
# GROWN-UPS GUIDE TO NANOGIRL'S LAB

## FLIGHT!

# Welcome to Nanogirl's Lab!

As a child, I spent hours and hours playing, building and tinkering with things from around the house.

That was where I fell in love with science and engineering, and it's the joy of those adventures that led to the creation of Nanogirl's Lab.

In this Flight Lab, we'll explore five different aspects of the science of flight. In this booklet you'll find everything you need to support your child as they work through the activities to figure out how to build the superpower of flight!

We've made sure that everything in this program is age-appropriate, child-friendly and can be easily done at home, so you can keep experimenting together no matter what's going on outside. The activities have been through an extensive testing process, and are designed to be completed independently by children aged 8 and up, or aged 7 and up with your help.

Your young scientist will have so much fun working on their own superpowers, but as they aren't superheroes yet, you might have to keep an eye on a few things. You might need to supervise younger children when using scissors and small objects, or when trying out something new for the first time.

For each activity, we've put together a set of notes to help guide the conversations with your child in a way that reinforces what they are learning.

Because all that playing, building and tinkering is more than just fun and games, it's a learning experience that could inspire your child's future.

Happy experimenting!

Michelle

**Dr Michelle Dickinson**

Co-founder, Engineer, Backyard Experimenter

# Here's how to get the most out of your Nanogirl online STEM experience:

1. **Download** the STEM Activity Lab Book.
2. Take a look at the **Equipment List** and make sure you've got everything.
3. Set up your young scientist with all the equipment they need for the daily experiment, **a device to watch the Nanogirl's Lab instructional videos, plus their STEM Superhero Training Manual**. We've designed this program so that your child can watch a new video each day; then, using their online superhero training manual, follow the instructions to build their different flying craft experiment, and have fun with our daily challenges and activities.
4. Refer to each day's **'Parent Notes'** to find details of the activities, plus top tips for you, so that you can talk about the experiments with your child even if they complete the activity without your help.
5. **ENJOY!** We can't wait to see where your superpower adventures take you as a family!

We encourage you to join our **private community Facebook Group** where you can share the results of your daily mission with other families taking part in the programme. This is a space where you can ask questions and get support from Dr Michelle Dickenson, and the Nanogirl Labs team.

**WWW.FACEBOOK.COM/GROUPS/NANOGIRLSLAB**

If the budding superheroes in your household love this program and want more, you can access the full pack of **45 additional Superhero STEM experiments** by signing up for a full years access to all of Nanogirl's Lab STEM activities.

Sound | Space | Sleuthing
Sight | Time | Strength
Earth | Throwing | Super Suit

Sign up here!



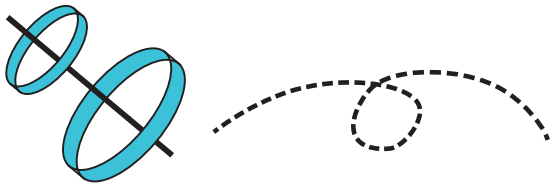
nanogirlslab.com

# Top Tips–Health and Safety

Safety is important for young scientists everywhere, so here are a few top tips to help your superheroes-in-training stay safe while experimenting while learning new STEM skills with Nanogirl's Lab.

1. We recommend that **young children are supervised** while using scissors and sharp objects.
2. The Super Kites activity requires a plastic bag, such as a rubbish bin liner. **Plastic bags should never be placed over the head or face.**
3. Take care that younger children do not swallow smaller items such as paper clips.
4. Some of the experiments can be used as projectiles, make sure they are never aimed at another person or animal and there is **plenty of space**.

Our experiments are not designed to be 'messy' but there is always the possibility of spills and thrills! Making a mess can be part of the fun, so you may need to supervise younger children to keep themselves and their environment safe while they learn, experiment and play.

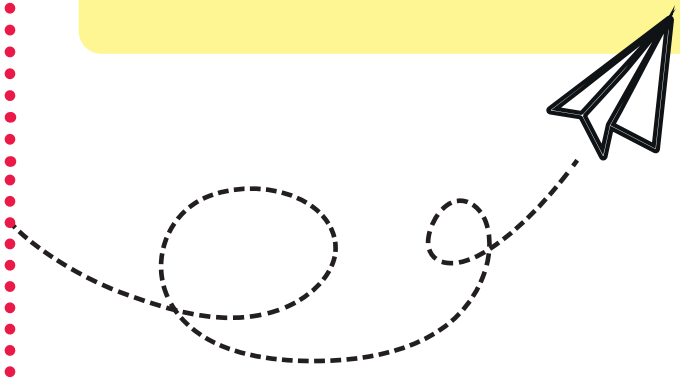


To get in touch with us, email

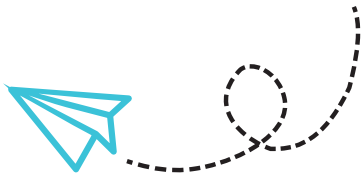
**info@nanogirllabs.com**

or join our closed facebook group

**'Nanogirl's Lab Subscribers Community'**



# Flight!
# Equipment List



## YOUR CHILD WILL NEED

- **Scissors** ◯
- **Tape** ◯
- **Ruler** ◯
- **Pencil** ◯
- **Colouring supplies** ◯
- **Plain, A4 paper x 6** ◯
- **Soft felt tip pen** ◯
- **Small plate to draw around** ◯
- **Empty, clean plastic bottle** ◯
- **Cardboard** e.g. cereal box card ◯
- **Hair dryer** ◯
- **Plasticine or blue tack** ◯
- **Square of toilet paper x 1** ◯
- **Table or kitchen counter** ◯
- **Wooden skewers x 3** ◯
- **String** ◯
- **Soft, thin plastic** e.g. rubbish bin liner ◯
- **Ribbons, coloured yarn or fabric** (optional) ◯
- **Ping pong ball** (optional) ◯

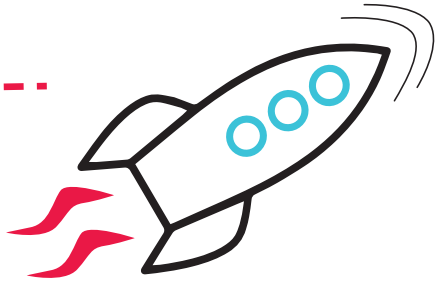
# Parent Notes: Flight!

# ROCKET LAUNCHER

**YOUR CHILD WILL NEED**

- Empty, clean plastic bottle ◯
- Small plate to draw around ◯
- Plain paper ◯
- Scissors ◯
- Tape ◯
- Ruler ◯
- Pencil ◯
- Colouring supplies ◯

Today we built a bottle rocket and learned about how to use air pressure to overcome gravity by creating enough thrust force.



## ASK YOUR CHILD

**What did you make today?**
(A bottle rocket)

**How does it work?**
(When you squeeze the middle, air is pushed out of the straw. This creates enough air pressure under the rocket that it can overcome gravity and take off)

**How can you make it go higher?**
(By changing the pressure from the moving air underneath the rocket you change the amount of thrust which is created. The quicker you squeeze the bottle and the more force you apply the higher the rocket should fly)

**Why do rockets have fins?**
(Fins help to keep the rocket stable when it's flying and stop it wobbling helping to keep it pointing in the direction that it launched)

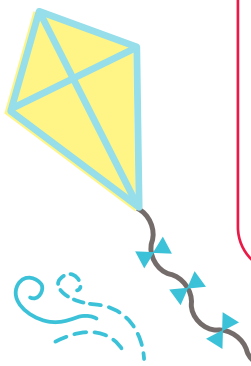
# Parent Notes: Flight!

# SUPERKITES

Today, we learned about how the force of lift helps kites to fly, and that kites need a large, flat surface area to help create enough lift to keep them in the air. We built a kite and tested it. We then thought about how different shapes and sizes of kite might affect its flight.

## YOUR CHILD WILL NEED

- Soft, thin plastic e.g. rubbish bin liner ◯
- Scissors ◯
- Soft felt tip pen ◯
- Ruler ◯
- String ◯
- 3x long wooden BBQ skewers ◯
- Tape ◯
- Ribbons, coloured yarn or fabric (optional) ◯
- Plain paper and colouring/ decorating supplies ◯



## ASK YOUR CHILD

**What did you make today?**
(A kite)

**How did you launch your kite?**
(By running really fast or by holding it up in the wind or infront of a fan)

**What is the name of the force which keeps a kite in the air, and how can you feel it?**
(The force is called ‘lift’ and you feel it as a tugging on the string in your hand while the kite is in the air)

**What is a good shape for a kite?**
(Any wide, flat shape with a large surface as long as the material is not too heavy)

**How might large surface areas and wind be used in the world?**
(Wind turbines have big blades to catch the wind and turn creating renewable energy)

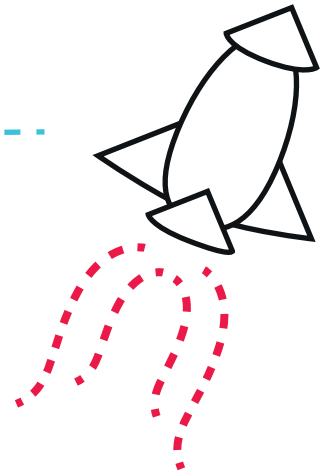
# Parent Notes: Flight!

# ROCKET STRAWS

**YOUR CHILD WILL NEED**

- Plain A4 Paper .....
- Pencil .....
- Scissors .....
- Tape.....
- Ruler.....
- Colouring Supplies.....

Today, we learned about the forces needed to launch a rocket, and experimented by making and launching small rockets of our own!



## ASK YOUR CHILD

**What did you make today?**
(A straw rocket!)

**How did you launch your rocket?**
(By blowing through a straw which pushed the rocket into the air)

**How far did your rocket fly?**

**What did you learn about the forces which help a rocket to launch?**
(The force of thrust, which pushes a rocket upwards so it can overcome gravity)

**What makes the rocket fly further?**
(Blowing harder through the straw, as this creates more pressure which results in more thrust)

# Parent Notes: Flight!

# AEROFOILS

**YOUR CHILD WILL NEED**

- Hair dryer ◯
- Square of toilet paper ◯
- Plain paper ◯
- Cardboard e.g cereal box card ◯
- Tape ◯
- Table or kitchen counter ◯
- Long wooden skewer or stick ◯
- Pencil or pen ◯
- Scissors ◯
- Plasticine or blue tack ◯

Today, we learned that airplanes use something called Bernoulli's Principle to help create the lifting force which keeps them in the air. We did a few different experiments to demonstrate Bernoulli's Principle using a hair dryer and a model of an airplane's wing.

## ASK YOUR CHILD

**What is Bernoulli's Principle?**
(Fast flowing air creates low pressure)

**How does Bernoulli's Principle help an airplane to fly?**
(The shape of an airplane wing is designed so that air moves faster over the top which creates an area of lower pressure. The slower moving air underneath the wing creates higher pressure which pushes the wing upwards and creates a force called lift which helps a plane to stay up in the air)

**How did you create the force of lift?**
(Used a hairdryer to create moving air which travelled faster over the top of the aerofoil than underneath it)

**Did you manage to lift your aerofoil off the table?**
(This was their challenge today)

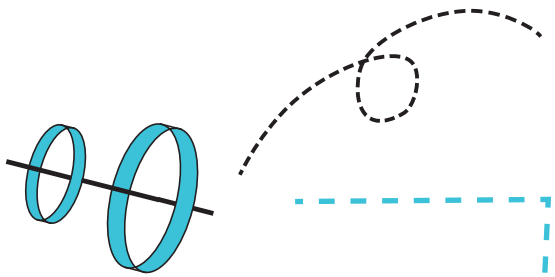
# Parent Notes: Flight!

# RING GLIDER and HOOP GLIDER

**YOUR CHILD WILL NEED**

- 3 x plain A4 paper .....
- Scissors .....
- Tape.....
- Pencil .....
- Ruler.....
- Colouring supplies (optional)

Today, we learned about how the shape of a plane helps it fly, and we used our knowledge of Bernoulli's Principle and surface area from earlier experiments this week to help us understand how different shapes stay in the air. We built three plane shapes and investigated which one flew farthest.



## ASK YOUR CHILD

**Which plane shape flew the farthest? How far did your glider fly?**

**What helps a hoop or ring glider fly?**

(It uses the force of lift over a curved surface to help it stay in the air even though it doesn't have wings like a traditional plane. Hoop planes also have a large back hoop to help them stay stable in the air)

**Where does the force come from to help your glider to glide?**

(To glide the glider needs enough force to fly in the air. This comes from the arm muscles that threw the glider. Sometimes this force can be too small or too big which means the glider won't glide well. By adjusting how hard the glider is thrown, the perfect amount of force can be found to help the glider to glide a long distance)


Thank you for purchasing Nanogirl's Lab School Holiday Club. I hope you and your superhero-in-training enjoyed working through the superpower of Flight together.

For your next adventure, don't forget that you can get our **full pack of 45 additional superhero STEM experiments** by signing up on nanogirlslab.com.

Get 10% off the full program when you sign up with the code "SHF1"

Sound
Space
Sleuthing
Sight
Time
Strength
Earth
Throwing
Super Suit