

AERONAUTICAL RESEARCH JOURNAL

June 2013 Edition

Brooklyn Aerodrome Flight School

Name _____

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1

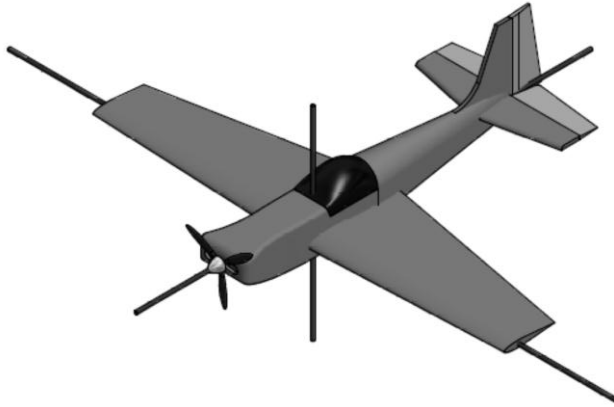
Paper Airplanes

5

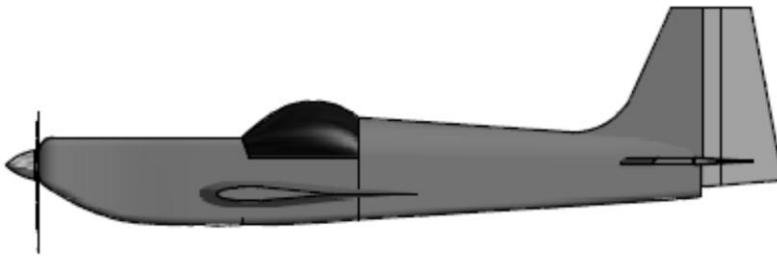
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Research: Describing Flight

Label Three Axis of Flight



Label the Four Forces of Flight



Experiment: Bullet vs. Dart

Hypothesis – What we think is going to happen

I think that planes with bigger wings will fly a shorter/longer (circle) distance than a plane with smaller wings when thrown softly

because...

Method – How are we going to do the experiment?

Quick Sketch of Bullet Paper Airplane	Quick Sketch of Dart Paper Airplane
Top View	Top View
Front View	Front View

Design: Best airplane for the job

Challenge: Create an airplane that will perform well in one of the three class challenges.

- Airplane that flies the furthest – longest distance as measured from the flight line to the airplane
- Airplane that lands closest to the center of a target – the airplane that is the smallest distance from the center of the target

Constraints – What are the rules or limits of designs:

- Each design must only use one sheet of paper
- Only enter one design into the competition

1. Plan

a. What competition do you want your plane to do the best in? (circle one)

Furthest

Most Accurate

b. How is each of the four forces of flight important to chosen competition?

Thrust	
Drag	
Lift	
Gravity	

c. What Airplane Attributes do you think are most important to your design (you may not be able to fit all of them into a design at the same time)

Attribute	Choose	Why you think it is important	How do you plan to implement the attribute
Wing Size	Big Wings Small Wings		
Weight	In the Front In the Middle In the Back		
Body Shape	Long Body Short Body		

2. Prototype

- a. Create two prototypes that will best match the attributes you think are important.

Prototype A	Prototype B
Top View	Top View
Front View	Front View

- b. Fold Both Prototypes
c. Test them in the testing area
d. Choose one prototype to enter into the competition
e. Which prototype did you pick? A B
f. How did you pick which prototype you are going to use?

3. Data Collection

a. How did your plane perform?

	Distance Event	Accuracy Event
Trial 1		
Trial 2		
Trial 3		
Average		

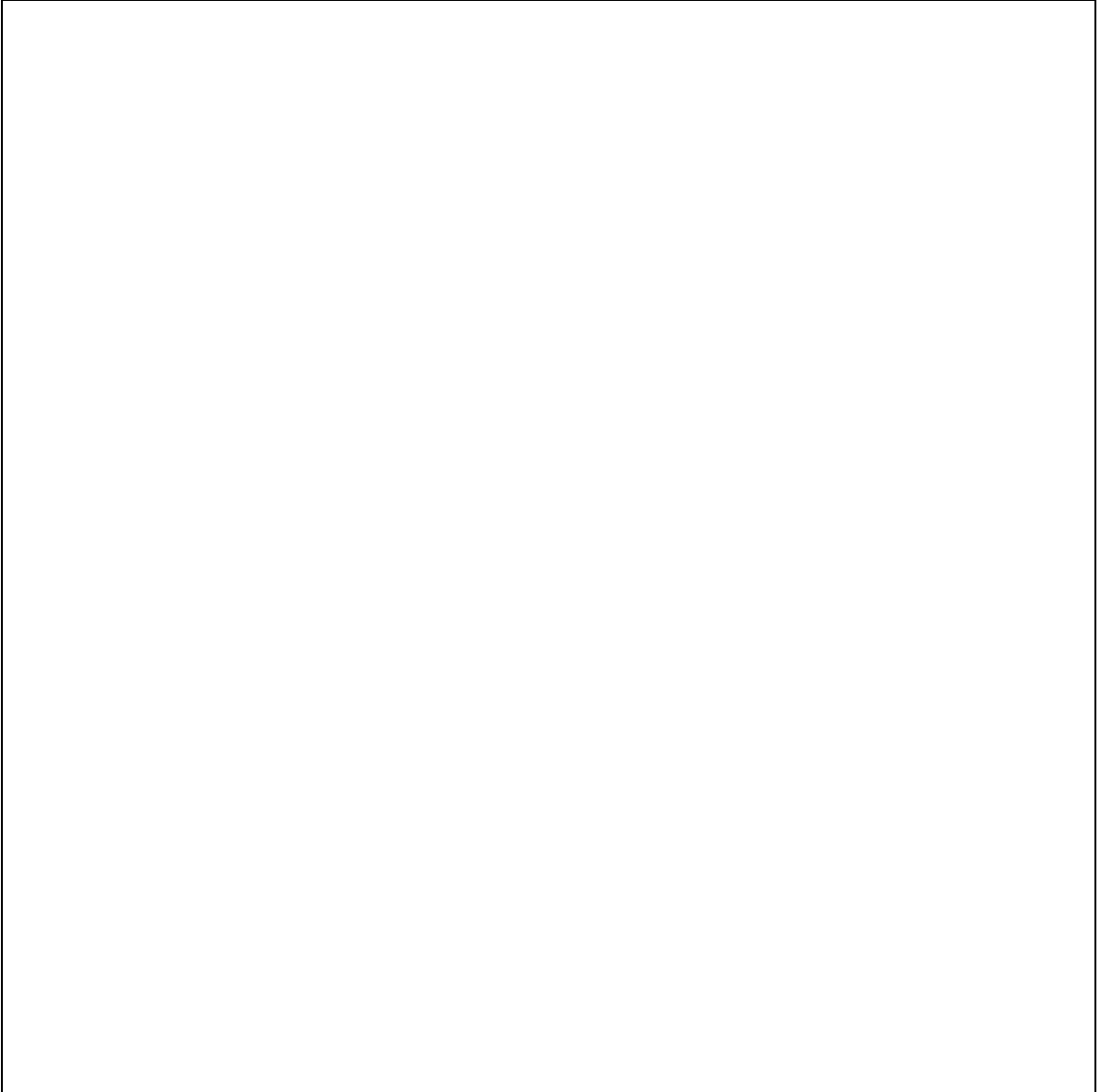
4. Analysis

a. Did your plane perform as you expected? Why/Why not?

b. What is one attribute you would change on your plane if you were going to enter the competition again?

Reflection: Post Competition

Use the space below to write and draw 2 things you learned about flight.

A large, empty rectangular box with a thin black border, intended for students to write and draw their reflections on flight.

2

Plank Gliders

Research: Parts of a Glider

Label the following parts of the plank

Body

Launch Hook

Trailing Edge

Elevons

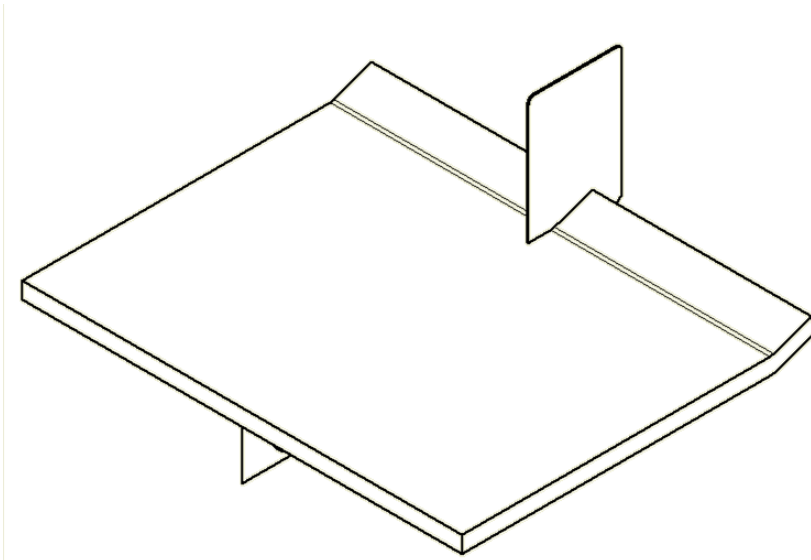
Weight

Left Wing Tip

Vertical Stabilizer

Leading Edge

Right Wing Tip



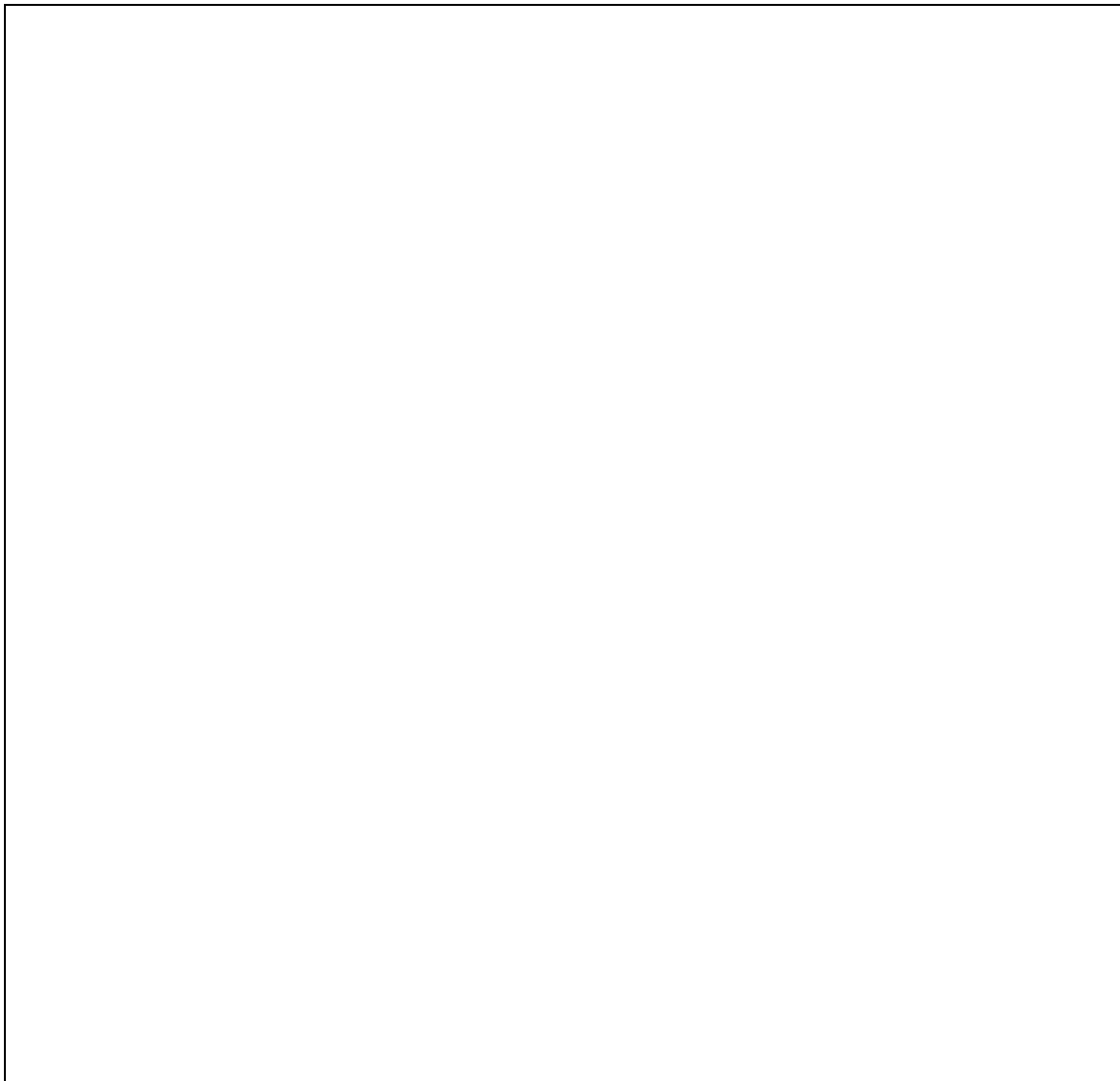
Practice: Scale & Measurement

Scale Drawing activity goes here



Reflection: Pre Flight

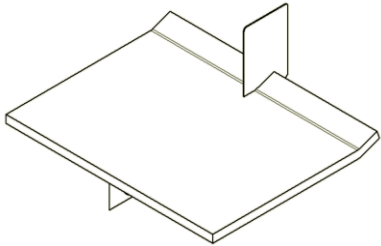
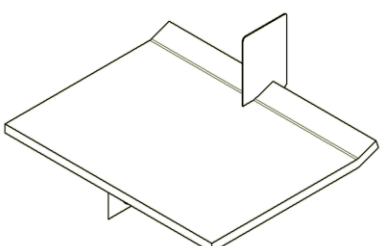
Use the space below to write or draw what you think will happen when you launch your plank for the first time

A large, empty rectangular box with a thin black border, intended for students to write or draw their reflections on the pre-flight experience.

Observation: Pre Flight

What are three similarities and three differences between your Plank and your partner's Plank.
You can look at measurements, weight, decoration, etc.

- A. Mark all three on the diagram
- B. Write a description for each one

Similarities	Differences
	
1.	1.
2.	2.
3.	3.

Field Test: Plank Flights

Flight Data:

Record the distances flown during your plank flights in the table below

	Distance in Meters	
	My Data	My Partner's Data
Test 1		
Test 2		

What are three observations that you noticed while you were flying your plank?

1.
2.
3.

3

Center of Gravity

Research: Pivot Points

Hypothesis – What we think is going to happen

1. When the fan is turned on, I think that the piece of foam

will

because...

2. When the fan was turned on, I observed

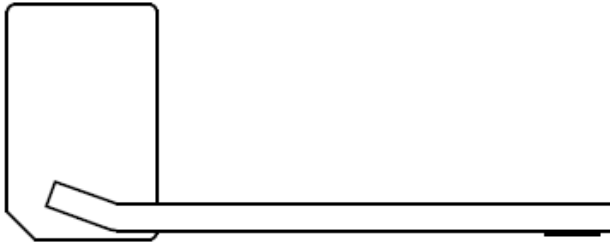
3. My hypothesis was correct incorrect

4. What change did we make?

5. How did it help the piece of foam in the fan?

Practice: Find Center of Gravity of Plank

1. Use the Finding balance point procedure in your pilot guide
2. Draw a line across your plane at that point
3. Draw a ▲ on the spot where your plank balances (use a ruler)



4. Use the Finding Surface Area Experimentally procedure in your pilot guide. This method is preferred for weird shapes

5. Use the Finding Surface Area Mathematically Procedure. This method is preferred for shapes based on rectangles and triangles

Total Length of the entire Plane	cm
Total Width of the entire Plane	cm
What is the total surface area of your plane Length * Width	cm ²
Fore Length	cm
Fore Width	cm
What is the Fore Surface Area Fore Length * Fore Width	cm ²
Aft Length	cm
Aft Width	cm
What is the Fore Surface Area Aft length * Aft Width	cm ²

$\frac{fore}{total} \times 100$	$\frac{back}{total} \times 100$
%	%
Target = 25%	Target = 75%

Practice 2: Find Center of Gravity of Practice Plane

1. Use the Finding balance point procedure in your pilot guide
2. Draw a line across your plane at that point
3. Draw a ▲ on the spot where your plane balances (use a ruler)
- 4.



5. Use the Finding Surface Area Experimentally procedure in your pilot guide.

How many total boxes in your plane	cm ²
How many boxes in front of your line	cm ²
How many boxes behind your line	cm ²

$\frac{\text{front}}{\text{total}} \times 100$	$\frac{\text{back}}{\text{total}} \times 100$
%	%
Target = 25%	Target = 75%

4

Analysis of Glider Designs

Research: BA Designs

For each of the 15 planes, make a hypothesis for:

- a. Distance, how far do you think the plane will fly?
 - a. a short distance,
 - b. a medium distance,
 - c. a long distance
- b. Accuracy, How accurate is the plane?
 - a. Unpredictable – The plane never lands in the same spot twice
 - b. Predictable – The plane will come close to the same spot
 - c. Very Predictable – The plane will always hit the same spot
- c. Nose Weight
 - a. Only a couple washers in the front
 - b. A few washers the in front
 - c. A lot of washers in the front

B	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot
C	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot

D	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot
E	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot
F	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot
G	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot
H	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot

J	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot
K	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot
L	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot
M	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot
N	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot

P	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot
Q	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot
R	Distance	Short	Medium	Long
	Accuracy	Unpredictable	Predictable	Very Predictable
	Nose Weight	Little	Medium	A Lot

Reflection: BA Designs

Use the space below to write what was different about the more challenging designs.



///Add something for data collection///

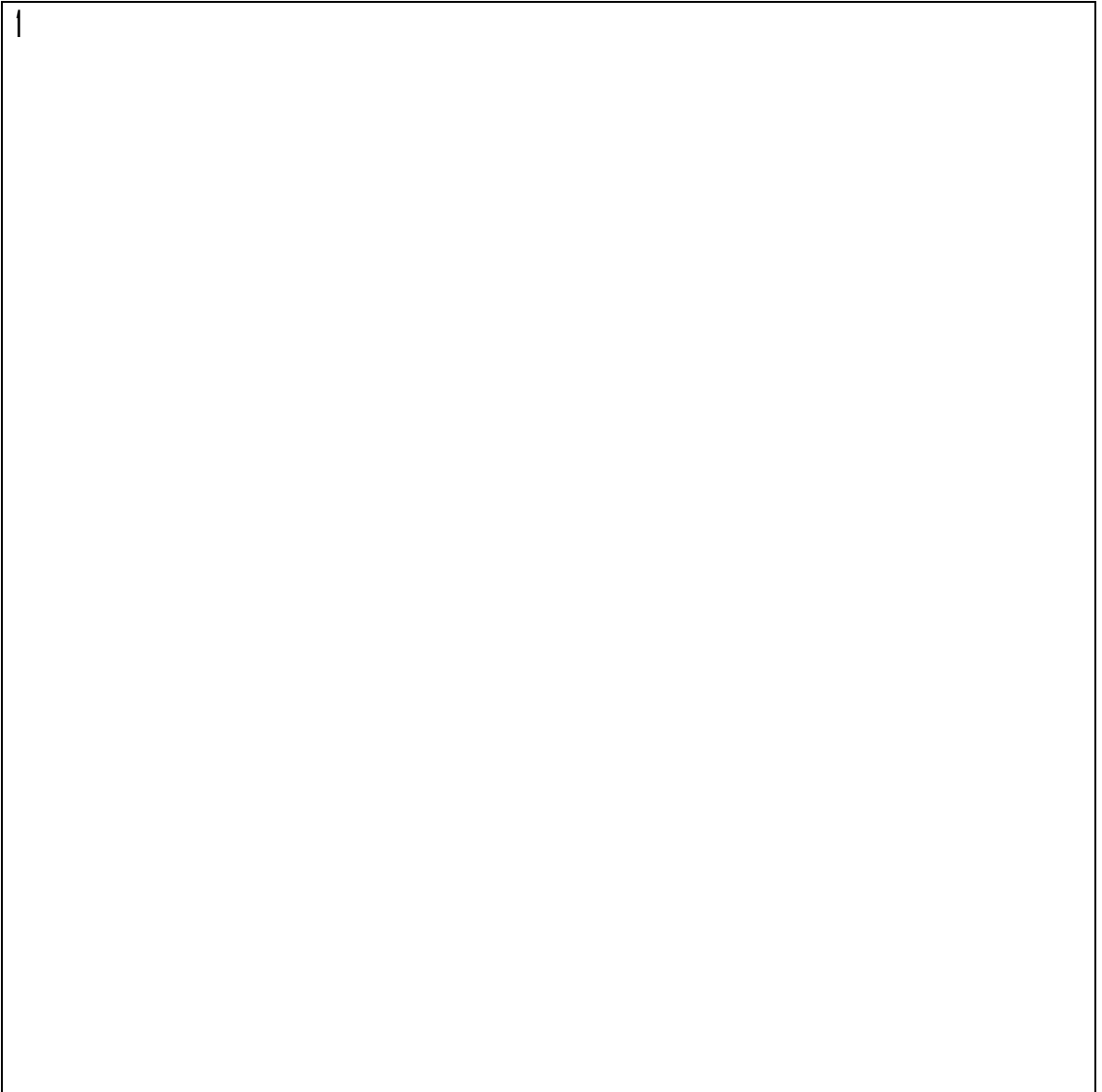
5

Small Glider Challenge

Brainstorm

Fill these pages 4 with your ideas don't think about whether they are good or bad designs

1



Explore

My primary competition will be

Distance

Accuracy

Cargo

Designs I plan to move further with

1. Draw the top view of the design in the big box (remember 1:2 scale)
2. Write in the measurements you want to try
3. Answer the questions

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Question 1	
Question 2	
Question 3	

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Question 1	
Question 2	
Question 3	

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Question 1	
Question 2	
Question 3	

Some writing thing to go with prototyping 1
Some writing thing to go with prototyping 2
Some writing thing to go with refine

Last Set of Questions
Final Reflection

