Element D – Score 0
Bicycle Tire Pressure Project

This entry would be likely to receive a score of 0, based on the EDPPSR.

The entry conveys the brainstorming that took place in order for the students involved in the project to select a problem. The entry had nothing to do with possible design solutions to the problem upon which they ultimately settled—the need for a device that notifies bicyclists of incorrect tire pressure, which can result in a reduction in the efficiency of or damage to equipment, and cause injury to the cyclist. Thus, there is no evidence of iterative thinking about a possible design solution.

The last paragraph of this entry does suggest that the students themselves were aware that they had not yet addressed design concept generation or the analysis that would lead to the selection of a possible solution. For this reason, some readers might regard this as an attempted explanation and assign the entry a score of 1.

One engineering educator who reviewed this entry commented that although not appropriate for the task at hand—design concept generation, analysis, and selection—this entry does demonstrate strong brainstorming skills and noted that those skills might have been applied elsewhere/earlier in the portfolio as foundational information.

Engineering Design Process Portfolio Scoring Rubric
Component and Element Titles

Component I: Presenting and Justifying a Problem and Solution Requirements

- Element A: Presentation and justification of the problem
- Element B. Documentation and analysis of prior solution attempts
- Element C. Presentation and justification of solution design requirements

Component II: Generating and Defending an Original Solution

- **Element D: Design concept generation, analysis, and selection**
- Element E: Application of STEM principles and practices
- Element F: Consideration of design viability

Component III: Constructing and Testing a Prototype

- *Element G: Construction of a testable prototype*
- Element H: Prototype testing and data collection plan
- Element I: Testing, data collection and analysis

Component IV: Evaluation, Reflection, and Recommendations

- Element J: Documentation of external evaluation
- *Element K: Reflection on the design project*
- Element L: Presentation of designer's recommendations

Component V: Documenting and Presenting the Project

- Element M: Presentation of the project portfolio
- Element N: Writing like an Engineer

Please Note: Elements M and N require no submission from the portfolio author(s) and are intended to be scored based on the portfolio work as a whole from what has been submitted from Elements A through L

Element D: Design concept generation, analysis, and selection

5 The process for generating and comparing possible design solutions was comprehensive, iterative, and consistently defensible, making a viable and well-justified design highly likely; the design solution ultimately chosen was well-justified and demonstrated attention to all design requirements; the plan of action has considerable merit and would easily support repetition and testing for effectiveness by others.

4 The process for generating and comparing possible design solutions was thorough, iterative, and generally defensible, making a viable design likely; the design solution chosen was justified and demonstrated attention to most if not all design requirements; the plan of action would support repetition and testing for effectiveness by others.

3 The process for generating and comparing possible design solutions was adequate and generally iterative and defensible, making a viable design possible; the choice of design solution was explained with reference to at least some design requirements; the plan of action might not clearly or fully support repetition and testing for effectiveness by others.

2 The process for generating a possible design solution was partial or overly general and only somewhat iterative and/or defensible, raising issues with the viability of the design solution chosen; that solution was not sufficiently explained with reference to design requirements; there is insufficient detail to allow for testing for replication of results.

1 The process for generating a possible design solution was incomplete and was only minimally iterative and/or defensible; any attempted explanation for the design solution chosen lacked support related to design requirements and cannot be tested.

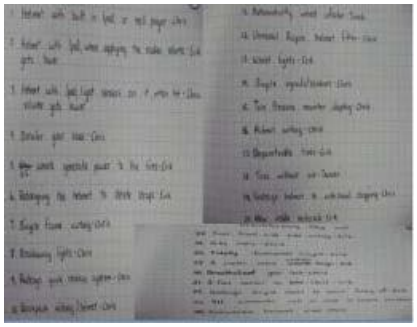
0 There is no evidence an attempt to arrive at a design solution through an iterative process based on design requirements.

Bicycle Tire Pressure

DESIGN CONCEPT GENERATION, ANALYSIS, AND SELECTION D

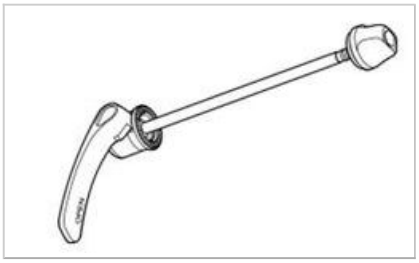
Overview of project's development and designing a solution

Throughout the first two months of this project, our problem statement was far broader. Realizing that in 2009, 630 bicyclists were killed on U.S. roads with far more injured, myself and partner [redacted] initially set out to solve this problem. However, we soon realized that there are many directions one can take in improving bicycle safety. In our search for specifying our problem statement, we learned many things about bicycle safety from both the Internet and consulting experts. Through considering the myriad of ways bicycle injuries can occur as part of our initial brainstorming session, we developed 30 designs. Each of these designs had unique characteristics that could potentially solve the specific problems our research and survey had outlined for us.



Out of our 30 brainstormed ideas, five of them particularly resonated with us. Initially, we believed that any of these could be accomplished within our time-frame, in addition to each design exhibiting otherwise noteworthy characteristics. They include:

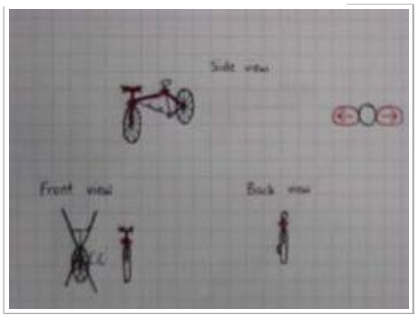
#1 Redesign the quick release function



The quick release is a skewer that allows cyclists to remove their bicycle wheels without the need of tools. Brought to our attention through California taking legal action to nearly prohibit companies from installing quick releases in new bicycles, the accidents due to quick releases have been well documented. Unfortunately, our group decided that redesigning such this metallic skewer would be difficult considering the materials that are available to us

#2 Bicycle Brake Lights

While light reflectors and installable lights of all sizes exist for bicycles, we designed a light that would illuminate upon cyclists hitting their brakes; this is similar in functionality to automobile brake lights.

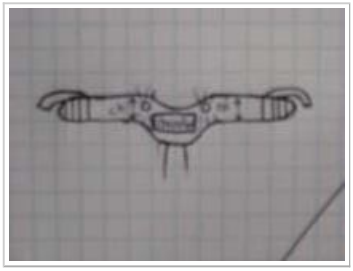


Upon researching this design further, our group discovered a product called LucidBrake. Our groups believes that when utilized, LucidBrake effectively solves driver's unawareness of decelerating bicycles.

#3 Universal Bicycle Strap Harness

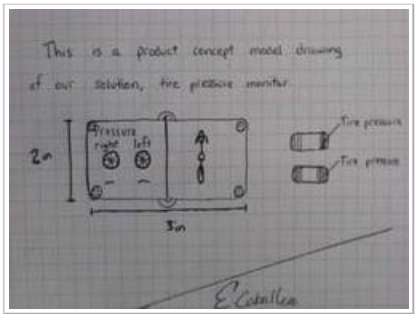
In order to ensure that bicycle helmets stay in place, most new helmets feature a strap harness. However, we have found that many older helmets do not offer the strap harness. Therefore, we figured that a harness that could be installed into older bicycle helmets would eliminate the necessity of cyclists purchasing a newer helmet simply because of the included strap harness. This idea was discarded as experts suggested that obsolete helmets should be replaced regardless, due to the protection wearing out in a matter of two years.

#4 Bicycle handlebar radio



While bicycle radios already exist, we found that a common complaint about these devices is that the audio is too quiet. Eventually, our group realized that this trade off was due to the other design constraints bicycle radios must obey, remaining light and unobtrusive. Understanding the brevity of redesigning the bicycle handlebar radio, we similarly agreed to abort redesigning this device.

#5 Bicycle wheel tire pressure gauge



Discovering similar pressure monitors in cars and motorcycles, this unspecific design was believed to have the most potential. We then refined our problem statement to reflect our newer, specific problem we would focus on. Despite the new problem statement, our original purpose to improve bicycle safety is ultimately satisfied.

By the time we were able to validate the problem of bicyclists' frequent unawareness to incorrect amounts of tire pressure, rigorously search for existing solutions, and develop design parameters, it was necessary to finalize our semester's work. Thus, our first step upon returning will be to develop several designs that are objectively based off of our design parameters.