

Milestone 3

Preliminary Design Report

- Due:* At the start of class, Monday or Tuesday, October 21 – 22, 2013.
- Value:* 10% of course grade.
- Framing:* Write the report so it makes sense of the experiences of your team, not simply for filling in a milestone requirement. What were the specific design decisions and how were the design decisions made? What are the most tentative aspects of your design, which aspects are you relatively sure of? The sections mentioned below are designed to help you organize your thoughts. Imagine the audience is another engineering student who is unfamiliar with this project.
- Format:* The maximum length is 25 pages. Please use 8.5 x 11 inch paper, 1 inch margins, 12 point fonts, 1½ line spacing, and page numbers. Single line spacing is acceptable for tables, references, figures, etc. All figures and tables must be numbered, captioned, and referenced in the text. Materials taken from publications and the web must be appropriately cited. The writing should be from the team's perspective, not the single person writing that section.
- Sections:* Include the following sections in your report in reasonable detail. Explain why you believe your approach will satisfy the project requirements. Originality is encouraged. You may include an Appendix to present detailed calculations, analyses, etc. that are too long to easily incorporate within a section, but this must fit within your 25 page limit.
- Required-
0 points* **Cover page and table of contents.** Include in your cover page: assignment name, team name, course and section numbers, and submission date.
- Required-
0 points* **Approvals.** Include the names and signatures of each team member. Each team member should briefly indicate, in type or hand printing, their main contributions to the design effort so far and to the report. Your signature indicates your approval of the report and your adherence to the University Honor Pledge.
- 5 points* **Executive summary.** (One page max.) This is the most basic view of the design: think about how you could pare down the structure and function of the craft to the most essential descriptions for someone to (i) understand the most important constraints for your design, (ii) imagine the structure of your craft and (iii) understand how your craft will carry out the mission. Imagine the audience is composed of non-technical, non-engineering executives.
- 5 points* **Introduction.** This is a somewhat more detailed introduction to your hovercraft, this time with the freedom to use technical engineering language. Discuss the objectives of your project mission and your design constraints. Describe your design (the hovercraft structure and how it will function). Review the basic challenges that must be addressed to achieve a successful design. Discuss benchmarking examples you have encountered and consider either as competition or inspiration. Some overlap with the Executive Summary is okay.

- 20 points* **Preliminary design details.** This should include the details of your structural design as well as your mission strategy (how you envision the hovercraft will function). Include the following subsections. Include engineering drawings of the hovercraft and any components, as well as circuit diagrams as needed to make the description more comprehensible to a reader. Include appropriate calculations (see examples in your homeworks).
- Hull structure. Present the hull shape, materials, and construction method. Include estimates of hovercraft mass, and the center of mass.
- Payload delivery. Discuss the structure of your payload delivery device and how it will function.
- Levitation. Present the sizing and selection of your levitation fan. Include your fan's characteristic curve and explain your decision process.
- Propulsion. Present the sizing and selection of your propulsion system as well as your decision process for making design choices. Show estimated linear acceleration calculations for your hovercraft in the Appendix.
- Power. Describe how you will provide power for levitation, propulsion, and electronic control systems. Describe how you will modulate power to levitation and propulsion systems (if that's part of your design). Include run-time estimates for how long you can power your hovercraft without re-charging the batteries.
- Sensors and actuators. Present your sensors and actuators and discuss the rationale for their placement on your craft.
- Control algorithm. Discuss your control strategy and present a flowchart or pseudocode of your control algorithm. A reader should be able to make sense of how your hovercraft will navigate and carry out the mission.
- 10 points* **Preliminary design drawings.** Present the following computer-generated drawings with sufficient labels, dimensions and notes. Follow appropriate technical standards. All fonts must be 10 point or larger. Drawings that are appropriate to include within the 'design details' section, should be included there. Any that do not fit into the description should be included in this separate section. At the very least, the following three drawings should be included in the report:
- Drawing of hull and skirt showing construction detail.
 - Assembly drawing of complete vehicle with all components. Clearly identify the location of each component relative to the center of pressure of the hull.
 - Wiring schematic(s).
- 5 points* **Preliminary bill of materials.** Provide a preliminary bill of materials. Inclusion of minor parts like wire and fasteners is optional. As appropriate, include manufacturer, vendor, model number, description, mass, and cost.
- 5 points* **Preliminary Gantt chart.** Present a comprehensive task list for project completion along with target completion dates. For tasks in progress or completed, indicate both initial and updated completion dates.

5 points **Construction and testing plans.** Discuss uncompleted tasks in the Gantt chart, and resource allocation.

5 points **Anticipated difficulties.** Discuss what challenges and set-backs you anticipate as you proceed with the prototype fabrication and testing. Also discuss what plans or strategies your team has talked about to get around those road-blocks.

Scoring: The report will be graded out of 100 possible points with a breakdown as follows.

60 points 1. Technical content (see sections above).

30 points 2. Clarity and insight of the design process. Narrative quality.

10 points 3. English usage, formatting, and graphical uniformity.

Materials Submission

You must submit a hard copy of your team's design report at the start of class on the day the report is due. This submission will be reviewed and assigned a grade. Additionally, you must submit an electronic version of your complete design report to your instructor as a single file (pdf, doc, or docx) through Canvas by 5:00 pm on the day the report is due.