Controlled Landing: Manipulating a Parachute to Determine the Landing Site of a Rocket

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The parachute is the most important device in the recovery of a rocket. Subject to changing and unpredictable wind vectors, parachutes add significant uncertainty to the landing site. This experiment aimed to test the effects of shortening and lengthening the shroud lines of three parachutes with the ultimate goal of using these changes to control the landing site of its payload. For the preliminary tests, three parachutes of different shapes but equal area were tested using a leaf blower and a rail. Each parachute had its shroud lines shortened by fifteen centimeters and was connected to a small car that could move freely in two directions perpendicular to airflow. All the parachutes exhibited some effect from the shortening of shroud lines, but the effects were greatest on the square parachute and least on the three to one ratio rectangular parachute. The octagonal parachute exhibited minor changes. Using these data, further tests were performed on the square parachute. A shroud line shortener was connected to the square parachute and launched to an altitude of 1.3 kilometers in a model rocket. The shroud line shortener aimed to change its landing site to be closer to either a target latitude or a target longitude, depending on orientation. Compared to the pieces of the rocket of similar mass and parachute size, the prototype was found closer to the target latitude, indicating shortening of shroud lines is able to significantly change the landing site of a rocket in two dimensions.

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