for the HPVC, which contributed indirectly to some of the problems that occurred. Several "roadblocks" such as lack of communication with our client, did occur throughout the semester that the team should focus to adjust. Struggles with CAD models and the lack of communication with out client proved to create "roadblocks" that could have easily been avoided. Moving forward, the team is enthusiastic and confident for the upcoming semester