Name_____Period _____

Newton's 3rd Law Engineering Challenge

Problem or need: NASA is seeking for a solution to a collision that involves a moving object in a system. NASA needs a device (parachute) that can safely deliver a space capsule to the surface of a planet. A free fall drop will produce too large of forces for any occupants in the space capsule to survive the landing.

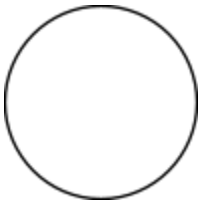
Supplies:

- One golf ball – the space capsule
- One Tissue paper
- 4 strings
- Tape
- Hole punch
- Scissors

Start of Testing

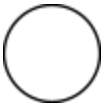
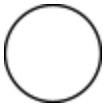
- Drop the unmodified space capsule in front of the height gauge from 2 meters, have one or two members of your group watching to see what the maximum height is that it bounced up.
- Repeat this test 2 more times and find the average bounce height
- Record the unmodified bounce here 1 _____ 2 _____ 3 _____ Avg _____

Using the space below draw a model of the forces involved and explain why the ball bounces.

Draw arrows on the model to show the action/ reaction forces that will be exerted in this system during the collision.	In the box below explain why the ball bounces. (be sure to discuss the model in your explanation)
 _____	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

Design Landing Version 1
Now using the tissue paper and string design a parachute, that involves a minimum amount of cutting, to slow the fall of your golf ball.

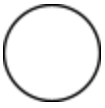
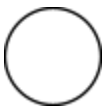
To help you with your design here are some suggestions. Position the strings at the corners of your tissue paper. Before you punch a hole in the tissue paper you should tape over the corners to strengthen them. For best results the strings that you use for the suspension lines need to be identical in length.

Draw a side view of your design here	Draw a top-down view of your design here
	

Testing Landing Version 1

- Before you drop space capsule make a prediction as to how high it will bounce up _____
- Drop the space capsule with Landing Version 1 in front of the height gauge from 2 meters, have one or two members of your group watching to see what the maximum height is that it bounced up.
- Repeat this test 2 more time and find the average bounce height.
- Record Landing Version 1 bounce here 1 _____ 2 _____ 3 _____ Avg _____
- What was the difference between your prediction and your average bounce height? _____

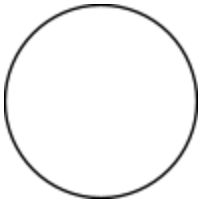
Design Landing Version 2
Now take your Landing Version 1 and review your results, determine what kept your parachute from performing as well as it could. With your team decide what changes you can make; this is the final test so you are able to do more cutting of the tissue paper than in the previous test.

Draw a side view of your design here	Draw a top-down view of your design here
	

Testing Landing Version 2

- Before you drop space capsule make a prediction as to how high it will bounce up _____
- Drop the space capsule with Landing Version 2 in front of the height gauge from 2 meters, have one or two members of your group watching to see what the maximum height is that it bounced up.
- Repeat this test 2 more time and find the average bounce height.
- Record Landing Version 2 bounce here 1 _____ 2 _____ 3 _____ Avg _____
- What was the difference between your prediction and your average bounce height? _____

Conclusion:

Draw a model of your lander and draw arrows to show the action/reaction forces exerted on your lander.	
How did you use Newton's Third Law to lessen the impact of the collision between the surface and the lander?	