

**GEEK
& CO.
SCIENCE!**



PROJECT KIT **Ages
8+**

RuBBer BaND RACERS

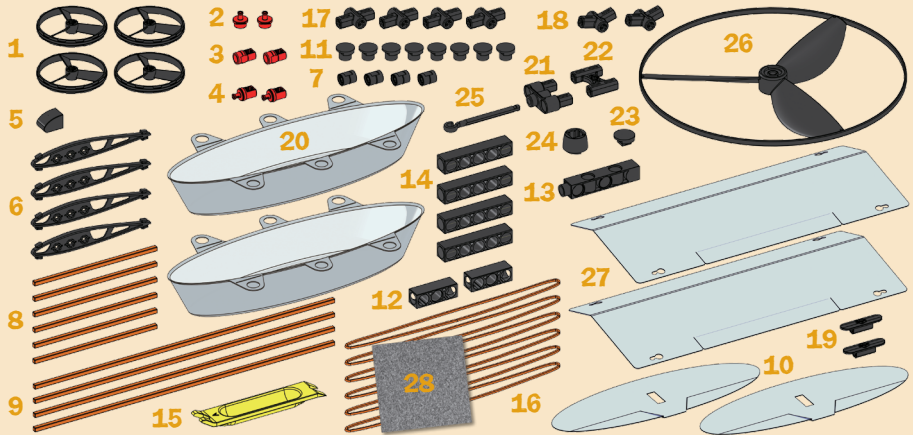


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Franch-Kosmos Verlags-GmbH & Co. KG, Pfizerstr. 5-7, 70184 Stuttgart, Germany | +49 (0) 711 2191-0 | www.kosmos.de
Thames & Kosmos, 301 Friendship St., Providence, RI, 02903, USA | 1-800-587-2872 | www.thamesandkosmos.com
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YOU WILL ALSO NEED: A “test flying” area at least 30 meters (about 100 feet) long, and a tub or kiddie pool for the watercraft experiments

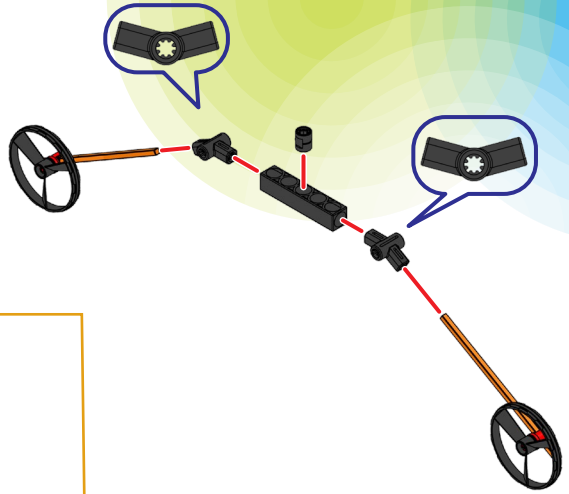
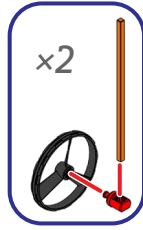
Hey Rubber Bandits!

Ready to build five awesome rubber band powered models, learn how propellers push vehicles forward, and how rubber bands store energy? Well, let's get started! With this kit you can build an airplane, helicopter, fan car, airboat, and hydrofoil. Helo the Geeker will be your guide!

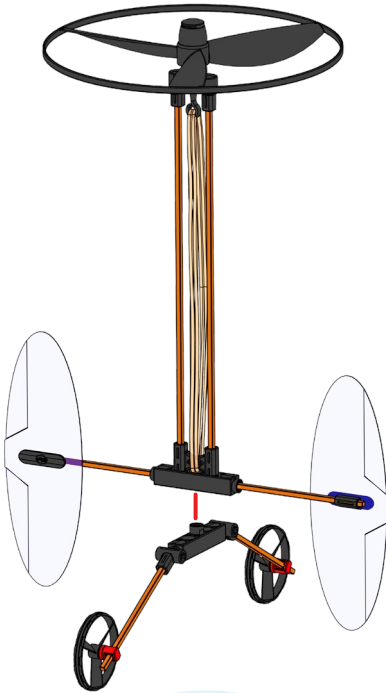
Hi! I'm Helo!



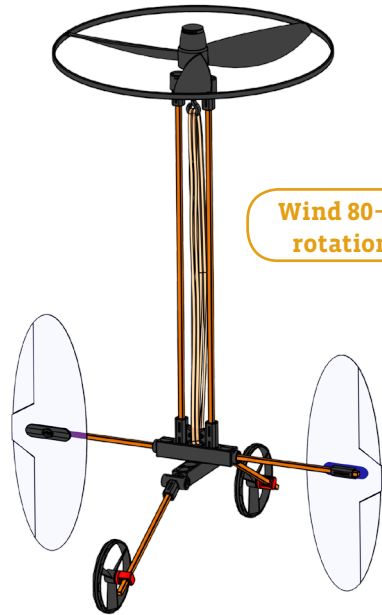
- 5** Build the landing gear assembly with 90 mm dowels **1** as shown.



- 6** Attach the landing gear to the helicopter body.



Wind



Wind 80-100 rotations.

- 7** Fly the helicopter outside or in a space with very high ceilings. To fly, wind the propeller in the direction indicated. Wind it 80-100 times. Hold the propeller. Do not stand over the helicopter.

Release the propeller and the model will fly upward and then fall back down. Be careful that no one is hit when it flies up or falls down.

HOW DO PROPELLERS WORK?

This is so Cool
it makes my
head spin!



To understand how propellers work, let's first look at another part of the airplane: the **wing**. Wings generate a lifting force in **air**. Air is a mixture of gases. The molecules in air are always moving around and they are always being pulled toward Earth by gravity. **Air pressure** is the result of all these moving particles pushing on each other and all the things under and around them.

Air behaves like a **fluid** and obeys the physical laws of fluids. To understand how wings work, the most important principle of fluids to know is that the faster fluids move, the lower their pressure. This is called **Bernoulli's principle** after the scientist who came up with it. Airplane **wings** are designed to take advantage of Bernoulli's principle to lift a plane upward.

The cross section of a wing has a top surface that is curved and therefore longer than its bottom

surface. Air flowing over the top has to travel farther, so it moves faster. As Bernoulli's principle states, faster moving air has a lower pressure and slower moving air has a higher pressure. The high air pressure under the wing pushes the wing upward and the low pressure above sucks it upward. This is called **lift**. Lift is always perpendicular to the direction of the airflow.

A **propeller** works like a spinning wing. Imagine taking two (or more) wings, sticking them on a central axis opposite one another, and spinning the axis. The wings would spiral through the air and create low pressure in front of them and high pressure behind them, and thus pull the propeller forward. The wings of a propeller, called **blades**, are angled so they cut into the air more.

Just like they screw through the air, propellers can also work in another fluid: water!

