Parachute Design Challenge

[redacted]

Period #7

Introduction to Technology/Art
Brooklyn Technical High School
Mr. Goldman, Teacher
February 13, 2001

Name [redacted] Period 7

excellent report (A) Glad you enjoyed it. Keep up the good work MB.

Parachute Report Assessment

1. **Cover** Neat ✓ Correct Format ✓ Correct Information ✓

2. **Table of Contents** Included ✓ Pages Numbered ✓ Page Numbers on T of C ✓

why not all of them?

3. **The Design Challenge** Included ✓

4. **Orthographic Projection** Included ✓ (A-)

3 views shown ✓ Views correctly oriented ✓ Major dimensions included ✓*
Ruled border ✓ Title Block ✓ Title Block information complete/correct ✓

Generally fine. You're got the idea.

* check the way I dimensioned on my samples. See me for help
* You don't need to show same dimensions on more than one view
Use pencil when you draw. No need to go over it in pen.

5. **Discussion** Included ✓ Titled ✓ (A)
Process described ✓ Variables listed ✓ Variables' affect examined ✓

What worked well/what did not ✓+ Changes suggested ✓ Extra Credit ✓

Good job here. You are clear and you give lots of useful information.
Would have liked to know a bit more about what role the group played, if any.

6. **Appendix** Title Page ✓ Test Records included 7-8 (A+) Other items —

these Test records suggest you did a lot of serious & thought ful work here. Keep it up. Excellent work.

In the future you ~~will~~ should be more specific in describing "Changes" & Mor elaborate & specific in examining "what you think you learned" (in conclusion.) this will help you clarify what you did & learned & help you do better work. And it will help me understand

See back for additional comment

What you are good at & where you need help

Table of Contents

ıme _____ Period _____

Parachute Design Challenge I

tuation:

rachutes are devices most often used to increase the time it takes for an object to fall a given distance rough the air. (They are also be used to slow a vehicle or airplane to assist it in coming to a stop.) When ed in vertical drops, parachutes generally look like large canopies with a cargo tethered or tied to them.

ıe force of gravity causes objects, including parachutes, to fall towards the earth's surface. If we increase ɜ mass (weight) of a falling parachute or the load it is carrying (without changing anything else) we ɔrease the force due to gravity, and the parachute and its load will fall faster.

falling parachute is designed to resist the pull of gravity. As it falls through the air, it collides with air ɔlecules under it. Air has mass, and this provides a resistance to the falling motion of the parachute and its rgo. This air resistance is called drag. If we increase the surface area of a parachute (without changing ything else) we increase the number of collisions between the parachute and surrounding air molecules. ıt is we increase the drag, and it will drop slower.

ɔoblem:

ɔsign a parachute that takes the longest time to fall a specified distance.

ıecifications:

Only the coffee filters provided by the teacher may be used to fabricate the parachute "canopy."

A minimum load of at least three washers (1/4", provided by the teacher) must be attached to the parachute as a load or cargo. Additional weight may be added.

The drop height will be from the bottom of the light fixtures. Only one person may hold the parachute in preparation for dropping. The parachute must be touching the light fixture when it is dropped/released.

ıles:

Students will work in groups. Every student must make his/her own parachute for the final "contest."

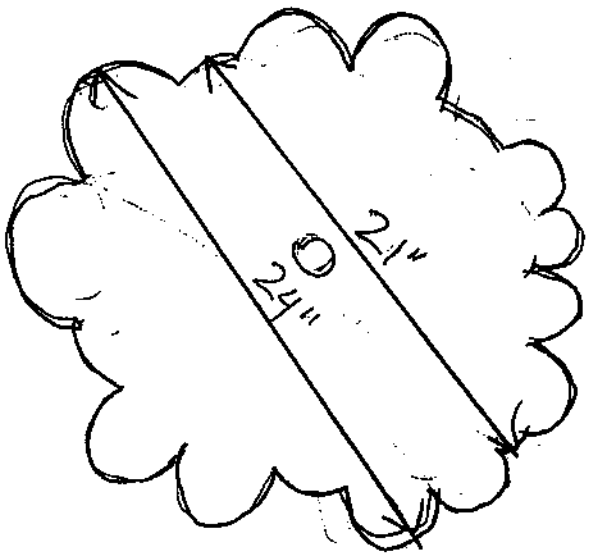
Drop time will be determined with a stopwatch provided by the teacher and will be kept by a students appointed by the teacher as "time keeper."

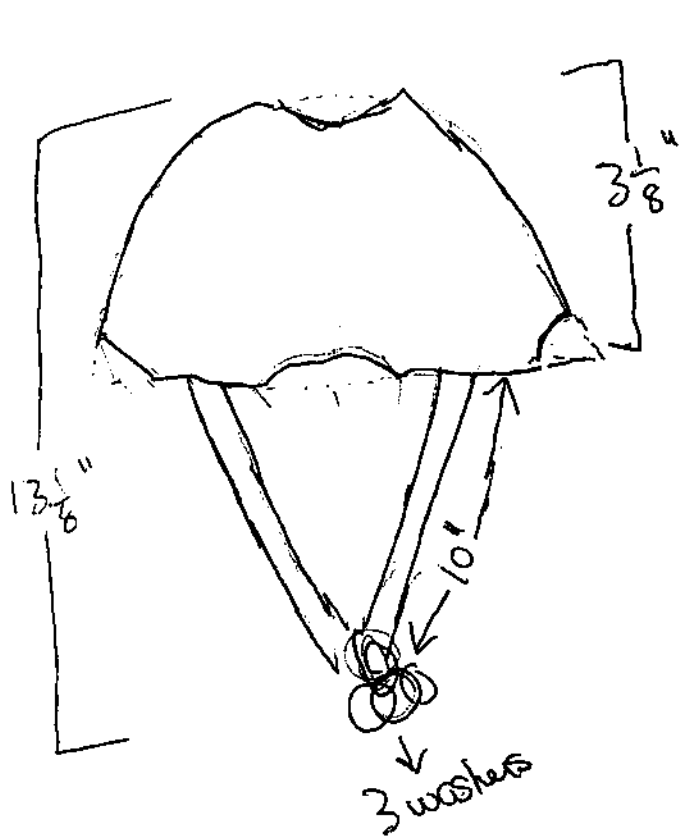
Each student will drop his/her parachute a maximum of 3 times. The number of drops will be determined by the teacher, depending of the time available.. The longest time aloft will be counted.

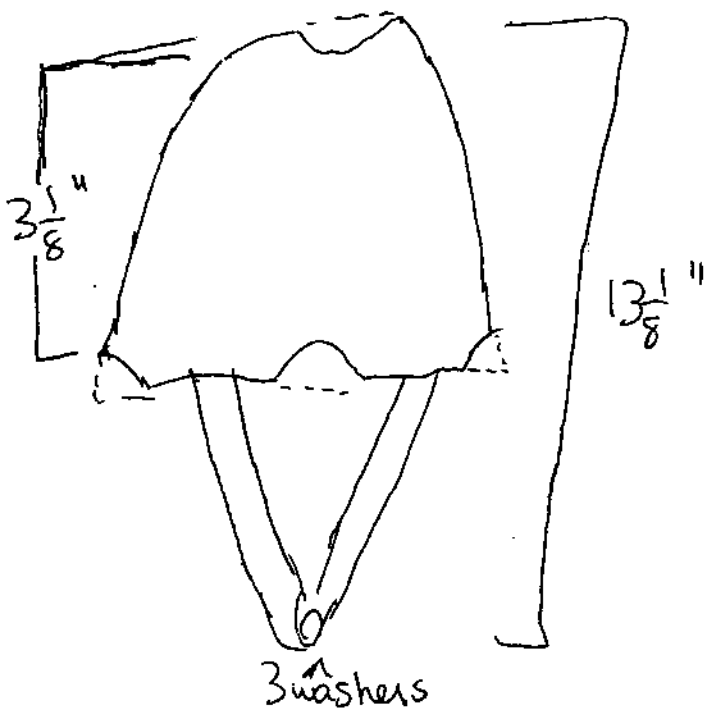
Group drop times will be determined as follows:
All team members' drop times will be totaled and the sum divided by the number of team members. If a student does not have a qualifying parachute to drop on the day of the "contest" his/her drop time will be zero seconds and will be added to the teams total before dividing the total.

The team with the highest score, calculated as defined in #4, will be declared the winner.

The date of the contest will be 2-18.







PARACHUTE	PERIOD #7 GROUP #1	FEBRUARY, 13, 2001	DRAWN BY: [redacted]

Parachute Test & Design Challenge Discussion

The process that I went through was in some way a bit complicated. First, I started off on square one on the first day. I examined the problem, and determined what I had to do for this project. Then, after clearly understanding this, I made a list of *possible* solutions for this project. There were many solutions that could have been *possible*. However, I realized that instead of going through every single one of these solutions, I should break it down. I put them in several different categories. These categories were basically the variables that I had to trade-off, or adjust, for the maximum and best solution.

There were some important variables that I had to reason, in order to make this parachute. Probably the most controversial one was whether or not I should put a hole in the parachute. After reading about parachutes, I wondered whether a hole on top of my parachute would actually work. Also, if it did work, how many of them did I need? As a result, I experimented. First, I constructed a prototype of a primitive parachute. This consisted of a single coffee filter with all the weights attached to a paper clip, without a hole. The test results confirmed that the motion of the parachute was chaotic. Therefore, I inserted a hole in a copy of the prototype. Unfortunately, the parachute was also chaotic.

Brain storming once more, I made the parachute bigger. This time I tested the parachute out without a hole, and my prediction was accurate. The flight of the parachute was chaotic. Then, I tested the parachute **with** a hole. Fortunately, what I expected happened. The parachute was in a constant motion, with the hole assisting in a constant passage of flowing air. I also learned that the bigger the parachute, the bigger the hole had to be for it to take an effect, and there was the need for only one hole, and no more.

Another aspect that had to be taken into consideration was the height of the string. In the beginning, I viewed that a person with a small parachute, and big strings had a typical slow parachute. Unfortunately, the same thing was not true for big parachutes. The most effective solution was to make the strings short in ratio and proportion of the parachute.

After making the finalized design and viewing the parachute in the contest, I recognized some faults in it. First, there was nothing to keep the parachute open. I needed some mechanism, probably cardboard, to keep the parachute its shape. This would be one major change because if the parachute was not kept open, it would collapse and fall quicker to the ground. Therefore, if I had accomplished this task, not only would it have been kept in a steady open position, it would be open, since I let it go from the top.

In conclusion, I basically like this project. This wasn't a project where a person had to do much writing and understanding. He or she had to figure it out on his or her own. Also, after school, my friends and I in our technology class and built our parachutes. It was fun because we were not supervised and we could fool around with our parachutes. I also had fun because during this time, we had mini-contests to see whose was better. I recommend that Mr. Goldman do this project again for the next CFI class.

Appendix

Name [redacted] Period 7 Date _____ GOLDMAN

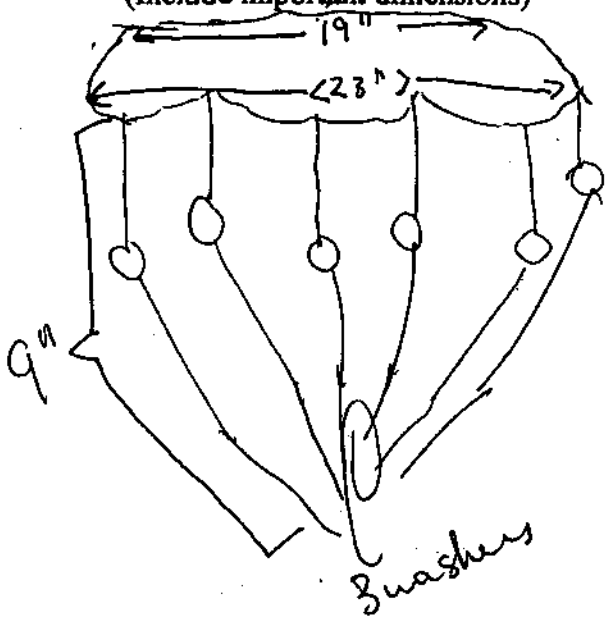
Parachute Design Test Record

Instructions:

1. You must complete a new "Test Record" each time you significantly change your parachute design.
2. You must complete all parts of the "Test Record."
3. Make at least three tests for each modification or each time you change or adjust a variable.
4. Record all data every time you test your parachute.

Design # 1

Sketch
(Include important dimensions)



Data

Test #	Drop Height	Drop Time
1	106"	3.5 secs.
2	106"	3.4 secs
3	106"	4.0 secs
4	106"	3.6 secs
5	106"	3.7 secs

Changes since last test
Including changes in design of parachute, ropes, drop height, load, etc.

Conclusions:
1. Summarize your data. 2. State what you think you learned with this test. 3. What you plan to do next.
(Use the back of this paper if you need more space.)

1) ~~The range diameter of the para~~
2) 5 tests were done. I eliminated extremes = 4.0 secs. Average = 3.55 secs
2) The lane diameter slowed down the descent of the parachute. Also the holes at the top gave a constant descent of the parachute instead of a swaying motion.
3) I will cover up the holes in order for the descent to slow even more.

Name [redacted] Period 7 Date 2/5/01

Parachute Design Test Record

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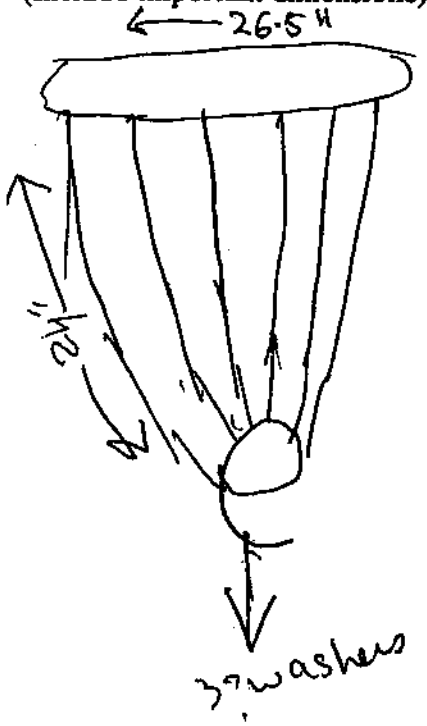
3. Make at least three tests for each modification or each time you change or adjust a variable.
4. Record all data every time you test your parachute.

Design # 3

Sketch
(Include important dimensions)



Data

Test #	Drop Height	Drop Time
1	103"	3.0
2	103"	2.6
3	103"	2.7
4	103"	2.8
5	103"	2.9

Changes since last test
Including changes in design of parachute, ropes, drop height, load, etc.

Increased number of coffee filters in a more organized manner.

Conclusions:
1. Summarize your data. 2. State what you think you learned with this test. 3. What you plan to do next. (Use the back of this paper if you need more space.)

1) Average = 2.7
2) The increase in coffee filters allowed a smoother air motion transfer
3) Add more coffee filters

Name _____ Period _____ Date _____ EG

GUARDIAN

Parachute Design Test Record

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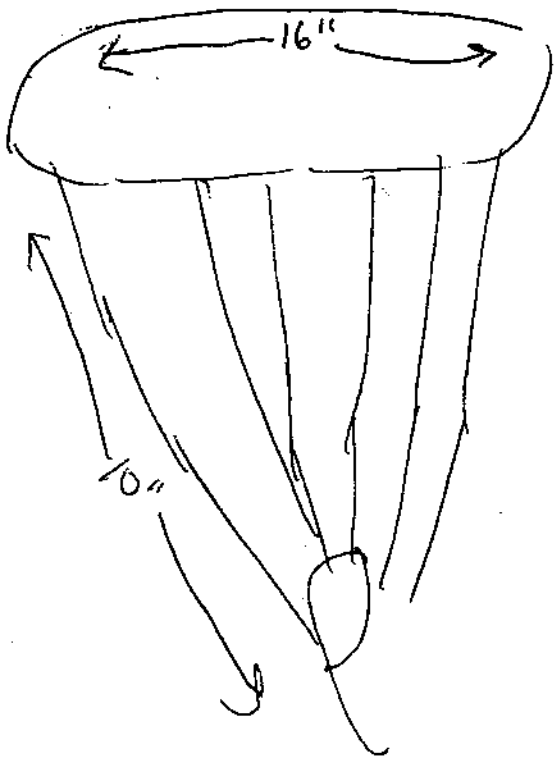
3. Make at least three tests for each modification or each time you change or adjust a variable.
4. Record all data every time you test your parachute.

Design # 4

Sketch
(Include important dimensions)



Data

Test #	Drop Height	Drop Time
1	106	2.19
2	106	1.25
3	106	1.41
4	106	2.10
5	106	1.60

Changes since last test
Including changes in design of parachute, ropes, drop height, load, etc.

~~Decreased~~ # of filters and strings

Increased

Conclusions:
1. Summarize your data. 2. State what you think you learned with this test. 3. What you plan to do next. (Use the back of this paper if you need more space.)

1) Took away extremes = 2.10 Mean = 1.30
2) The disorganization of the canopy caused a faster descent.
3) Organize the canopy more with a set pattern.

Name _____ Period _____ Date _____

GUSSMAN

Parachute Design Test Record

Instructions:

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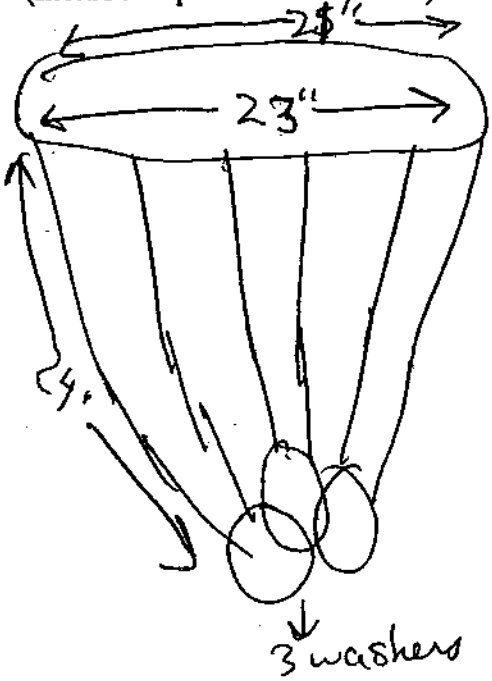
2. You must complete all parts of the "Test Record."
3. Make at least three tests for each modification or each time you change or adjust a variable.
4. Record all data every time you test your parachute.

Design # 6

Sketch
(Include important dimensions)



Data

Test #	Drop Height	Drop Time
1	106	2.6
2	106	2.3
3	106	2.4
4	106	2.2
5	106	2.5

Changes since last test
Including changes in design of parachute, ropes, drop height, load, etc.
Turned old-fashioned parachute into a glider and increased the strings.

Conclusions:
1. Summarize your data. 2. State what you think you learned with this test. 3. What you plan to do next. (Use the back of this paper if you need more space.)

1. Average = 2.4
2. The glider is one of the excellent parachutes. But the strings need to be long for maximum result, which is a drawback.
3. Increase the width.

Name _____ Period _____ Date _____

Parachute Design Test Record

GOLDMAN

Instructions:

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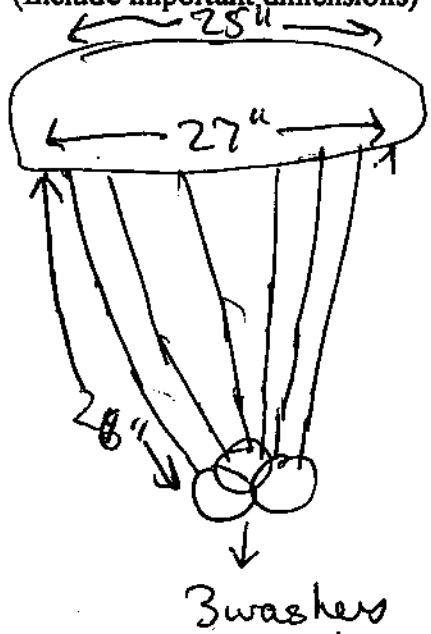
3. Make at least three tests for each modification or each time you change or adjust a variable.
4. Record all data every time you test your parachute.

Design # 6 7

Sketch
(Include important dimensions)



Data

Test #	Drop Height	Drop Time
1	106	2.4
2	106	2.5
3	106	2.3
4	106	2.1
5	106	1.8

Changes since last test
Including changes in design of parachute, ropes, drop height, load, etc.

Increased size of glider in width.

Conclusions:
1. Summarize your data. 2. State what you think you learned with this test. 3. What you plan to do next. (Use the back of this paper if you need more space.)

1. Average = 2.0 secs.
2. The glider was an excellent prototype for a parachute. Yet, it collapsed after some while, yet the increased width is bad.
3. Go back to the old-fashioned parachute. Yet, increase the # of coffee filters by 2x or 3x.