# 1.1 Project Scope

**Project Description**

The overall goal of the design experiment is to successfully develop a "hardware in loop" wheeled robot to optimize a path to maintain velocity and minimize inertial losses from accelerating and decelerating. The plan to do this is to create a control system for the vehicle's steering and acceleration. After discussing with the object detection team, a point of contact within the vehicle will be established where commands are sent to the control system. This should result in an autonomous vehicle, that optimizes its path and minimizes inertial losses.

**Key Goals**

The goals of the project will be defined so that, once met, the project functionality will match the project description.

The first goal of the project is to create a small-scale autonomous vehicle. To do so, the vehicle is expected to have sensors that allow for obstacle detection and light sensors that will detect if the vehicle is driving down a straight line.

The second goal of the project is to ensure the vehicle can maintain velocity. The assumption is that this design feature is like the cruise control feature found in cars, which utilizes acceleration and deceleration to control the speed of the car.

The final goal of the project is to minimize inertial losses from accelerating and decelerating. Inertial losses involve the energy needed to accelerate being proportional to the mass of the vehicle.

**Assumptions**

To successfully create a functioning design that meets all the key goals, assumptions had to be made. One assumption is that the obstacles the vehicle will come across will be static. Another assumption that will be made is that the road grade will be changing along the path. The

third assumption is that there will be multiple possible paths from point A to point B, meaning it is up to our vehicles autonomy to choose the best one. To accomplish this, the vehicle should be able to utilize the features of object locating and tracking provided by team 504. Therefore, a feature of the design will include sensors, dynamic movement, and velocity changes to overcome the obstacles experienced when navigating an unknown terrain. The user is also assumed to be able to successfully operate the design, even though the design is intended to be autonomous. -The final assumption is regarding deliverable timing, where we expect the sponsor to want mechanical and software prototypes monthly once the design specifications are outlined.

**Markets**

In having our final design's functionality match the project description, the goal is to fulfill the requirements of the project sponsors, the CIA. With this in mind, the primary market includes C.I.A. teams and any counterterrorism teams in public and private government agencies. The secondary markets might consist of original equipment manufacturers (OEM), spyware enthusiasts, private search teams, and space exploration companies. Automobile companies can gain influence into autonomy and minimize inertial effects from our project and implement them on a larger scale. Spyware enthusiasts may find interest in the design to add to their collection. Space exploration and private search teams can use the small-scale vehicle to navigate with ease and collect information.

**Stakeholders**

Unlike markets, which depend on who will benefit from the final design, stakeholders are any party with active involvement in the project, which includes project sponsors, investors, advisors, and adjacent teams. For this project, the main stakeholders are the Central Intelligence

Agency (C.I.A.), C.I.A. subject matter experts (SME), Dr. Shayne McConomy, Dr. Camilo Ordonez, and Team 504.

The C.I.A. sponsors the project and emphasizes control over the overall design as well as financing the design. As the project advisor, Dr. Camilo Ordonez will be contributing time and resources towards the design. The C.I.A. SME also contribute their time and knowledge to assist in design specifications. Dr. Shayne McConomy contributes his time by evaluating the project progression and helping the team by guiding the project in the right direction. Finally, Team 504 will be assisting in the visual mapping of the external surroundings.