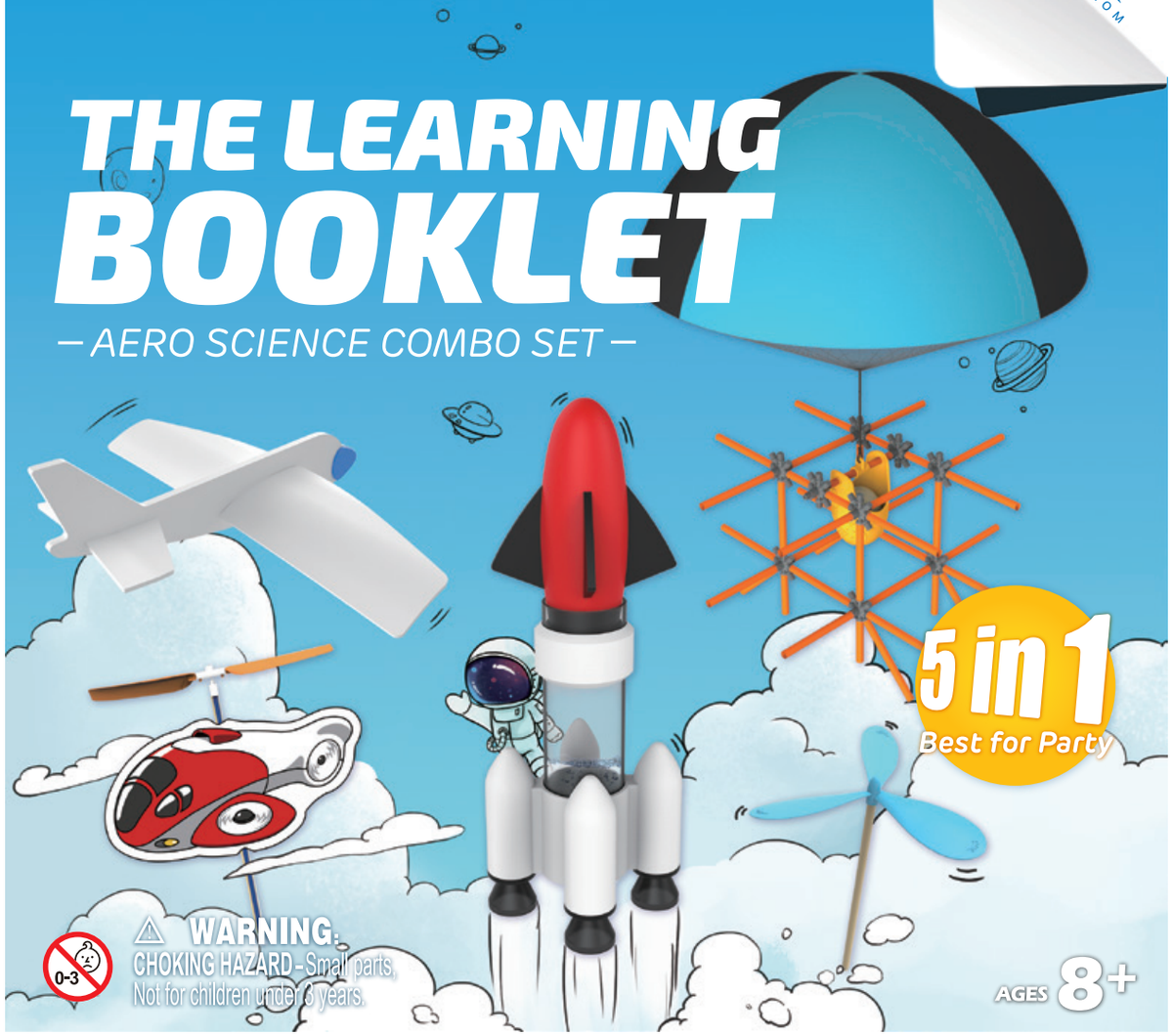
PLAY • READ • INSPIRE

THE LEARNING BOOKLET

— AERO SCIENCE COMBO SET —



WEBSITE: WWW.PLAYSTEAM.COM **EMAIL:** INFO@PLAYSTEAM.COM **ADDRESS:** SUITE 35 - 36 THE DESIGNWORKS, PARK PARADE, LONDON, NW10 4HT. MANUFACTURED BY HANGZHOU ZT MODEL COMPANY LIMITED. ADDRESS: NO 6 MINGDE RD., PUYAN, BINJIANG, HANGZHOU, CHINA.

PLAY • READ • INSPIRE

TABLE OF CONTENTS

WARNING MESSAGE

GENERAL WARNING

Before you begin, please read through the instructions together with your children. Make sure you understand the safety messages. Please keep the packaging and instructions, as they contain important information.

This kit is designed for children over 8 years of age. This product contains small parts which may pose a choking hazard. It is not suitable for children under 3 years old. Please keep individual parts and the fully-assembled product away from children under 3 years of age.

Screws and other metal parts may have sharp edges. Children should have adult supervision when assembling the product.

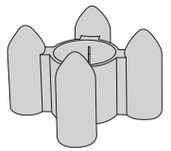
Water and rain will damage the electronic components.

Last but not least, please clean the parts and finished product with a damp cloth. Make sure to remove the batteries from the battery compartment before cleaning. Do not use any soap or cleaning solutions.

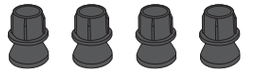
1 WARNING MESSAGE

Package Contents

① Launch platform



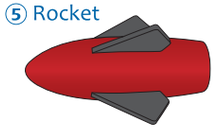
② Feet



③ Cabin ring

④ Cabin body

⑤ Rocket

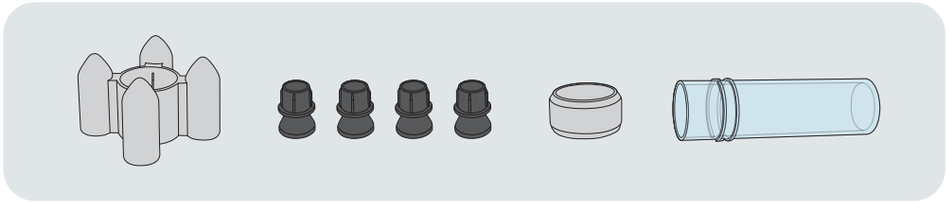


Vinegar

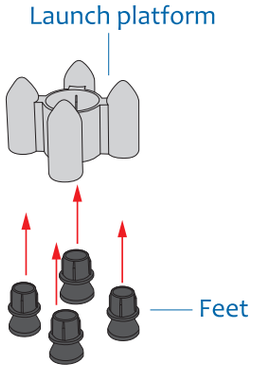
Baking soda

Required but not included

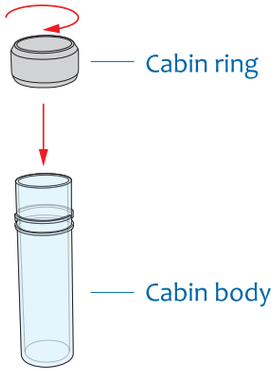
Installation



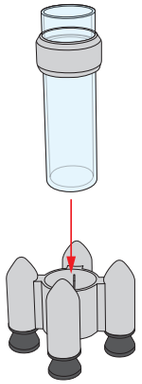
1. As shown in the figure, insert the four feet into the bottom of the launch platform.

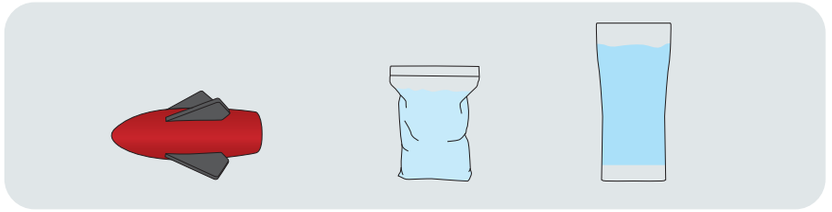


2. Insert the cabin ring into the body of the cabin, rotate and tighten.

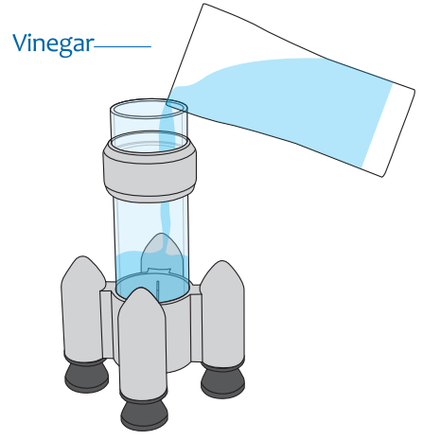


3. Put the completed cabin assembly on the launch platform.

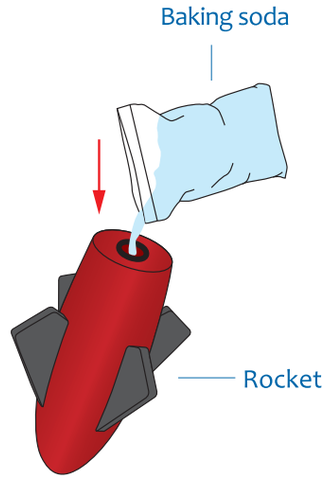




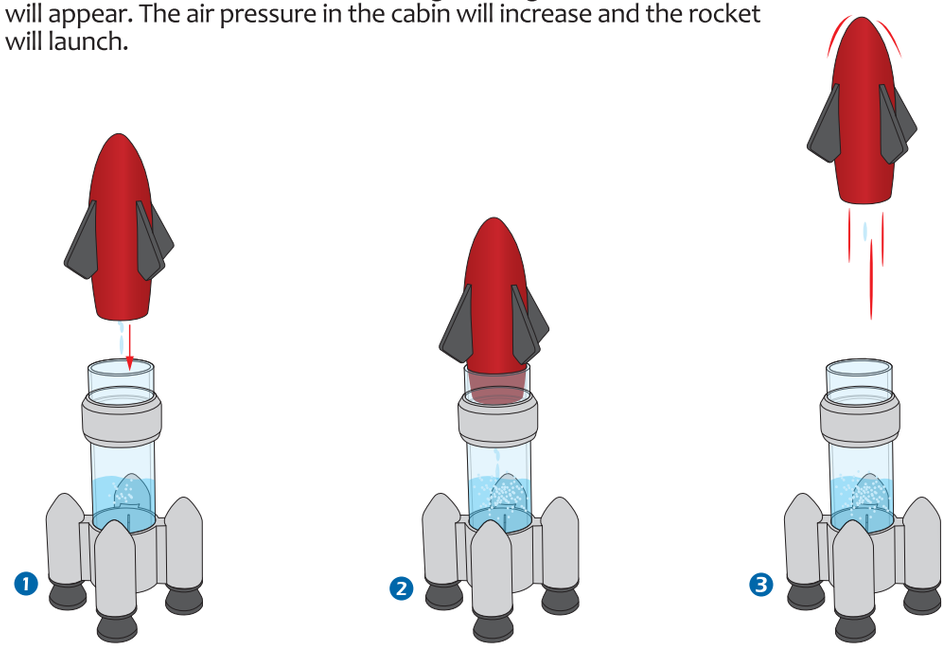
4. Pour some vinegar into the cabin.



5. Pour the powder into the rocket compartment hole.



6. Insert the rocket with the powdered baking soda into the completed cabin assembly and seal it. As the powdered baking soda slowly drops into the cabin and reacts with the vinegar, a large number of bubbles will appear. The air pressure in the cabin will increase and the rocket will launch.



You will notice that different amounts of vinegar and baking soda will lead to different situations. You can try yourself to adjust the quantities and check the results. (try start from 1 ml vinegar and slowly increase the amount)
You can also try different combinations with different substances (i.e. using dissolved citric acid instead of vinegar) to see if they can propel the rocket.

What does it do?

Fill the rocket with baking soda and the launcher with vinegar. Position your rocket on the launcher, the chemical reaction between the soda and the vinegar will propel your rocket.

How does it work?

In chemistry terms, baking soda is a "base" and the vinegar is an "acid". When mixed together, a chemical reaction occurs which creates a gas. This gas increases the pressure and propels the rocket up and away. Try adjusting the quantities of "base" and "acid" to find the best formula.

FUN FACTS 01

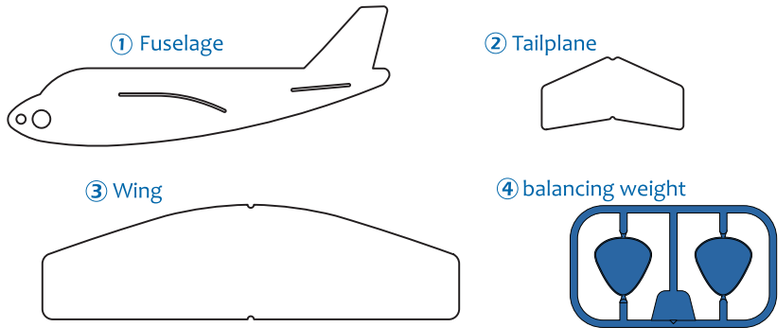
The airbags in a car work in almost the same way. A powder reacts with the air to create a gas that inflates the bag. For airbags, the chemical reaction is very very quick to ensure that the bag will completely inflate before a passenger in a collision is injured by the hard surfaces of the car.

FUN FACTS 02

Using stronger chemical reactions, real rockets are propelled in almost the same way. A chemical reaction occurs in the rocket and a "propellant" is ejected. As the propellant is ejected downward, the rocket is propelled upward.

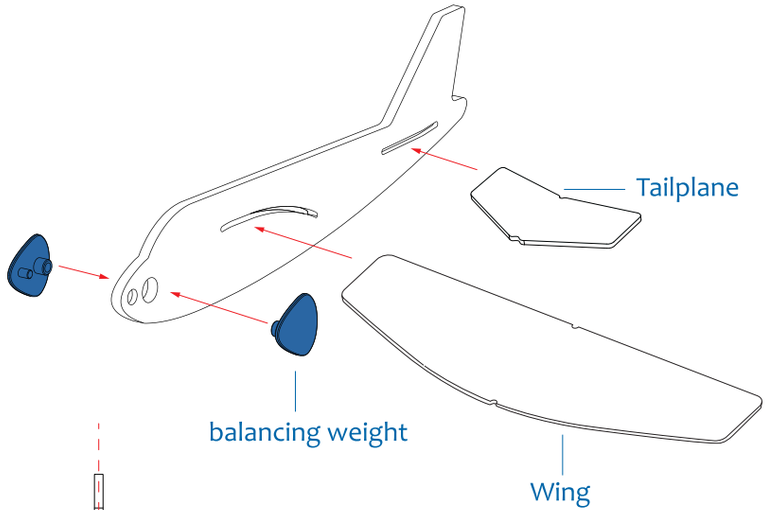
HULA LOOP PLANE

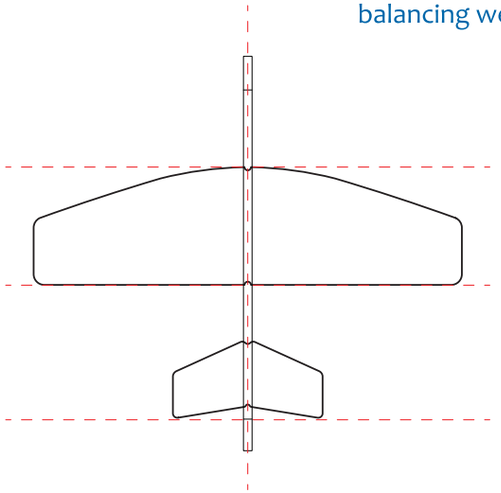
Package Contents



Installation

1. Detach the balancers from the frame, tightly clip them from both sides of the fuselage. Insert the wing and tail into the fuselage.

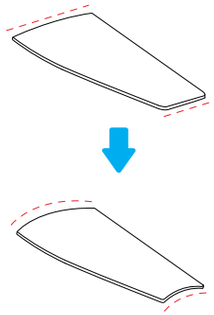


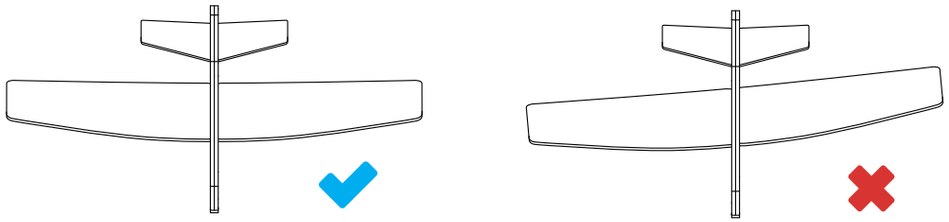


Adjust the position of the wings and the tailplane to balance the center of gravity.

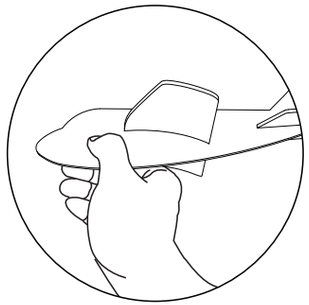
If the wings are not properly adjusted, it might result in odd flying trajectories and the plane might not loop back.

Two important parameters that impact on flight trajectory are the camber and the symmetry of the wings. You can adjust the wings to a proper cambered shape by slightly bending them. Meanwhile pay attention to give the right and left wing a symmetrical shape. Look at the plane from front and readjust the wings accordingly.





2. Correct holding position.

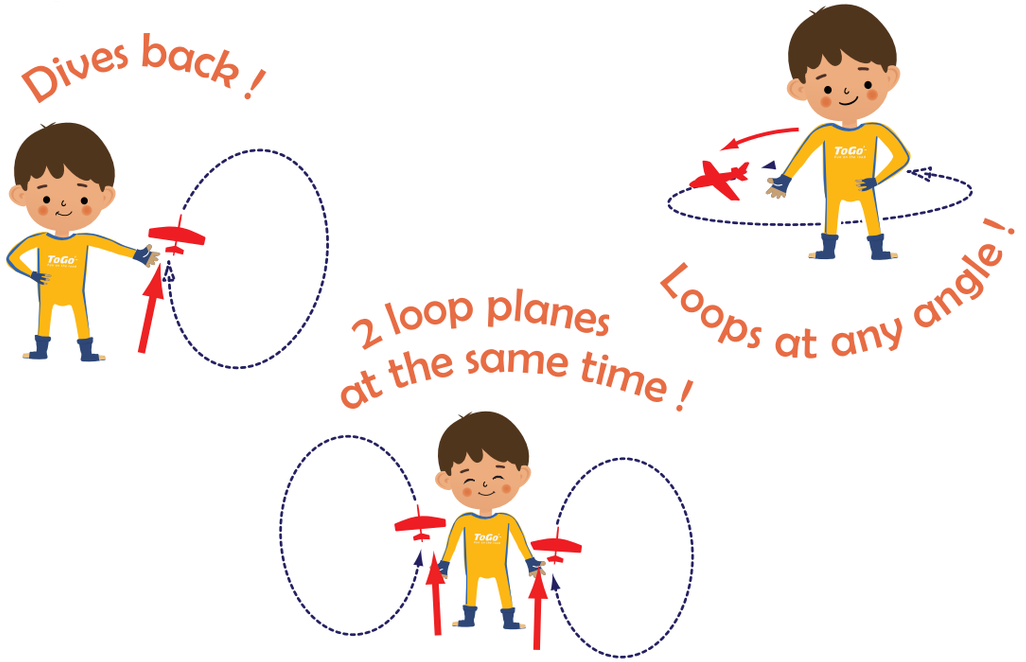


Forward grip

Rearward grip

3. Flight method

Pinch the bottom of the plane (under the balancng weight), throw the plane outward and observe the maneuvring trajectory. Note: do not throw it in straight line. The plane is designed to follow a circular trajectory with the top of the wings always facing the center of the circle.



You will soon notice there are two main ways of throwing your plane to make it loop back. First, always keep the bottom of the wings facing you. If you throw it almost horizontally with a slight angle or about 15 to 45 degrees, your plane will loop back horizontally. If you throw it upward, it will dive and loop back vertically. After trying a few times, you will be able to do it whenever you want.

What does it do?

The Hula Loop Plane is designed to fly back to you in a perfect loop. Throw the plane as shown in the drawing, and try to catch it as it comes back.

How does it work?

Many parameters affect the quality and the direction of an aeroplane in flight. The plane you have in your hands has specially designed wings that enable it to fly back to you. Take a look at the special curve of the wings.

FUN FACTS 01

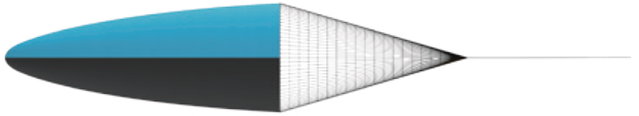
On real planes, the wings have the mechanical ability to change their shape while in flight. The pilot modifies the width of the wings and the orientation in order to slow down or to turn. There is a flight called the ZERO-G experience that simulates "zero gravity". The plane flies following a certain curve so that you feel weighless when you are in it.

FUN FACTS 02

There are some aircrafts specially designed to perform flying manoeuvres which are light and easy to fly. The practice of such manoeuvres is called "Aerobatics". Often performed as entertainment, they were first developed for military fighter pilots.

Package Contents

① Parachute



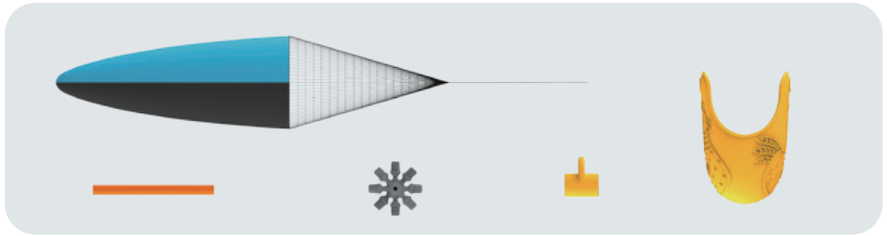
② Paper straws x 40

③ Connector joint x 10

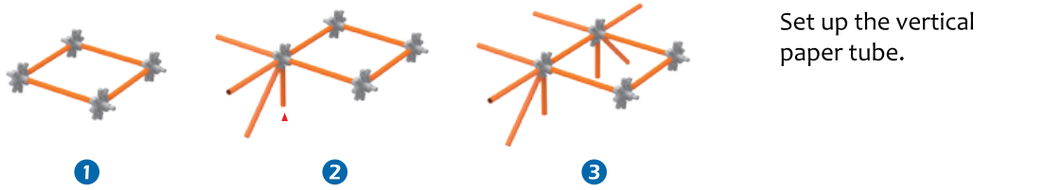
④ Hanger

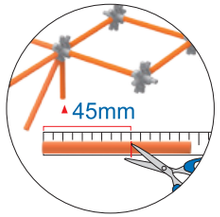
⑤ Pocket

Installation



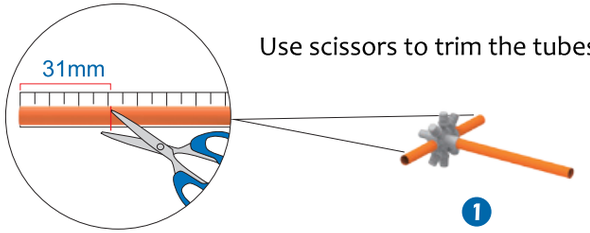
Step 1
Following the figure, complete the bracket base.



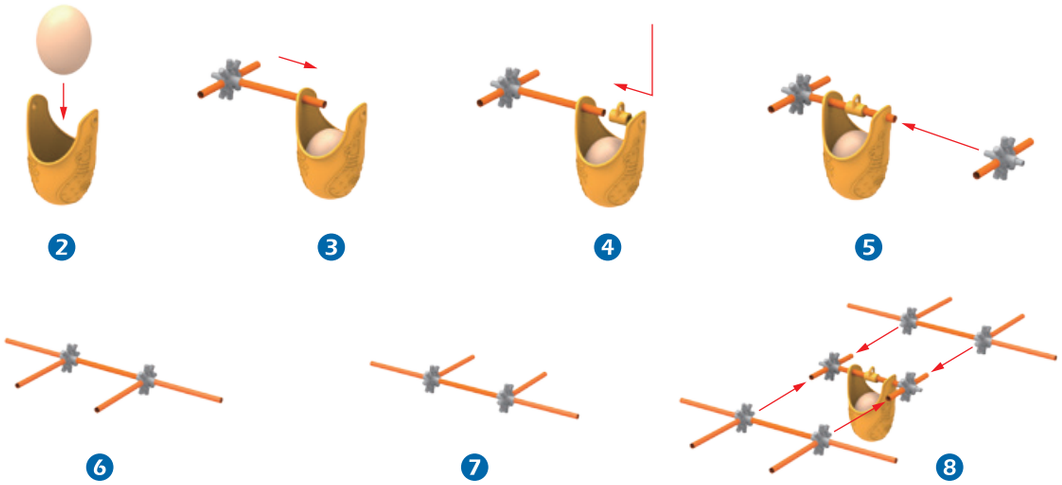


Set up the vertical paper tube.

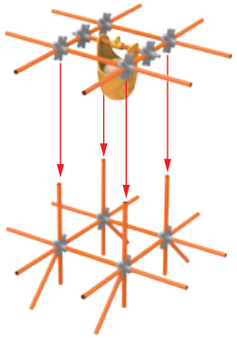
Step 2
Following the figure, complete the hanging rod layer.



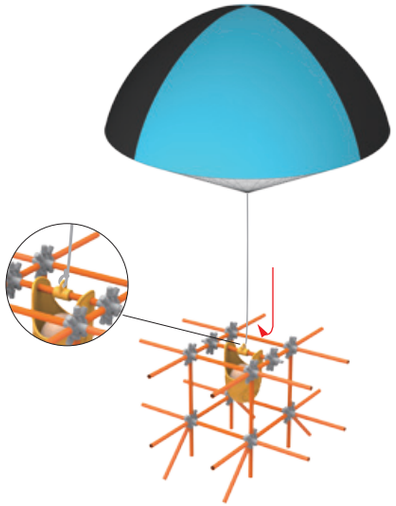
Use scissors to trim the tubes on both sides.

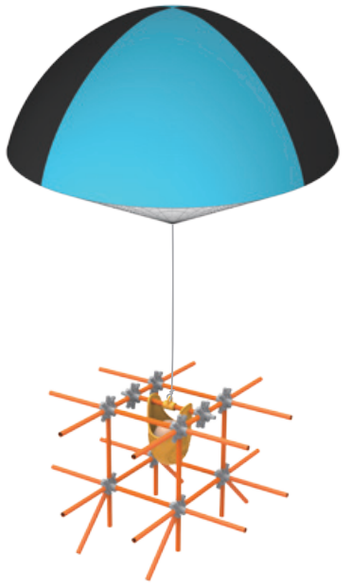


Step 3
Following the figure, insert the hanging rod layer into the bracket base.



Step 4
Following the figure, complete the assembly of the parachute tether.





Let's start your landing test.

What does it do?

Using paper straws, build the structure and store the egg in the pocket. Attach the parachute and throw it from a sufficient height (at least 5 metres). The parachute should slow the egg's fall and prevent it from breaking.

How does it work?

While falling, the parachute will automatically deploy itself. Once deployed, it will increase air resistance and slow down the fall.

FUN FACTS 01

During World War II, goods like food or weapons were parachuted-in to resupply troops who were inaccessible through traditional resupply methods. This is called an "airdrop". If you like, you can use your parachute to airdrop biscuits or chocolate.

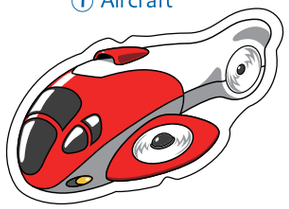
FUN FACTS 02

Parachutes are also used for other purposes. For example, they may be used to slow down an aircraft landing on a short runway like an aircraft carrier.

RUBBER BAND POWERED HELICOPTER

Package Contents

① Aircraft

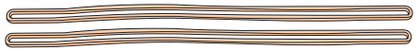


② Head

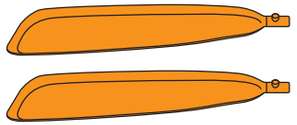
③ Tail hook

④ Buckle

⑤ Rubber band

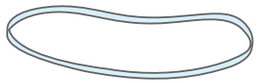


⑥ Propeller blades

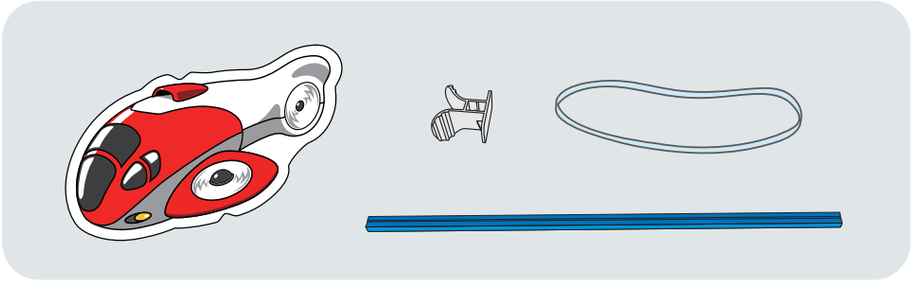


⑦ Plastic rod

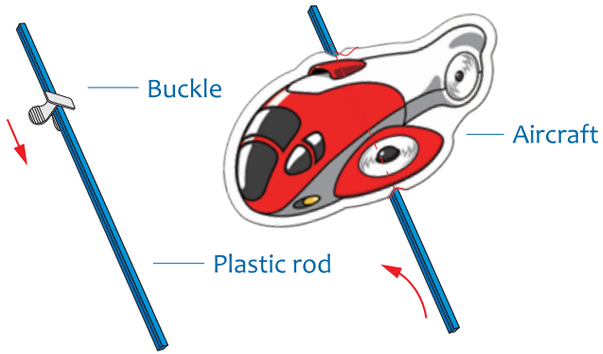
⑧ Transparent rubber band

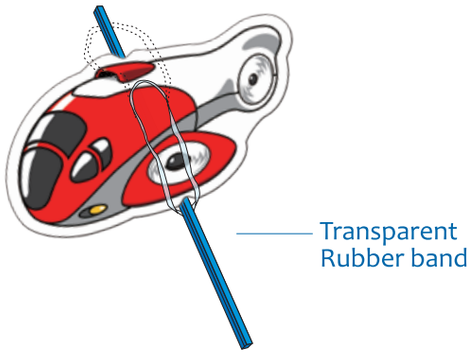


Installation

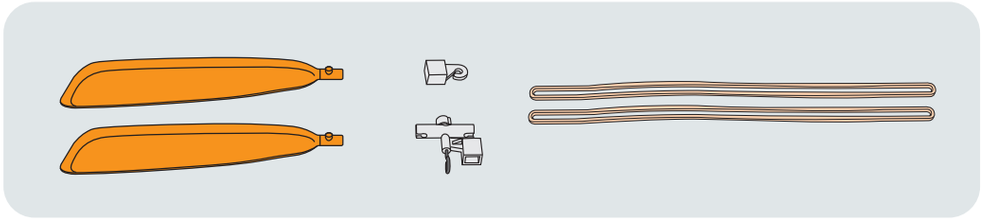


1. As shown in the figure, insert the buckle into the plastic rod. Press the centre of the body against the narrow side of the plastic rod.

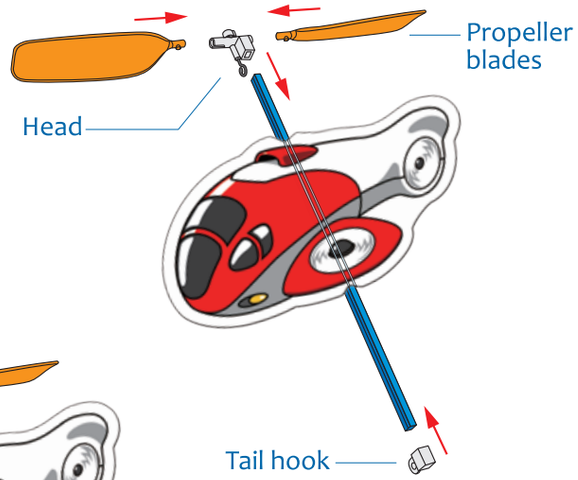


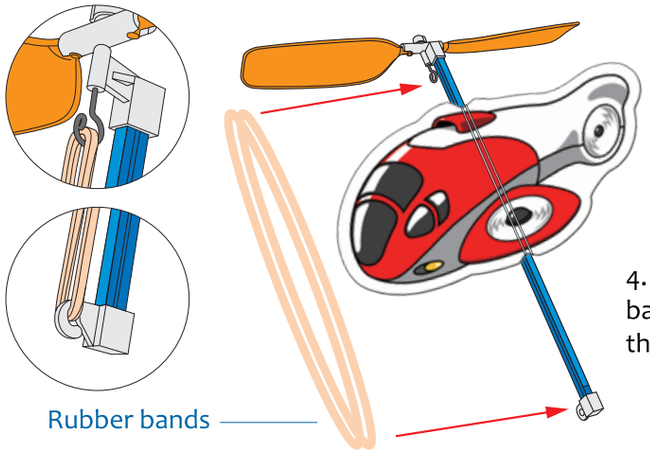


2. As shown in the figure, install the transparent rubber band.



3. Install the machine head and propeller blades on the top of the plastic rod. Then install the tail hook on the tail of the plastic rod.

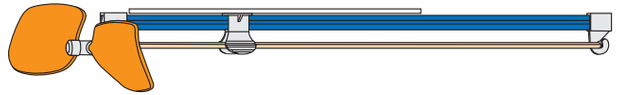


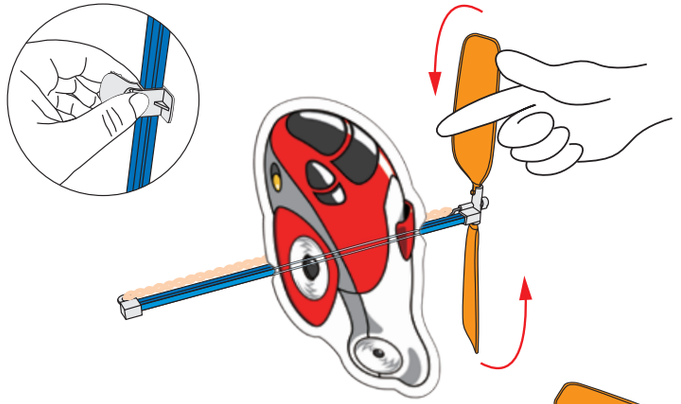


4. Place the two ends of the two rubber bands into the tail hook and then hook them to the head.

Correct Installation and FLIGHT!

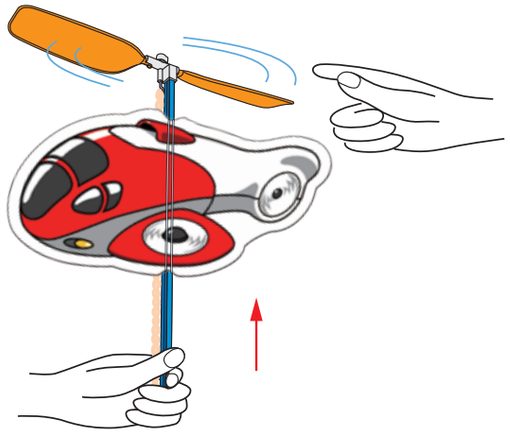
Check the figure to make sure that everything has been installed correctly.





1. Hold the buckle as illustrated, and rotate the propeller blades clockwise for 50 turns. Try to rotate more and observe how it could affect the flying performance.

2. Hold the bottom of the plastic rod with one hand and loosen the propeller with the other hand. Once the propeller starts rotating, let go and watch it fly!

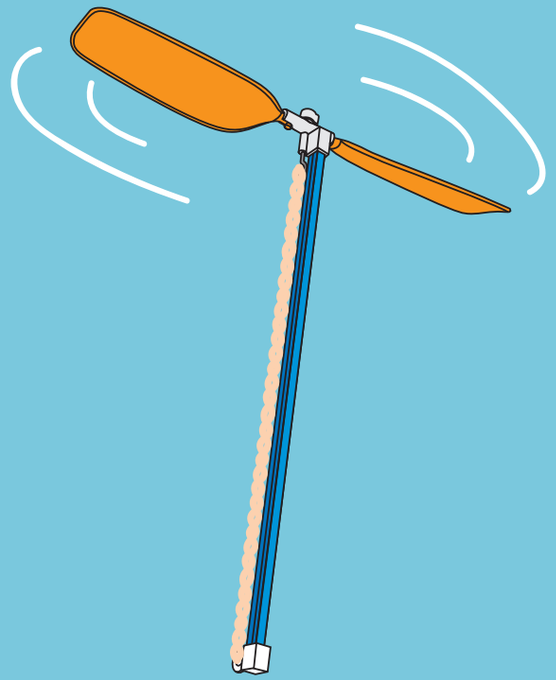


What does it do?

Hold the helicopter with one hand and wind the propeller up with the other hand. Make sure you have enough space around you and release the Rubber band Helicopter to let it soar up in the air just like a real helicopter!

How does it work?

When you wind up the propeller, energy is stored in the rubber band. Once released, the energy is transferred back to the propeller to make it rotate.



FUN FACTS 01

Energy storage can be a very tough problem for engineers. In your toy, the wound up rubber band serves as the energy storage. However, for huge amounts of energy, like in a nuclear power station, energy can't be stored and must be used immediately.

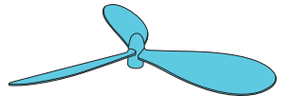
FUN FACTS 02

The energy stored in the rubber band is mechanical energy. There are other ways to store energy such as chemical energy (batteries or fuel).

GREEN FLYING STICK

Package Contents

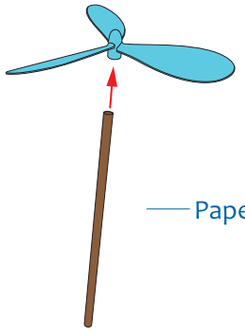
① Propeller blades



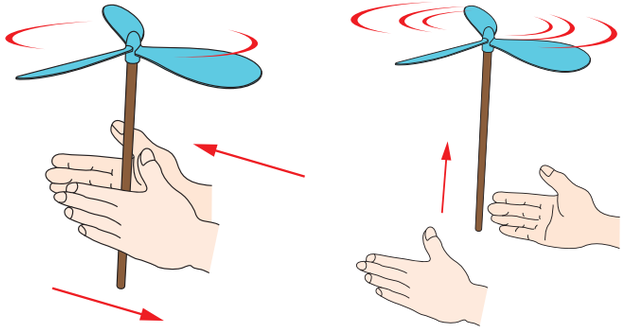
② Paper tube

Installation

As shown in the figure, the propeller blades are inserted into the paper tube.



As shown in the figure below, place the paper tube in the palm, rotate it as fast as possible and let go. It should fly upwards on its own.



What does it do?

Grab the tube between your hands and spin it in the direction shown by the arrows on the wings. The stick will take off from your hands and fly above your head.

How does it work?

This uses the same mechanism as a helicopter. When rotating, the propeller creates an air flow which pushes the engine upward.

FUN FACTS 01

The Sycamore Maple is a tree which you can find in most parks. It has naturally propeller shaped seeds. When they fall from the tree, they swirl in the wind and scatter all around.

FUN FACTS 02

The first helicopter is said to have been designed in the 1480s by the great Italian mathematician Leonardo da Vinci. Although it was not built during his lifetime, he called his invention the "Aerial screw".