The goal of our project was to develop a wireless location approximation system for use within an aircraft fuselage. The location detection will take place within the interior of a 200 foot long aircraft assembly while it is being populated with 1/2 inch thick metal or plastic structures. The location detection needed to be accurate to within 1/2 inch and able to perform efficiently in conditions when the radio signal was obstructed. The coordinate system was required to be capable of moving with the fuselage during the assembly process. As multiple systems were to be implemented, it was required that there be no interference between systems in close proximity.

The Team realized that many wireless localization systems are currently available and being used in production. After careful research of the accuracy, cost, and performance of each system the Team decided upon the TI CC2431dk. By arranging the wireless transmitters of the TI system into different physical arrangements and implementing a 3d positioning algorithm, the Team was able to meet the requirements of the project. The Team created a software utility program and a user manual for the positioning system.

An intersection of spheres algorithm was implemented to compute the coordinate location of a node of unknown location. The algorithm filtered and averaged the coordinates obtained from every combination of three fixed reference nodes within range of the blind node. The algorithm was verified through simulation. To see how the system handled errors, several simulations were performed using perturbed distance measurements. The simulated system was found to maintain 1/2” accuracy when small perturbations occurred across multiple distance measurements.

A series of physical testing grids was developed to test the accuracy of the actual system in a production environment. The grids varied in size and shape, and several different testing locations were planned. Although the Team was unable to complete this testing, a detailed description of all grid layout parameters and testing locations was created. It is the recommendation of the Team that further testing be performed to determine the overall accuracy of the system.