Optimum Shroud Line Length for 50 cm Parachutes--Summary

Ryan Coleman
NAR #59361 B Div

The primary objective of this work was to test what shroud line length provided the most drag and descended the slowest for 50 cm parachutes. In this process, I also hoped to observe that parachutes with excessively short shroud lines descend faster, verifying the process of reefing parachutes.

For this project I made 5 indentical parachutes of dry cleaner's bag material. The only difference was in the length of the shroud lines, measured from parachute edge to the snap swivel. I dropped these parachutes 10 times each from 5 meters and 10 times each from 11 meters.

This report fulfilled both objectives. I observed from the data that Parachute D provided the longest time aloft in both sets of drop tests. I also verified that reefing parachutes, or using parachutes with short shroud lines will result in quicker descent time. Of course, we can only be scientifically sure of the 1.5 x Parachute Diameter shroud line length being optimum for parachutes 50 cm in diameter and carrying 23.7 grams of weight.

Optimum Shroud Line Length for 50 cm Parachutes
Ryan Coleman
NAR #59361

Objectives

The primary objective of this work was to test what shroud line length provided the most drag and descended the slowest for 50 cm parachutes. In this process, I also hoped to observe that parachutes with excessively short shroud lines descend faster, verifying the process of reefing parachutes.

Experimental Setup

For this project I made 5 indentical parachutes of dry cleaner's bag material. The only difference was in the length of the shroud lines, measured from parachute edge to the snap swivel. I established the following naming conventions to use throughout this report:

Name	Individual Shroud Line Lengths	Length / Parachute Diameter
A	37.5 cm	0.75
B	50 cm	1.0
C	62.5 cm	1.25
D	75 cm	1.5
E	100 cm	2.0

Each parachute would be dropped 10 times each attached to 23.7 grams of weight. I used a balcony and a window both contained inside Piqua High School to conduct the drop tests. At the time the tests were conducted, the building had been setting empty for several years and had little or no air movement. The temperature in the building, although not measured, was

approximated at 20' C.

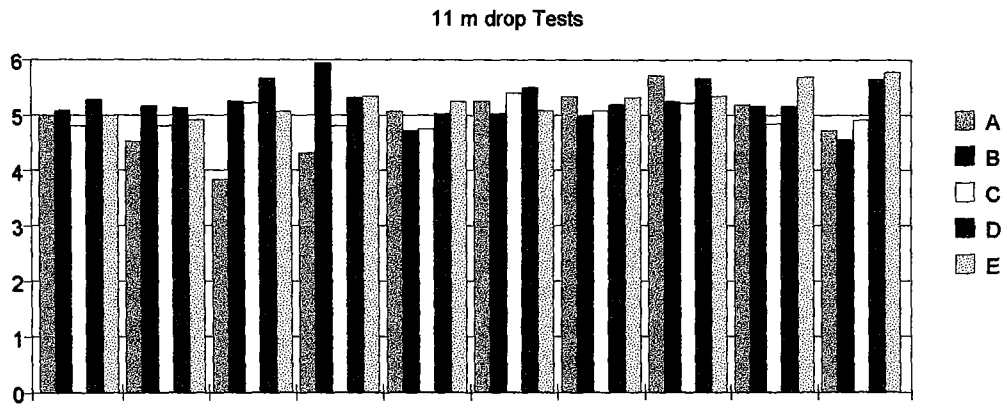
The two drop zones were 5 meters and 11 meters high respectively. A stopwatch with hundreth of a second accuracy was used to time them from release to touchdown. A fishing pole with a snap swivel attached in place of a hook was used to pull the parachutes back up to be dropped again. A 2 meter piece of wood had a clothespin attached at one end with a wire which could be pulled to release the parachutes. Each parachute would be put into the clothespin at its center. Time would be taken for the parachute to stop swaying, since this could affect the drop. When a signal was given, the parachute would be dropped, timed, and then hoisted back up.

Results

Here are the results from the 11 meter drop zone:

	A	B	C	D	E
1	5.00	5.09	4.81	5.28	5.00
2	4.53	5.16	4.81	5.13	4.91
3	3.84	5.25	5.22	5.66	5.07
4	4.32	5.94	4.81	5.32	5.34
5	5.07	4.72	4.75	5.03	5.25
6	5.25	5.03	5.40	5.50	5.09
7	5.34	5.00	5.09	5.19	5.32
8	5.72	5.25	5.22	5.66	5.35
9	5.19	5.16	4.85	5.16	5.69
10	4.72	4.56	4.91	5.65	5.78
Avg.	4.898	5.116	4.987	5.358	5.28

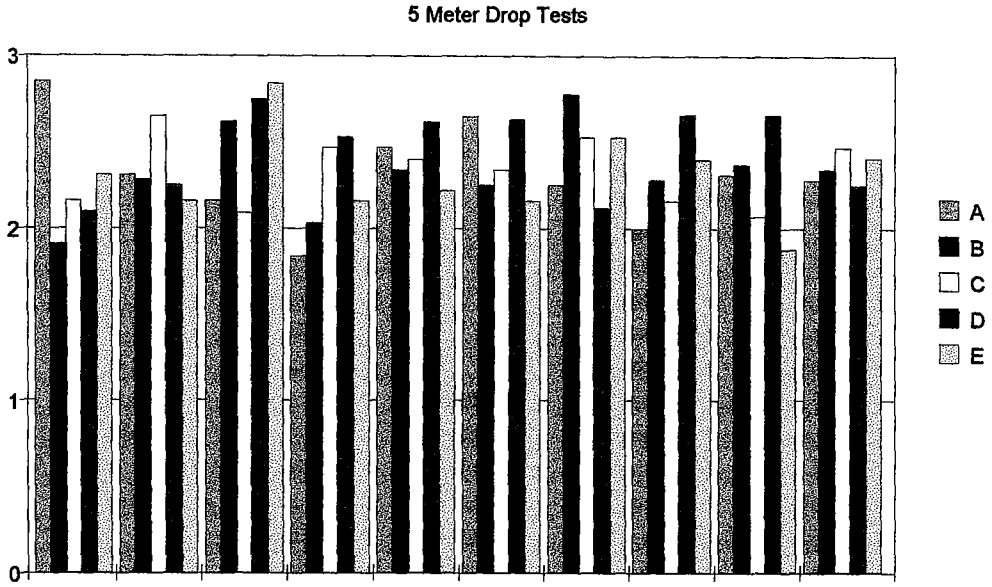
These results can also be graphed as follows



Here are the results from the 5 meter drop tests

	A	B	C	D	E
11	2.85	1.91	2.16	2.10	2.31
12	2.31	2.28	2.65	2.25	2.16
13	2.16	2.62	2.09	2.75	2.84
14	1.84	2.03	2.47	2.53	2.16
15	2.47	2.34	2.40	2.62	2.22
16	2.65	2.25	2.34	2.63	2.16
17	2.25	2.78	2.53	2.12	2.53
18	2.00	2.28	2.16	2.66	2.40
19	2.31	2.37	2.07	2.66	1.88
20	2.28	2.34	2.47	2.25	2.41
Avg.	2.312	2.32	2.334	2.457	2.307

And here is the corresponding graph:



Also of value would be observations made while the parachutes fell. The shorter length shroud lines of parachute A and to some extent B made the parachute very unstable and oscillate violently, which decreased their time aloft. Parachutes C and D had enough length to let the parachutes open up fully and cause the most drag. At times, Parachute E's shroud lines could be observed pulling down on the rim of the parachute, obvious that their weight had overcome the advantage of length.

Conclusions

This report fulfilled both objectives. I observed from the data that Parachute D provided the longest time aloft in both sets of drop tests. I also verified that reefing parachutes, or using parachutes with short shroud lines will result in quicker descent time. Of course, we can only be scientifically sure of the 1.5 x Parachute Diameter shroud line length being optimum for

parachutes 50 cm in diameter and carrying 23.7 grams of weight.

Materials Used

Dry Cleaner's Bag	$0.25
Spool of Thread	$.075
5 Snap Sviwels	$1.00
Lead Weights	$0.50
Tape Dots	$0.10
Total	$2.60

Materials on hand used were scissors, board, clothespin, fishing pole, stopwatch, clipboard, and Piqua High School.