

SENIOR DESIGN PROJECT: AIR FORCE ABSTRACT

This project is a competition among several universities presented by the Air Force Research Laboratory, whose mission is the discovery, development, and integration of warfighting technologies for our air, space, and cyberspace forces. The challenge was to design and manufacture a robot capable of placing a sensor on a structure, tree, pole, or building. The robot must have the ability to function 150 feet away from the individual operating it, must also be capable of operating 10-100 feet above the ground, and must be able to position three or more sensors. Simple cameras like GoPro's and Rings were preferred. Additionally, the robot should not leave visible damage while the robot is operating on a structure, wall, tree, or pole. A ground approach is preferred when the robot is about to operate because the robot will be mainly used in third-world countries where there are wind restrictions that will make this task nearly impossible for a flying-style method.

Our first approach to this challenge was to split it into four main teams. The Spider bot team focused on designing, building, and testing concepts that will allow the robot to stick to the wall. The Spider Bot team emphasized on using spikes and coming up with a mechanism that can retract the spike while not in contact with a wall or structure. The Powered Propeller team focused mainly on testing, designing, and building structural frames for the robot. Also, the Powered Propeller team was responsible for coming up with propellers that can retain the robot. The Robot Communication team was responsible for the coding and powering of the robot. The Gecko Bot team was responsible for coming up with electro-adhesive design; however, the Gecko Bot team was cancelled due to a proof-of-concept failure and inability to manufacture.

The end goal was to combine the best concepts and prototypes each team presented and utilize them to make it into one well-functioning robot. This approach keeps track of each member's effort towards the project and encourages participation. Throughout the project, we were able to test five prototypes. These five prototypes were a combination of each team presented. From this, we were able to combine our technologies to make our current designs. From the results we derived from each prototype, we were able to come up with two robot prototypes. One of the prototypes is purely propeller driven with free rolling wheels, and the other uses spike-wheels powered by servo motors along with propellers generating a large normal force for the robot to climb. While going through the process of testing, we found that our spike-wheel driven robot has the climbing technology needed to complete the task at hand, but it may lack in battery technology.