PSYCHE MISSION - COBALT CLASS

ROBOTIC EXPLORER FOR HYPOTHESIZED SURFACES

Project Charter

Senior Design – Team 503:

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Date:

September 20th, 2019

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1 Project Scope

1.1 Project Description

The Psyche mission's main objective is to explore a unique metallic asteroid, 16 Psyche, to learn more about planetary cores. As part of the mission, the Robotics Explorer Team will research and analyze data to develop a viable, robust terrestrial rover capable of traversing the theorized surface terrain of the 16 Psyche asteroid.

1.2 Key Goals

Upon completion of this project, the Robotic Explorer team will present an operable rover prototype cable of navigating Psyche's surface. Mechanisms must be developed that can overcome the types of terrains present: hard unstructured terrains, soft unstructured terrains, and large structures. Hard unstructured terrain consists of uneven metallic surfaces, gravel, and rocky terrain. Soft unstructured terrain consists of regolith, loose deposits of material that cover a solid surface (space sand). Throughout the course of this project, our robotic explorer must be decomposed into the necessary functional subsystems and integrate software, mechanical systems, and electrical systems into a single coherent system. The design must be as lightweight to reduce the weight of payload during travel. Functionality of the robot must be robust, so that behavior is predictable and reliable. The final fabricated design will be tested on Earth in simulated conditions to that of 16 Psyche's terrain/environment.

1.3 Markets

Since this project is an internally funded and exploratory mission, the primary market target is the National Aeronautics and Space Administration (NASA). The rover will directly benefit the agency and its partners. External markets are indeterminate at this time due to the proprietary nature of information pertaining to the project. Despite this, the technological developments could influence secondary markets that are private space exploration companies that would benefit from advancing technology, such as SpaceX, Blue Origin, and Boeing. Other secondary markets include robotics labs that focus on traversal over unstructured terrain, such as, Boston Dynamics, IHMC, Agility Robotics, and many academic research labs worldwide like CISCOR in Innovation Park. More secondary markets include the military and first responders where remote controlled/autonomous robots can be used for scouting areas too dangerous for human subjects.

1.4 Assumptions

Communications from 16 Psyche to Earth are not a concern for this project. It will be assumed that the robot will have a continuous power supply. The device will only need to be capable of traversing one of the various terrains hypothesized on 16 Psyche. Simulating the robot's functionality on Earth will be sufficient for the asteroid's hypothesized environment. Extreme temperatures will be neglected.

1.5 Stakeholders

The parties involved and affiliated with this project are National Aeronautics and Space Administration (NASA), Arizona State University (ASU), Dr. Cassie Bowman (Co-Investigator/Sponsor), Dr. Shayne McConomy (Mechanical Engineering Senior Design Professor), Dr. Jerris Hooker (Electrical & Computer Engineering Senior Design Professor), Dr. Jonathan Clark (Engineering Adviser), the United States Government, and the United States citizens and taxpayers.

2 Mission Statement

The next generation of engineers designing technology to traverse new worlds.

3 Code of Conduct

3.1 Team Roles

- Sharice Lewis (Engineering Manager):
  Plans, organizes, executes, and leads the project.
- Justin Larson (Mechatronics Engineer):
  Designs, builds, and integrates both electrical and mechanical systems.
- Devon Foster (Mechanical Systems Engineer):
  Designs, fabricates, and constructs mechanical systems.
- Chris Lopes (Software Engineer):
  Develops software for the robot's intelligence and actuation controls.
- Sadzid Pajevic (Mobile Robotics Engineer):
  Develops mechanical and navigational systems.
- Alexander Legere (Electrical Systems Engineer):
  Designs and builds electrical systems.

3.2 Communication

Team member will communicate through Group-Me for everyday communication and updates. Google docs will be used to share, organize, and work on documents, presentations, and other assignments. Ryver, webex, and Google duo will be used to communicate with the group's sponsor and project manager.

3.3 Dress Code

3.3.1 Presentations

Team members are expected to dress business professional for any and all presentations. Color/style schemes will be coordinated a minimum of one week prior to the presentation date to ensure a professional, uniform look between group members.

3.3.2 Sponsor/Adviser Meetings

Polos and button downs are suggested for sponsor and advisor meetings. Pants are preferred, but not a necessity.

3.3.3 Team Meetings

Casual is acceptable for semi-weekly team meetings; comfort is key.

3.4 Attendance Policy

Attendance is mandatory for all team members at every scheduled event; this includes, but is not limited to sponsor/adviser meetings, presentations (even if the member is not presenting), and semi-weekly team meetings. All members must attempt to attend meetings/events that are not planned for ahead of time, unless a valid excuse is accepted by a majority of the other group members.

3.5 Decision Making/Conflict Resolution

All general decisions will be decided by a vote, where majority wins. If a member who voted against the majority thinks the majority decided poorly on a critical decision, the member may attempt to re-explain his/her stance in depth and cast a revote. If the decision

remains the same after the recast, the point of discussion cannot be overturned unless four out of five members agree to do so.

If the item under consideration relates directly to a mechanical engineering principle, a vote will be taken between the three ME students; the same deciding factors apply to this but scale down to three people as opposed to five.

If the item under consideration relates directly to an electrical engineering principle, a vote will be taken between the two EE students; in the instance where the two EE students do not agree on a decision, a tie breaking vote will be held between the ME students.

4 Statement of Understanding

By signing below, each member accepts the responsibility to uphold the guidelines presented in this code of conduct and to put forth full effort in completing the project outlined in the scope.

Signature	*Date*
_____	_____
_____	_____
_____	_____
_____	_____
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