F13-BID-03

Snow Ski Design and Testing

Client: **Green Light Skis**		Number of Teams Desired: 1
☑ Mechanical Engineering	☐ Civil Engineering	☐ Intellectual Property Agreement Required
☑ Electrical Engineering	☐ Environmental Engineering	☐ Non-disclosure Considerations
☐ Computer Science	☐ Humanitarian Engineering	☐ Liability Considerations

Project Overview

Green Light Skis is a Boulder, CO ski company started by college kids in their garage out of a love for skiing and an appreciation for quality skis. The goal of this project is to determine the ideal materials and configuration of ski cores for three types of skis: terrain park, all mountain, and powder.

An exceptional design team will explore and analyze the core material options for skis both theoretically and experimentally. In order to accomplish this, it is expected that the team will have to design and build a testing rig while also analyzing and constructing ski core samples.

The testing rig (as currently imagined) will consist of an electro-mechanical assembly that is capable of testing all the critical mechanical properties of ski cores. With the assistance of Green Light Skis, students will fabricate their ski core designs by laminating the wood in various configurations and cutting the ski cores on Green Light Skis' CNC machine. After the testing of all cores is complete, the team will compare the results to their theoretical analysis and determine the optimum ski core configuration to be used

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Preliminary Deliverables

1.Theoretical calculations of ski core properties
2.A reusable testing rig
3.Software to record data from the testing rig
4.Design and building of ski cores (with help from Green Light Skis)
5.Comparative results between theoretical and experimental data to determine the optimum ski core material and configuration for the three types of ski

F13-BID-14

FourCross Bike Update

Client: **Adaptive Sports Center**

Number of Teams Desired: 1

☑ Mechanical Engineering	☐ Civil Engineering	☐ Intellectual Property Agreement Required
☐ Electrical Engineering	☐ Environmental Engineering	☐ Non-disclosure Considerations
☐ Computer Science	☑ Humanitarian Engineering	☐ Liability Considerations

Project Overview

Want to design a downhill mountain bike for athletes with disabilities? This project will involve working in conjunction with the Adaptive Sports Center in Crested Butte (http://www.adaptivesports.org/page.cfm?pageid=18769). They use FourCross bikes to allow folks with various disabilities to enjoy downhill mountain biking. These particular bikes have no propulsion mechanism and rely on gravity. Adaptive Sports have identified two major shortcomings for the bikes that they currently use and would a design team to develop solutions.

Adaptive Sports Center will provide a bike for evaluation and prototyping, though modifications should be fully reversible since the bikes sell for $12-$15k new.

There are two key items to address:
(1) Modify brakes to work for an incomplete quadriplegic utilizing shoulder/forearm motion for braking. There are different levels of quadriplegia (sometimes referred to as tetraplegia) that vary with injury level (the higher in the cervical spine the more function is lost) and the completeness of the injury (someone with an incomplete injury may retain more function than a complete injury). Some of these individuals may have the ability to move their arm but not functionally use their hands.
(2) A second challenge is with the seat. Riders often wear body armor which isn't terribly comfortable with the bucket style seats currently used. High level paraplegics may not have good trunk control and rely on the seat back for posture and stability. When these users crash they can hyperextend their backs over the seat which is painful and potentially dangerous.

Preliminary Deliverables

1. A working prototype (which does not require non-reversible changes to the existing bike)
2. Complete design documentation package that would allow the client to manufacture the proposed solution on-demand

F13-BID-42

NASA Lunabotics - Autonomy

Client: **CSM - Chemical & Biological Engineering Department**

Number of Teams Desired: 1

☐ Mechanical Engineering	☐ Civil Engineering	☐ Intellectual Property Agreement Required
☑ Electrical Engineering	☐ Environmental Engineering	☐ Non-disclosure Considerations
☑ Computer Science	☐ Humanitarian Engineering	☐ Liability Considerations

Project Overview

The Fourth Annual NASA Lunabotics competition will be held at the Kennedy Space Center Visitors Center in May 2014. The Lunabotics competition calls for the design of a robot capable of traversing a field of lunar regolith simulant, excavate the regolith simulant in a designated area, and transport it to a collection bin. The robot must satisfy minimum requirements of mass and space worthiness. Points will be awarded for mass of regolith deposited in the collection bin, autonomous operation, low mass, high dust tolerance, and innovation. CSM has sent a team to the competition in each year, and in the predecessor competition, the NASA Centennial Challenge for Regolith Excavation. Furthermore, CSM has a history of designing, building and testing lunar excavators dating back to 2001.

Preliminary Deliverables

The CSM Lunabotics team will produce a new and competitive excavation robot. The new 5th Lunabotics rules set will be followed. The CSM 5th Lunabot will improve upon past CSM Lunabots in several categories. In the 3rd annual Lunabotics competition the CSM team fielded a robot capable of full autonomy; however, flaws in execution in the lunarena failed to produce a qualifying result. The 5th CSM Lunabotics Lunabot is expected to qualify for the competition. Furthermore, it is expected to operate autonomously, be of lower mass than previous CSM lunabots, execute the competition with low bandwidth, be dust tolerance, and have innovative features.

The Autonomy team will focus on autonomy sensors and control software. The team will reconsider the programming environment, path finding and obstacle avoidance algorithms, sensor configuration on the rover and beacons, and dust mitigation at a minimum.

THERE ARE NO AVAILABLE POSITIONS OPEN ON THIS COMPETITION TEAM.