# Project Description:

*"The objective of this project is to improve on water performance for the Intrepid 409 Valor."*

An issue faced within Intrepid Powerboats is the weight of their hardtops and their aerodynamic properties. These issues cause excess fuel consumption, lower top speed, and reduce the overall performance of the boat. Our team has been tasked with coming up a solution or series of solutions to solve the issues within the current hardtops. For this specific project, the hardtop we will be using is on the Intrepid 409 Valor boat model and the design changes will then be implemented within Intrepid for the rest of their fleet.

# Key Goals:

The primary goal, according to Intrepid, is improving vessel performance on water. Weight reduction for the hardtop assembly can be a contributing factor to improvements in on water performance. Another goal of this project is improving fuel efficiency. Analyzing and possibly altering hardtop shape and angle of attack may affect trim angle, plane speed, fuel efficiency, and on water performance. Once analysis of the current hardtop is done, improvements to the shape, angle of attack, and aerodynamics may be possible. Another goal is to improve lift and reduce hull-water friction. Changes to the characteristics above can positively affect the boat in the areas of running angles, fuel efficiency, plane speed, and lift generated. Also, if more lift is generated by the hardtop, the boat will run higher out of the water causing less hull surface area to be in contact with the water which reduces friction, improving running capabilities and fuel efficiency of the vessel. Another goal is to stay within Intrepid's manufacturing tolerances and capabilities. This will allow Intrepid to continue to manufacture their own hardtops while keeping the design feasible, which in turn reduces cost and manufacturing time. Though not desired, an increase in cost may be acceptable if the cost incurred is outweighed by

the improvement in weight savings, aerodynamic characteristics, and other areas, because the main goals are performance oriented.

## Assumptions:

We are assuming that cost constraints will be considered at all phases of design. Therefore, the budget needs to be kept to a minimum, so most analysis may be done virtually. Furthermore, one must assume that this improved design will be accepted and implemented by Intrepid. We can assume that these performance changes will be applied solely to the hardtop. The current hardtop supports, like the fiberglass arches and the aluminum support structures, will not be changed or altered in this project. We can assume that the improved hardtop will be attached to the 409 Valor mounting points. We can assume that we will not be altering anything on the boat other than the hardtop. We can assume that we will not physically produce the improved hardtop within the given time frame. We assume manufacturing processes similar to current Intrepid methods will be implemented to produce the new model. We can assume we will be using similar materials to ones currently used and will be focusing on geometric shape of the hardtop more than research of materials.

## Stakeholders:

Intrepid Powerboats is a stakeholder for this project as our sponsor. The President of Intrepid, Ken Clinton, and Vice President of Engineering, Richard Ahl, are stakeholders who represent the company. The team advisor, Dr. William Oates, and the Senior Design professor, Dr. Shayne McConomy, are both stakeholders. Other stakeholders include aerodynamics professor Dr. Rajan Kumar, thermal fluids professor Dr. Mohd Yousuf Ali and all members of this senior design team tasked with this project.

## Primary Market:

The key markets for these solutions are current and future Intrepid Powerboats customers and the company itself. Since this project is primarily a solution within Intrepid, they are the primary market.

## Secondary Market:

Developments in this project have several potential secondary markets. These solutions could be implemented into government projects that require boats to be more fuel efficient and have a higher top speed for agencies such as the Coast Guard, Fish and Wildlife Conservation and other federal bureaus that require powerboat use. Other potential markets would be competitors within the consumer boating industry. Further, lightweight advancements in fiberglass building could be adapted for other industries such as aerospace and defense where strong and lightweight materials are extremely important. Lastly, the improvements found in this project can be applied to the automotive industry to automakers who use fiberglass materials in their vehicles and potentially desire lightweight characteristics.