4. Critical Function Prototype

Deliverables

Design, build, test and share a critical component, subsystem or function that makes a difference. Create an opportunity for improvement that could be a key to enhanced product performance. This conceptual prototype is not the product itself but points a possible way. Present and demonstrate your CFP during the meeting with your faculty mentors, **due the week of October 10.** Be prepared to say why it is critical and give the rationale for your choice. Say what you've learned from the prototype. The learning often emphasizes technology, but it can also address key elements of the design process.

Rationale

The Exploration Review (Benchmarking and Needfinding) gave you a design knowledge foundation. Now it is time to try a design cycle that projects into the future of what could be.

The goal of prototyping is to challenge certain assumptions you have about your design by building certain aspects of the product and testing it on users, physics, and/or yourself. A prototype ultimately should answer questions that you have about your design (and at the same time raise/answer questions that you never even thought about). A critical function prototype is not a mockup, which communicates the idea to other people (scale models are in this category unless you plan to take it to a wind tunnel). Before you start building, think to yourself "what is the question I'm trying to answer with this prototype?"

Review Format

This is a "benchtop review." You will have approximately 20 minutes (+5 minutes Q&A) to make your case. The focus is on the hardware and/or results. A simple two-sided handout for attendees is useful to summarize the main points. Printouts of plots of data are also appropriate, but a fancy presentation with PowerPoint slides is NOT appropriate. The handouts should complement your briefing and not substitute it.

Tips and Comments

This is not a challenge to put in a bunch of all-nighters gluing something together. It is a thinking challenge to identify the critical issues that afford you a creative opportunity. One key measure of that affordance will be how much you learn from the prototype. That said, this assignment is often the defining one for teams in the fall semester and gives a strong indication of how significant their future engineering efforts will be.

In order to "answer questions," there is a tendency to design experiments rather than products or prototypes. Teams that do this often run into the problem of having quantifiable data that does not guide their design at all. By trying to design products (or parts of it), you'll get better insights (from testing and building the prototype) that will help you move on with the design even if the prototype ends up being an absolute disaster.

Examples

Example-1: The resonance frequency of a device will make or break its utility, THEREFORE, build a simple apparatus for observing mechanical resonance behavior and making relevant measurements of it. Ideally, present some preliminary results obtained with the apparatus too.

Example-2: You think gesture recognition is a good way of interacting with functions in a car but you don't know if the user will find this intuitive or desirable. THEREFORE, set up a gesture control simulator with one of your team members controlling the in car function while watching what the user is signaling (ideally through a camera so that the user does not know that there is a human operator in the system). Run certain experiments to collect user reactions and insights.

Example-3: Your benchmarking has revealed a sensing approach for your design that is very intriguing, but also high risk. THEREFORE, build some test apparatus that can help you determine whether the approach is really worth pursuing further.