Executive Summary

NanoHUB.org has alerted our engineering team to a problem. Namely, that the underclassmen at the university level believe that nanotechnology is not something they will deal with until later in their academic careers- or something they will not have to deal with at all. NanoHUB has tasked our team with assisting in the solution of this problem by creating a Graphical User Interface (GUI) using MATLAB. This ‘solution’ must meet each of the following six criteria:

1. Clearly helps peers understand the Size & Scale of nanotechnology (big idea #1).

2. Clearly assists peers in connecting Size & Scale to at least one other nanoscience (big

ideas #2-5).

3. Clearly connects 1. & 2. to one or more engineering disciplines.

4. Uses simulation(s) to enable visualization and exploration of models related to 1., 2., and 3.

5. Is highly engaging and interactive for peers.

6. Is easy to use and operate.

Our team has decided that the best way to solve NanoHUB’s problem is by creating a set of GUIs to explain different aspects of nanoparticles as if they were being used to design an airplane. Each of our simulations applies to a different aspect of the plane’s design. This will help teach students the importance and functionality of nanoparticles while relating them to something more well-known, such as an airplane. Relating all four simulations to building an airplane helps verify that the information being delivered to the user actually has a real-world application and applies to an engineering field.

Our solution meets these criteria 1 by showing and allowing the user to interact with rivets on a plane wing, carbon nanotubes in the wing, and graphene molecules in the nanotube.

Our solution meets criteria 2 by showing how nanoparticles can react chemically in surprising ways due to their increased surface area (size-dependant properties).

Our solution meets criteria 3 by placing the user in a scenario where they are an aeronautical engineer and have a design they wish to present to a board of directors, but need some information from the chemical engineering and mechanical engineering teams to finish up and make some informed decisions.

Our solution meets criteria 4 by plotting various nanoscale properties that can affect the building of an aircraft against time (for example, structure of a wing during takeoff).

Our solution meets criteria 5 by providing multiple inputs in each simulation and providing the user with a story of sorts, instead of just thrusting information at them.

Our solution meets criteria 6 primarily by eliminating the need for typed user input. Instead the user will select from a series of buttons, or operate a slider, etc. This also helps eliminate user error.