Preliminary Design Review (PDR) Assignment

ASEN 2002, Balloon Lab, Fall 2020

Document Scope

This document specifies the required elements and deliverables for the presentation assignment and provides a grading rubric. Much of this wording is adopted from the ASEN 4018, Senior Projects PDR assignment. This presentation assignment is meant to help prepare you for the PDR presentation that you will give in the senior capstone course.

Purpose of PDR

The purpose of the Preliminary Design Review is to **provide evidence** that the project design is **feasible**, i.e. can be accomplished within the constraints of technology.

It is expected that the key elements to be analyzed for feasibility are clearly defined. For each key element, a first-level feasibility analysis is expected.

Presentation of suggested future studies is highly recommended. The presentation style should give the impression that the material presented in PDR is the first step in a larger design process with the 'next steps' section indicating what the team believes would occur next in the design cycle. For example, an explanation of the limitations on the material selection process would lend itself nicely to a next step of enhancing the confidence in the relevant material properties with the procurement of a material sample and conducting in-house tests.

PDR Presentation Structure

3.1Project description

3.1.1 Brief project definition using an interpretation of the design requirements provided in the assignment.

3.1.2 A brief description of the key parameters of the current design (size, weight, material, etc.). The presentation should expand on these key parameters through an explanation of the pertinent models, governing relationships, and design choices.

3.2 Evidence of feasibility

3.2.1 Identification of design elements and a first-level feasibility analysis of all key elements using the primary governing relationships and techniques (Buoyancy, Ideal Gas Law, force balance, thin-walled

pressure vessels, etc.). Discuss how the understanding you gained from the scale model experiment applies to the large scale system.

3.3 Status summary and Strategy for conducting remaining studies

Recap the design with aspects shown to be feasible. Indicate specific items of the design that require further investigation with a brief description of what those investigations would entail and the motivation for those investigations. For example, “The confidence on the material yield strength is low since we used a value from www.MaterialParametersFromChipTheBuffalo.com. A material test to determine a better approximation of the true yield strength would result in a better estimate of the balloon final volume.”

4. Deliverables

4.1 PDR Presentation Package

Each group must submit their Presentation Package in the form of a .pdf and a 15-minute maximum recording of the discussion points. Each team member must speak at least once during the presentation. Name your files in the following format: Section_Group.pdf (e.g. 301_01.pdf and 301_01.mov)

4.2 Due Date and Time

Wednesday Oct. 14th at 800 AM MDT.

4.3 No Changes to the Submittal

To ensure fairness, no changes will be allowed to your presentation materials after the due date and time. You will be presenting from the version of the presentation that is submitted.

Design Laboratory Assignment: Rubric

(5 pt) Briefing Overview and Content. Provide a general purpose for the project and outline talk elements. Identify who will brief what section as everyone must talk.

(5 pt) Design Requirements. State and interpret the requirements for the design.

(5 pt) Brief design overview. State the important aspects of your design (size, lifting gas, material choice, etc.)

(15 pt) Design Research. Present the design research by providing relevant data that you identified through your research. This includes justification for your gas selection and material selection. Document your research sources.

(15 pt) Design Specifications. Present your design specifications to meet the requirements. Include gathered information about zero-pressure balloons, imposed assumptions, diagrams, and algebraic development. Present your design analysis logic. Directly relate your understanding gained from the scale model to this full-scale design.

(20 pt) Design Analysis. Provide an estimate of your final balloon volume based on your selected factor of safety, any necessary plots to help in the explanation of your selection and assess the final mass budget of your system in terms of fractional mass and relate results to your scale model findings.

(10 pt) Performance subject to radiation. Explain the assumptions, equations, and processes that were used to model the effects of radiation on the system. Discuss the design decisions that were employed to keep the payload at the desired altitude. If you choose to incorporate ballasts or venting of gas you need to show how much and when the systems are activated (e.g. "*the design would require 500 kgs of ballast to be dropped at dusk*").

(10 pt) Design Deliverables. Present and discuss the findings and deliverables of your preliminary balloon design. Describe how you have checked the software. Describe 'future studies' that you would anticipate based on your understanding of the design cycle and the limitations of the assumptions made at the preliminary design stage.

(5 pts) Quality of Presentation. The group presentation needs to be well organized, well formatted with appropriate and readable figures and scales, and content must be clearly communicated. The presentation level should be targeted towards "an educated engineering audience." All group members must present coherently and clearly.