Experimental Conditions

The experiment was performed at a parking garage at TCC. The experimental apparatus was dropped from the fourth floor, approximately 11.2 meters. The conditions were slightly windy which caused the apparatus to drift a couple of feet from where it was dropped on the horizontal plane while the parachute was attached. Minimal to no drift was observed with the streamer.

Results

Model 1 seems to be very accurate, average decent time recorded during the experiment was 3.2% longer then model 1 predicted. The predicted time for the fall based on this model 2.46 seconds and the average time measured for the fall was 2.5 seconds. These results are nearly the same and the error between them could be that the stop watches used to measure the fall times were only accurate to the tenth of a second and the delay in the operators' reaction time. Model 1, also, accurately predicted the falling time for parachute 2 as well. The average time measured in the experiment was 7.5% longer then the model predicted but this is the difference between 1.9 seconds measured compared to 1.8 seconds recorded, so the error in the measurements could be caused by the delay in human reaction time to the release of the apparatus and it striking the ground. The stream is a different case. The model predicted that the apparatus would fall 8.2% more slowly than what was measured. This could be because unlike with the parachute which has a constant drag coefficient regardless of the material, the drag coefficient of the streamer was unknown. A range of drag coefficients was found but it appears the drag coefficient of the streamer used may have been lower than the range that was found. For this reason it may be more difficult to institute a streamer.

Model 2 seems to be less accurate. Model 2 assumes that the parachute and streamer only limits the terminal velocity of the apparatus and has no effect on the acceleration. This means that the model's accuracy increases the longer the apparatus is at terminal velocity and as the drag coefficient is smaller. This is because the expected acceleration time is constant for the model regardless of the drag coefficient. The measured decent time for parachute 1 was 22% larger than the model predicted. Since the apparatus with parachute 2 did not reach terminal velocity for very long or possibly even at all, the fall took 42% longer than predicted by the model. An increase in accuracy is seen for the streamer but, this increase is because the drag force generated by the streamer was significantly less than either of the parachutes.

When comparing the parachute It can be seen that even though the area of the streamer is 44% larger than parachute 2, the streamer only increases the falling time by 15 while parachute 2 increases the falling time by 46 percent.

Using model one to predict the size of the parachute and streamer necessary to limit the terminal velocity of the CanSat to 20 meters per second, it is found that the area of the streamer would be over 5 times larger than the parachute. This would give the parachute a 7.5 inch diameter and assuming the width of the streamer is 1.5 inches, the length of the streamer would be 13 feet and 3 inches long. Since there is a limited amount of space and a streamer would be more difficult to predict it would be most beneficial to the project outcome to use a streamer.