companies on collaborative ideation and manufacturing allowed?	guys need to come up with on your own.	not design specifications. Design should be done by us alone.

Interpreting the statements of the customer allows the team to translate the customer's ideas into tangible goals. From the statements the team concluded that the glider should be energy efficient, mobile, and able to withstand ocean conditions. In addition, it is assumed that the glider will be able to sense the surrounding pressure and temperature. The customer also emphasized the importance of computer modeling and requested models of the glider under certain oceanic conditions which can help to visualize its motion and verify the craft's design specifications.

1.3 Functional Decomposition

1.3.1 Introduction

The purpose of functional decomposition is to outline a design's most basic tasks for operation. The aim is to separate the main systems and their respective subsystems to better describe the physical actions and outcomes of subsystems.

Data and information used to create the functional decomposition came from multiple sources: screening the customer, background research from Dr. Ordonez, and various research papers listed in the Appendixes. The information provided by these sources was broken down and converted to the functions of each subsystem that would create the underwater glider. Previous experimentation on underwater gliders allowed Team 502 to understand the feasibility of operation capabilities for a successful product and impacted future design and component decision-making.

1.3.2 Hierarchy Chart and Cross-Functional Matrix

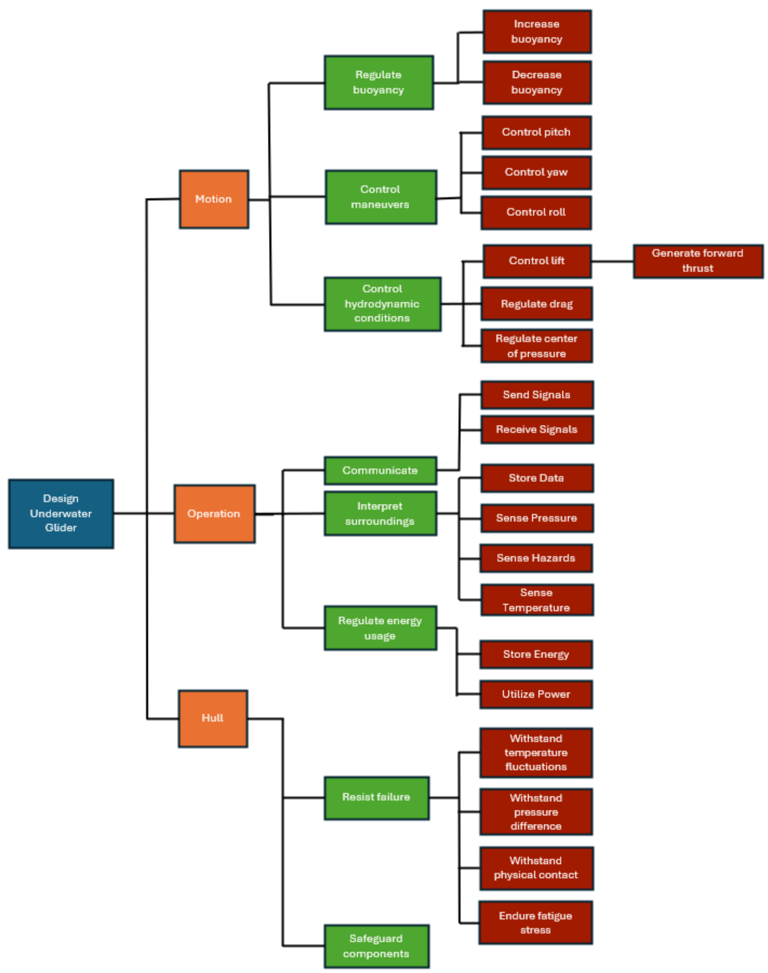

Figure 1 shows a hierarchy chart, in which these functions are split up into systems and more specific subsystems.

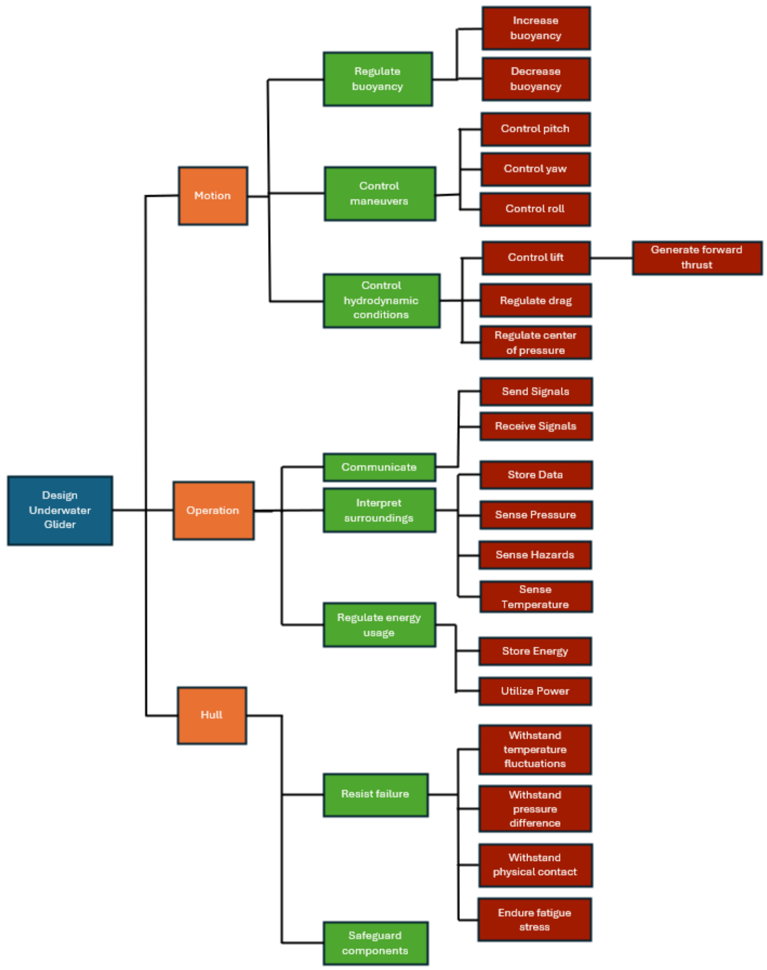

Figure 1: Hierarchy Chart.

The chart is divided into three different main systems: motion, operation, and hull. These were deemed the essential systems required for the glider to perform baseline operations. The hierarchy chart is essential for splitting the project up into digestible portions and helping to create actionable goals.

For the glider's motion several aspects were addressed: buoyancy control, control maneuvers, and control hydrodynamic conditions. For the glider to submerge and ascend it is necessary to regulate buoyancy. It was therefore determined that the glider would need to increase and decrease its buoyancy force within the water. The glider must also change its orientation and maintain stability within the water to create motion. Therefore pitch, roll, and yaw must be controlled. To ensure the most efficient motion the hydrodynamic conditions of the glider must be enhanced for every situation. The glider should be able to control these hydrodynamic forces, including lift, drag, and center of pressure. In controlling the lift produced by the glider, forward thrust will be produced.

When considering operation, the device needs to be able to effectively communicate with the user and vice-versa. To communicate, we expect the glider will need to send and receive certain signals to trigger functions. The glider should contain methods to report system status back to the user. Further, the device should be able to gather information from its surroundings and report them back to the user. This includes sensing water pressure, temperature, and the location of potential hazards in relation to the glider. The information gathered should also be stored so the glider can adjust to environmental conditions.

During operation the glider will be subject to different environmental conditions. The hull of the glider should be able to withstand these environmental conditions to ensure sustained operation. The glider should be able to resist loads imposed on it by the surroundings, like thermal expansion, pressure, fatigue stress, and physical contact with hazards. The hull should also safeguard all electronic components to prevent electronic failure.

Cross-Functional Matrix			
Functions \ Subsystems	Motion	Operation	Hull
Regulate Buoyancy	X	X	
Maneuver Glider	X		X
Control Hydrodynamic Forces	X	X	X
Maintain Orientation	X	X	X
Communicate with Operator	X	X	
Interpret Surroundings	X	X	
Resist Failure		X	X
Safeguard Components		X	X

Figure 2: Cross-Functional Matrix.

1.3.3 Connection to Systems & Smart Integration

Figure 2 presents a cross-functional matrix for the underwater glider. The vertical axis presents the different functions that pertain to the glider. The horizontal columns list out the subsystems and which functions correspond.

For these subsystems to succeed in accomplishing the key goals of the glider, it is important to describe each of their necessary functions and explain how they contribute to their respective subsystems.

Motion has four key functions: regulate buoyancy, maneuver glider, control hydrodynamic forces, and maintain orientation. The glider must be able to dive and rise to specified depths and hold at a specific depth underneath any external motion or disturbances.

In the case of operation, the glider must be able to communicate with the operator and interpret surroundings. By monitoring the surroundings, the glider will be able to determine