**­Senior Design Project Brief**

Team 5 - 'The Little Rascals (Calvin Bolt 2.0)'

October 17, 2016

Phillip Kim

Nathan Swaim

Samuel Hanover

Bernice Portugal

***Objective***

The long term objective of this project is to modify the Calvin Bolt in such a way that represents Calvin engineering to perspective and current students. However, the short term objective is to begin a platform in which every year a senior design team works in-depth on a portion of the vehicle to meet the long term objective of creating a functional and reliable vehicle. The creation of this platform opens the opportunity for future interested students to work with a vehicle for senior design as well as meeting the current long term objective.

*Safety*

The Calvin Bolt must be safe to ride in throughout all seasons. Passengers will be contained within the vehicle at all times when in motion. The safety of the passengers as well as the vehicle itself will not be at all comprised when faced with road obstacles.

*Ease of Use*

Operating the vehicle itself will be similar to that of a golf cart in that steering the front wheels’ will be effortless and when the brakes are activated, the vehicle should slowly and smoothly come to a stop. In addition, the documentation software will be user friendly allowing future students to easily access past files, CAD drawings and other documents. The steering and braking system will be of easily accessible making maintenance less of a nuisance.

*Quality*

The quality of steering and braking system along with the documentation software will be a quality that well represents Calvin College. All systems will be fully functional, accessible and reliable.

*Maintenance*

With correct use of the vehicle, maintenance of the steering and braking system will be kept to a minimum. Misuse of the system (i.e. braking too hard) will result maintenance within shorter time periods.

*Aesthetics*

Since the steering and braking system will not publicly be visible, little attention to aesthetics will be provided. However, mechanical aesthetics will include the surface smoothness, clean welds (if needed) and other mechanical related aesthetics. In relation to design, both steering and braking systems should have a simple yet flexible design.

*Seasonal Outdoor Usage*

The improved systems of the vehicle should not only operate, but operate well during all seasons, especially when being used outdoors. Specifically, during winter, the braking system should direct no worry to user.

***Motivation***

There are many drives behind this project. The first of them being is wanting to bring new ideas into an already made product such as the original Calvin Bolt vehicle. As stewards of Christ and students upholding the values of Calvin College, we believe that the hard work of previous students should not be dismissed upon their graduation but used toward the future. In addition, to prevent more unsuccessful designs of vehicles upon vehicles created by previous students wanting an automotive based design project. It is felt, if set up properly, this project will alas produce a successful vehicle and learning opportunity for those interested in the automotive industry. Lastly, as students representing Calvin College Engineering, we, along with others, feel the need to express the joy and fascination of engineering with current and prospective students of Calvin College.

***Requirements***

In order to successfully meet the objectives, both long and short term, the following set of requirements need to be met:

*Functional Capacity*

The steering and braking systems should be fully functional and reliable with any minor and/or major disturbances while in operation. A type of feedback system should be in place to determine the stability and functionality of the systems. In addition, the documentation software must be usable, accessible and continuously updated with the course of the project.

*Safety*

Safety features should be considered for the passengers such as arm rest and a parking brake. If there is adequate time remaining, possible additional safety features may be turn signals, headlights, and brake lights.

*Time Feasibility*

The design and improvement upon the steering and braking system, along with the final update of the documentation software must be completed before or on May 5th, 2016.

***Design Norms***

As we go through this project we will be sure to use design norms such as Cultural Appropriateness, Transparency, Stewardship, Integrity, Justice, Caring, and Trust. We will make sure that these characteristics are resembled in every aspect of our project. Below is a more in depth explanation of how we will implement a few of these Design Norms in our process.

*Trust*

Passenger safety: passengers should be confident in trusting the design and its reliability. It will be constructed with high standards for each component ensuring its reliability.

*Integrity*

The two systems, braking and steering, will be constructed so that they operate as smoothly and efficiently as possible. The design should be driver-friendly with a minimum amount of effort from the user.

*Stewardship*

We will go about the process of developing this system knowing we are doing the best that we can do. Each member of the group will do all that they can to make this project as good as it can be and not only relying on another team member to do the work.

***Current Status***

At this point in time, we are currently researching the steering and braking system in its current form as well as possible solutions for improvement. As for the documentation software, we also are researching not only how a documentation software operates, but the type of software that will fit well with our project. Lastly, we are working on fixing the acceleration pedal for the Calvin Bolt so we may begin testing the systems as they are now, before designing improvements.