

## Activity Guide

# Harness the Power of the Sun with the Solar Helicopter!

Category: **STEAM**

Topic: **Maker**

Level: **Hard**

Duration: **60 mins**



## Activity Description

Solar energy is a renewable energy source, derived from the sun's thermal radiation and primarily captured as sunlight. Today, solar power is widely used to generate electricity and provide energy for various types of equipment. The **Solar Helicopter** is powered by a solar panel, allowing students to explore how solar energy can be transformed into electrical energy to drive a functional model.

## Learning Outcomes

- Understand the fundamentals of solar power and how it generates electricity.
- Learn about the transfer of electricity and its application in powering devices like the Solar Helicopter.
- Apply design thinking to construct a solar-powered helicopter.
- Explore basic circuitry and the concept of conductivity in renewable energy systems.

## 21<sup>st</sup>-Century Skills Developed

- **Collaboration:** Work in teams to build and troubleshoot the solar helicopter.
- **Communication:** Share ideas and discuss the potential of solar power for various applications.
- **Creativity and Innovation:** Experiment with solar technology to create and optimise the helicopter design.
- **Critical Thinking and Problem-Solving:** Solve challenges related Smart Energy

Collectively Creating  
Opportunity for Children,  
Young People and their  
Communities



# How to Use This Activity Guide

## For Educators

- Use the learning outcomes and competencies to help build programme plans, logic models, sessions, and lesson plans.
- Refer to the equipment list to ensure you have all the materials and resources needed for the activity.
- Share the guide with colleagues and volunteers to help them learn how to effectively facilitate the activity.

## For Everyone

- Print out the guide, starting with the **Step-by-Step Instructions**, for young people to follow along. This allows you to focus on deepening their understanding and engagement with the activity.
- Use the **Glossary of Terms** to help build young people's technical and science vocabulary as they progress through the activity.



## Equipment

### Equipment

- Laptop/PC with speakers

### Arts & Crafts Materials

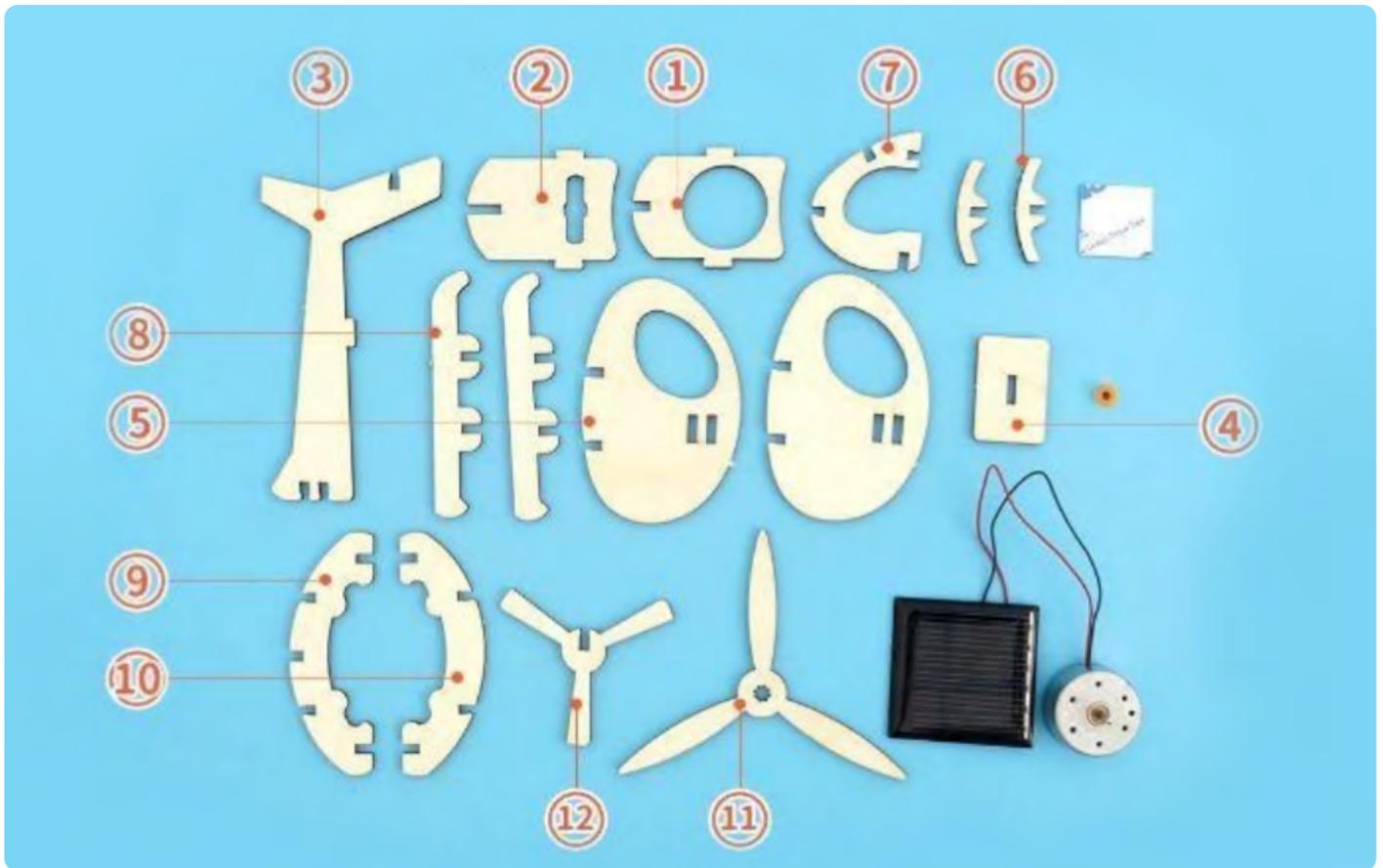
- Large black bag or table cover (this will help with the clean-up)
- PVA glue
- A pair of scissors



## Step-by-Step Instructions

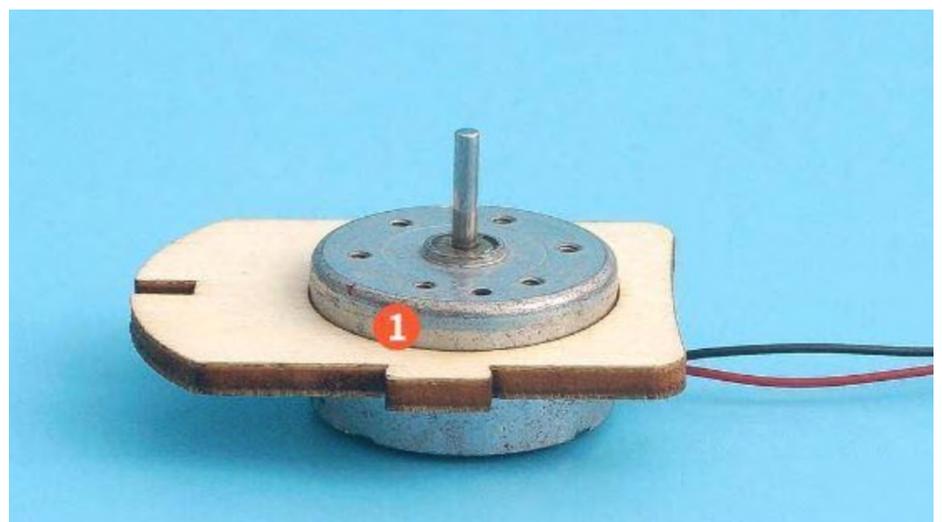
### Step 1

Prepare all the assembly materials.

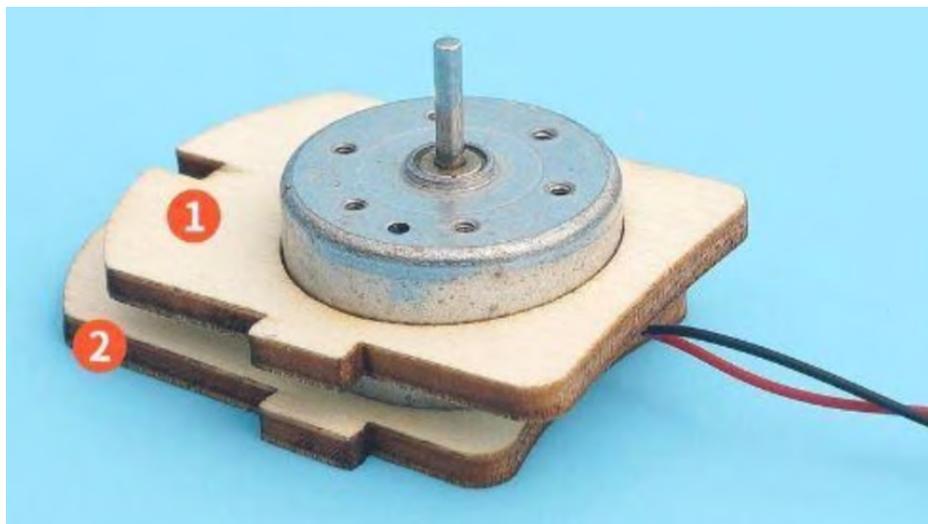


### Step 2: Installing motor

Install the first motor into the clip #1.  
See photo above.



Install motor clip #2 onto the motor.



### Step 3:

First apply the PVA glue to the motor clips #1 and #2, install the motor clip #1 then install the motor clip #2 on the board #3.

#### NOTE

Please be careful when using the PVA glue. Do not let the glue come into contact with eyes. Take safety precautions and if it does come in contact with eyes seek medical attention.

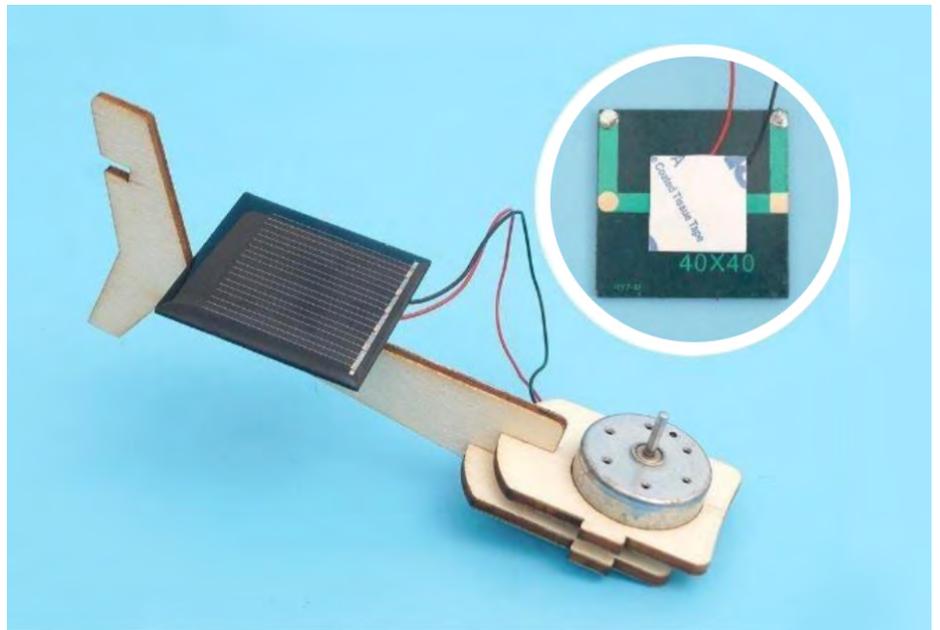


Apply the PVA glue to the card slot #4, and the attach #4 plate to #3 tail wing.



#### Step 4:

Using the double sided tape attach the solar panel to the plate #4, see photo above.



Refer to picture above, apply PVA glue in the slots of #5 boards. Then install the two #5 boards onto motor clips #1 and #2.



#### Step 5:

Refer to the photo above, apply PVA glue to the slots of boards #6. Then install the #6 boards onto the #7 boards.



Apply PVA glue into the slots of board #7, then install board #7 onto the motor splint #1. See photo above.



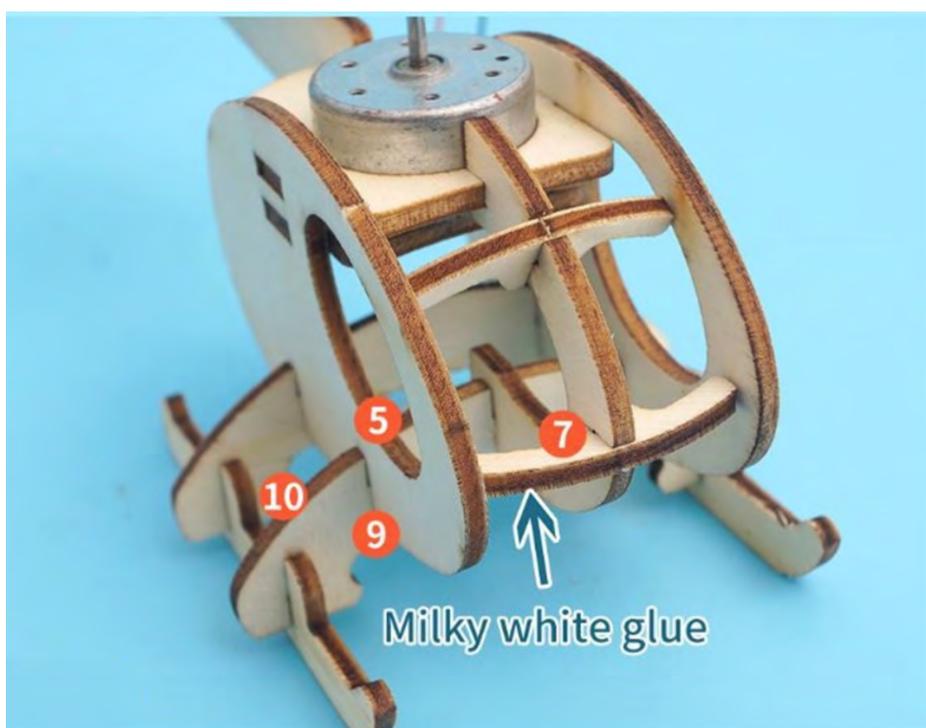
### Step 6:

Refer to image above and apply PVA glue to the slots of the #8 board, then install the #9 and #10 boards onto the two #8 boards.



### Step 7:

Install the battery in the battery box, close the knife switch, and the simple vacuum cleaner starts to work.



### Step 8:

Refer to the above figure, first apply PVA glue to the round hole of #11 propeller, then install the orange fixing ring in the round hole of #11 propeller, and finally install the propeller on the motor shaft.



### Step 9:

Refer to image above, first apply PVA glue to the slot of #12 board, then insert the tail board #12 into slot of board #3



### Step 10:

The solar helicopter is now complete, put the helicopter in a sunny window and watch for the propellers to rotate.





## Potential Troubleshooting

### Issue 1: Under what circumstances do solar panels work best?

- The outdoor temperature must be above 15 degrees Celsius, and the sunlight is strong, so that the helicopter motor can be fully driven by solar power.
- The outdoor temperature is lower than 15 degrees Celsius, and the solar panel has insufficient power supply to drive the motor.

### Issue 2: Can flashlights and LED lights illuminate solar panels to generate electricity?

- Flashlights and LED lights can illuminate the solar panel to generate electricity, but the electricity emitted is very weak and cannot drive the motor to rotate.



## How does Solar power work?

Solar power works by turning sunlight into electricity. This process is called solar photovoltaic (PV) power generation. The most common way to do this is using solar panels, which are made from special materials called semiconductors (like silicon). When sunlight hits the solar panels, the energy from the light knocks electrons loose in the semiconductor, creating an electric current. This electricity can then be used to power things like homes, buildings, or even satellites.

## Here's a step-by-step breakdown of how solar power works:

- **Sunlight hits the solar panel:** Solar panels are made up of many small cells that absorb sunlight.
- **Converting light to electricity:** Inside these cells, the sunlight energy is absorbed and turned into electricity by moving electrons (this is called the "photovoltaic effect").
- **Electricity flows out:** The electricity created is in the form of direct current (DC). If the electricity needs to power a home, it's usually converted into alternating current (AC), which is the type of electricity used in most homes.
- **Use or storage:** The electricity can be used immediately or stored in batteries to use later, like at night when the sun isn't shining.

## Advantages of Solar Power:

- **Inexhaustible energy:** The sun's energy won't run out, so solar power is a renewable source.
- **Clean and quiet:** Solar power doesn't cause pollution, make noise, or harm the environment.
- **Widely available:** Solar power can be used almost anywhere there's sunlight, and you can even put solar panels on your roof.
- **No fuel needed:** Solar panels don't need fuel, and you can generate power right where it's needed, so there's no need for long power lines.
- **Fast to set up:** Installing solar panels is relatively quick, and they start producing energy as soon as they're set up.

## Disadvantages of Solar Power:

- **Takes up space:** Solar panels need a large area to collect enough sunlight, so they can take up a lot of space.
- **Depends on sunlight:** Solar power is affected by the time of day, weather, and seasons. It doesn't work at night, and it's less effective when it's cloudy.
- **High initial cost:** The technology for solar power is still expensive to set up, and while it saves money over time, the initial cost is high.

In summary, solar power is a clean and renewable energy source that uses sunlight to create electricity. While it has many advantages, like being environmentally friendly and widely available, it also has challenges like needing large spaces and high upfront costs. However, as technology improves, solar power will likely become more common in the future.



### Battery type

Only use Zinc Chloride Cell batteries while using this kit.

## Warning! Battery Box:



1. The supply terminals are not to be short-circuited
2. Insert batteries with the correct polarity
3. Remove batteries when not in use
4. Do not use rechargeable batteries
5. Different types of batteries of new and old are not to be mixed
6. Only use Zinc Chloride Cell Batteries

# Battery Safety Warning

Batteries, such as the AA batteries used with this teaching kit, are a source of electrical energy and must be handled with care. To ensure your safety and the proper functioning of your STEM activities, please adhere to the following guidelines:



## Keep Away from Heat

Avoid exposing the battery to direct heat sources or prolonged sunlight, as excessive heat can affect its performance and safety.



## Avoid Short Circuits

Do not connect the battery box terminals to each other, as this can cause the battery and wire to become extremely hot. Always use the designated connectors and components. Always use the provided connectors, wires, or components as intended.



## Polarity

Ensure that you insert the battery with the correct polarity, aligning the positive (+) and negative (-) terminals accordingly.



## Dispose of Properly

When your battery is no longer in use, dispose of it in accordance with your local regulations and guidelines for battery recycling.



## Inspect for Damage

Before use, carefully inspect the battery for any visible damage, such as leaks, dents, or corrosion. Do not use a damaged battery.



## Adult Supervision

Always have an adult supervise your use of batteries and electrical components.