Teni & Tayo Creations

The Maker's Box

NGSS-Aligned Activity Guide

Solar Fan | Wind-Powered Car | Taxi Airplane

For Young Makers in Grades K-5 | Ages 5-10

How to Use This Guide

This guide has two parts. Part 1 is the Activity Guide for kids and caregivers to use together during the build. Part 2 is the Parent Explainer, which gives adults the science context and conversation tools to go deeper after the toys are built. Everything in this box is inquiry-first: kids build exactly as instructed, then observe, wonder, and explore.

PART 1

Activity Guide for Kids

These activities are designed to be done after you build each toy. You followed the instructions and made something real. Now let's figure out how it works.

Activity 1: Solar Fan

The Big Question:
Where does the energy that spins the fan blades come from?

Before You Start: Make a Prediction

Look at your solar fan. Think about these questions:

- If you cover the solar panel with your hand, what do you think will happen to the fan?

- Where do you think the fan gets its power?
- What is a solar panel made to collect?

Let's Observe

Try these observation steps with your fan:

- Take your fan outside or place it near a bright window.
- Watch the fan blades. Do they spin? Which direction?
- Slowly cover the solar panel with your palm. What happens?
- Remove your hand. What happens now?
- Try tilting the solar panel toward the light and then away from it. Does the fan change speed?

What Did You Notice?

My Observations:
When I covered the solar panel, the fan _____
When I tilted the panel away from the light, the fan _____
I think the fan gets its energy from _____

Think Like a Scientist

Scientists use the word energy transfer. Energy from the sun travels to the solar panel, which converts it into electrical energy, which powers the motor, which spins the blades. Each step passes energy along a chain.

Sun	Solar Panel	Motor	Fan Blades
Light energy	Converts to electricity	Turns electricity into motion	Spin and move air

Decorate Your Fan

Your fan works exactly as built. Now make it yours! Decorate the blades, the base, or any surface you like. Think: if this fan were a character in a Feyi Fay adventure, what colors and patterns would it have?

Talk About It:
Can you think of three places where you have seen solar panels in real life? What were they powering?

Activity 2: Wind-Powered Car

The Big Question:
How does invisible air make a car move?

Before You Start: Make a Prediction

Look at your wind car. Think about these questions:

- What part of the car do you think catches the wind?
- What do you think will happen if you blow harder versus softer?
- Do you think the car will go faster on a smooth surface or a rough surface?

Let's Observe

Try these observation steps with your wind car:

- Place the car on a flat, smooth surface.
- Blow gently at the sail. What happens?
- Try blowing harder. Does the car move faster or farther?
- Try blowing from different angles. Does the direction of the wind change the direction of the car?
- Try the car on a rougher surface like a rug or carpet. What is different?

What Did You Notice?

My Observations:
When I blew harder, the car _____
On the rough surface, the car _____
I think the car moves because _____

Think Like a Scientist

When you blow on the sail, you push air into it. Moving air has force. That force pushes the sail, which pushes the car forward. Scientists call this wind force or push force. The sail converts wind energy into movement.

The wheels help too! Wheels reduce friction, which is the resistance that slows things down. That is why the car moves more easily on a smooth surface than on a rough one.

Decorate Your Car

Your car moves as built. Now make it look like it belongs on an adventure! Add a flag design, a team name, or characters from your imagination to the sail and body.

Talk About It:
Real sailboats and land yachts use the same idea as your car. Can you think of other ways people use wind energy in real life?

Activity 3: Taxi Airplane

The Big Question:
What is the shape of an airplane for, if the plane stays on the ground?

What is a Taxi Airplane?
A taxi airplane is a real type of vehicle! At airports around the world, small aircraft that drive passengers across the tarmac are sometimes called ground taxis. Your airplane is built to roll and be observed, not to fly. That means we can study its shape and parts as a ground vehicle, which is a great way to learn about aircraft design.

Before You Start: Make a Prediction

Look at your taxi airplane closely. Think about these questions:

- How many wheels does your airplane have? Where are they placed?
- Why do you think the wings are shaped the way they are?
- What parts of the airplane do you think help it stay balanced on the ground?

Let's Observe

Try these observation steps with your taxi airplane:

- Roll the airplane slowly across a flat surface. Does it go straight?

- Look at the wings. Are they flat, or do they curve? Look from the front and from the side.
- Find the tail of the plane. What shapes do you see?
- Gently blow over the top of the wings. What, if anything, do you notice about how the air moves?
- Compare your airplane to a real airplane photo. Can you spot the same parts?

What Did You Notice?

My Observations:
My airplane has _____ wheels placed at _____
The wings look _____ when I look from the front.
I think the tail helps the airplane by _____

Think Like a Scientist

Even though your airplane does not fly, it has the same parts as a real one. Each part has a job. Learning the names of these parts is what aeronautical engineers do.

Part	Name	Job	Find It On Your Airplane
Long flat parts on the sides	Wings	Create lift when moving through air	Look for the wide side panels
Back fin standing upright	Vertical Stabilizer	Keeps the plane from swinging side to side	Tall fin at the tail
Horizontal back piece	Horizontal Stabilizer	Keeps the nose from dipping up and down	Flat piece at the rear
Rolls it forward	Landing Gear / Wheels	Supports the aircraft on the ground	Count the wheels and note placement

Decorate Your Airplane

Design the livery (that is the real word for the paint design on an airplane) of your taxi plane. Real airlines choose special colors and logos. What does your airline look like? Give it a name!

Talk About It:

Before a real airplane can take off, pilots do a "pre-flight check" of all the parts. Using what you now know about your airplane's parts, can you do a pre-flight check? Name each part and say what it does.

NGSS STANDARDS ALIGNMENT

Standards Alignment at a Glance

All three activities in this Makers Box connect to Next Generation Science Standards (NGSS) for grades K-5. The table below shows the primary standards addressed by each toy.

Toy	NGSS Standard	Science & Engineering Practice	Crosscutting Concept
Solar Fan	K-PS3-1: Make observations to determine the effect of sunlight on Earth's surface. 2-PS1-2: Analyze data from tests of an object or tool to determine if it works as intended.	Planning and Carrying Out Investigations Analyzing and Interpreting Data	Energy and Matter: Energy can be transferred in various ways.
Wind-Powered Car	K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls. K-PS2-2: Analyze data to determine if a design solution works as intended.	Planning and Carrying Out Investigations Analyzing and Interpreting Data	Cause and Effect: Events have causes that generate observable patterns.
Taxi Airplane	K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change. 3-5-ETS1-1: Define a simple design problem reflecting a need or want that includes specified criteria for success.	Asking Questions and Defining Problems Obtaining, Evaluating, and Communicating Information	Structure and Function: The shape and stability of structures of natural and designed objects are related to their function.

A Note on Design Constraints

These kits are guided discovery and observation tools, not open-ended engineering design challenges. Kids build from instructions to produce a working toy, then observe and question how it works. This reflects real-world science: most scientists work within constraints and study systems they did not design from scratch. Following instructions precisely and then observing outcomes is itself a scientific skill.

PART 2

Parent & Caregiver Explainer

You do not need to be a scientist to guide your child through this box. This section gives you simple, accurate explanations of the science behind each toy, plus conversation prompts to extend the learning naturally.

Solar Fan: What the Science Is Really About

The Core Concept: Energy Transfer

Your child's solar fan demonstrates a chain of energy conversions. Sunlight (radiant energy) strikes the solar panel, which contains photovoltaic cells that convert it into electrical energy. That electricity flows to a small motor, which converts electrical energy into kinetic energy (movement) that spins the fan blades.

The key scientific idea is that energy does not appear from nowhere. It moves from one form to another. This is the Law of Conservation of Energy, though you do not need to use that term with young children. What matters is building the intuition: something is always powering something else.

Conversation Prompts by Age

Age Group	Questions That Extend Thinking
Ages 4-6 (K-1)	"What do you think the sun is sending to the panel? Can you see it?" / "What would happen to our fan at night?"
Ages 7-8 (2-3)	"Where else have you seen solar panels? What were they powering?" / "Do you think a bigger panel would make the fan spin faster?"

Ages 9-10 (4-5)	"Why do you think solar panels are tilted at an angle in real life?" / "What are some advantages of using sunlight for power instead of batteries?"

Common Questions Kids Ask

- "Why does it stop when I cover it?" - The panel needs light to produce electricity. No light means no electrical signal to the motor.
- "Can I charge my iPad with this?" - Not this panel. It produces a small amount of electricity, enough for a tiny motor, but not enough for larger devices.
- "Does the sun touch the panel?" - Not exactly. The sun sends light energy across space. The panel catches that light and converts it.

Wind-Powered Car: What the Science Is Really About

The Core Concept: Force and Motion

Your child's wind car demonstrates how forces cause changes in motion, a core idea in physics. When your child blows on the sail, moving air exerts a push force. That force is transferred through the sail to the body of the car, overcoming friction (the resistance between the wheels and the ground) and causing the car to accelerate forward.

Two variables are easy to explore here: the strength of the push (how hard you blow) and friction (what surface the car is on). Both affect the outcome in predictable ways, which is why this toy is excellent for early experimental thinking.

Conversation Prompts by Age

Age Group	Questions That Extend Thinking
Ages 4-6 (K-1)	"Can you feel the wind when I fan your hand? That same push moves the car." / "What do you think would happen if the sail had holes in it?"
Ages 7-8 (2-3)	"Why do you think the car moves straighter on a smooth surface?" / "Is wind a push or a pull? How do you know?"
Ages 9-10 (4-5)	"Can you think of a way to test whether the size of the sail changes how far the car goes?" / "Why do racing cars have a low, flat design instead of a tall sail?"

Common Questions Kids Ask

- "Why does it stop by itself?" - Friction. Even with no more wind, friction between the wheels and the surface slows and eventually stops the car.
- "Can I put a motor on it?" - In this kit, the car is designed for wind power only. But the question is a great one: that is exactly how engineers think.
- "Why does it go sideways sometimes?" - Small differences in how force hits the sail, or uneven friction on one side, push the car off course. Real vehicles use steering systems to correct for this.

Taxi Airplane: What the Science Is Really About

The Core Concept: Structure and Function

Your child's taxi airplane is a study in how shape and structure determine what a machine can do. Even though this airplane stays on the ground, every part on a real airplane (and on this model) has a specific job. The wings create lift when air moves over them; the vertical stabilizer keeps the plane from rotating sideways; the horizontal stabilizer prevents the nose from pitching up and down.

This is one of the most important ideas in engineering: form follows function. The shape of a thing tells you something about what it is designed to do. Even a ground vehicle has an aerodynamic design because aircraft are built to eventually move through air at speed.

Setting Expectations: Why It Does Not Fly

This is an important conversation to have before or during the build.
If your child expects the airplane to fly and discovers it does not, use that moment. "This is a taxi airplane. It drives on the ground at airports. Do you know what a taxi does?" Connecting it to a real vehicle type they may know (a car taxi) makes the ground function feel intentional rather than like a disappointment. The scientific conversation is: not all aircraft fly. Helicopters, hovercraft, and ground-effect vehicles are all part of aviation history.

Conversation Prompts by Age

Age Group	Questions That Extend Thinking
Ages 4-6 (K-1)	"Count the wheels with me. Where are they? Why do you think there are wheels?" / "What is the name of the flat pieces on the sides?"
Ages 7-8 (2-3)	"If we made the wings bigger, do you think the airplane would look different? Why?" / "What do you think the tail does?"

Ages 9-10 (4-5)	"Why do you think the wings are shaped like that and not flat like a table?" / "Can you find the same parts on a real airplane in a photo?"

Common Questions Kids Ask

- "Why does it not fly?" - This airplane is designed to drive on the ground, like a ground taxi. Not every aircraft flies. Some move on water, and some roll along airport tarmac.
- "What makes real planes fly?" - The shape of the wing causes air to move faster over the top than the bottom, which creates a pressure difference that lifts the plane. This is called Bernoulli's principle. You can demonstrate a version of it by blowing over a strip of paper and watching it rise.
- "Could I make it fly if I changed it?" - The kit is designed to be built as instructed. But the curiosity behind that question is exactly what engineers feel.

Key Vocabulary Reference

Use these terms naturally in conversation. You do not need to quiz your child. The goal is exposure, not memorization.

Word	What It Means (Kid-Friendly)
Energy	The ability to do work or cause change. It comes in many forms: light, heat, motion, electricity.
Energy Transfer	When energy moves from one place or form to another.
Solar Energy	Energy that comes from sunlight.
Force	A push or a pull. Forces cause objects to start moving, stop moving, or change direction.
Friction	The resistance that slows things down when surfaces rub against each other.
Wind Energy	Energy carried by moving air.
Structure	The way something is built or put together.
Function	The job that something is designed to do.
Observation	Using your senses to notice and describe what you see, hear, or feel.
Prediction	A thoughtful guess about what will happen before you try something.

Keep the Adventure Going

The build is just the beginning. Here are a few simple ways to extend the learning after this box is done:

At Home

- Put your solar fan near a window at different times of day. When does it spin fastest?
- Race the wind car on different surfaces around your home. Which surface produces the longest run?
- Look up photos of real aircraft and try to name the parts on your taxi airplane.

At the Library or Online

- Search for "how solar panels work for kids" to find videos and animations.
- Look up "land sailing" or "land yachting" to see real wind-powered vehicles in action.
- Explore photos of airport ground operations to see taxi aircraft and ground vehicles.

In Conversation

- Ask your child to explain to another family member how one of the toys works. Teaching others is one of the best ways to deepen understanding.
- Let your child ask questions you do not know the answer to. Looking things up together is a science practice in itself.
