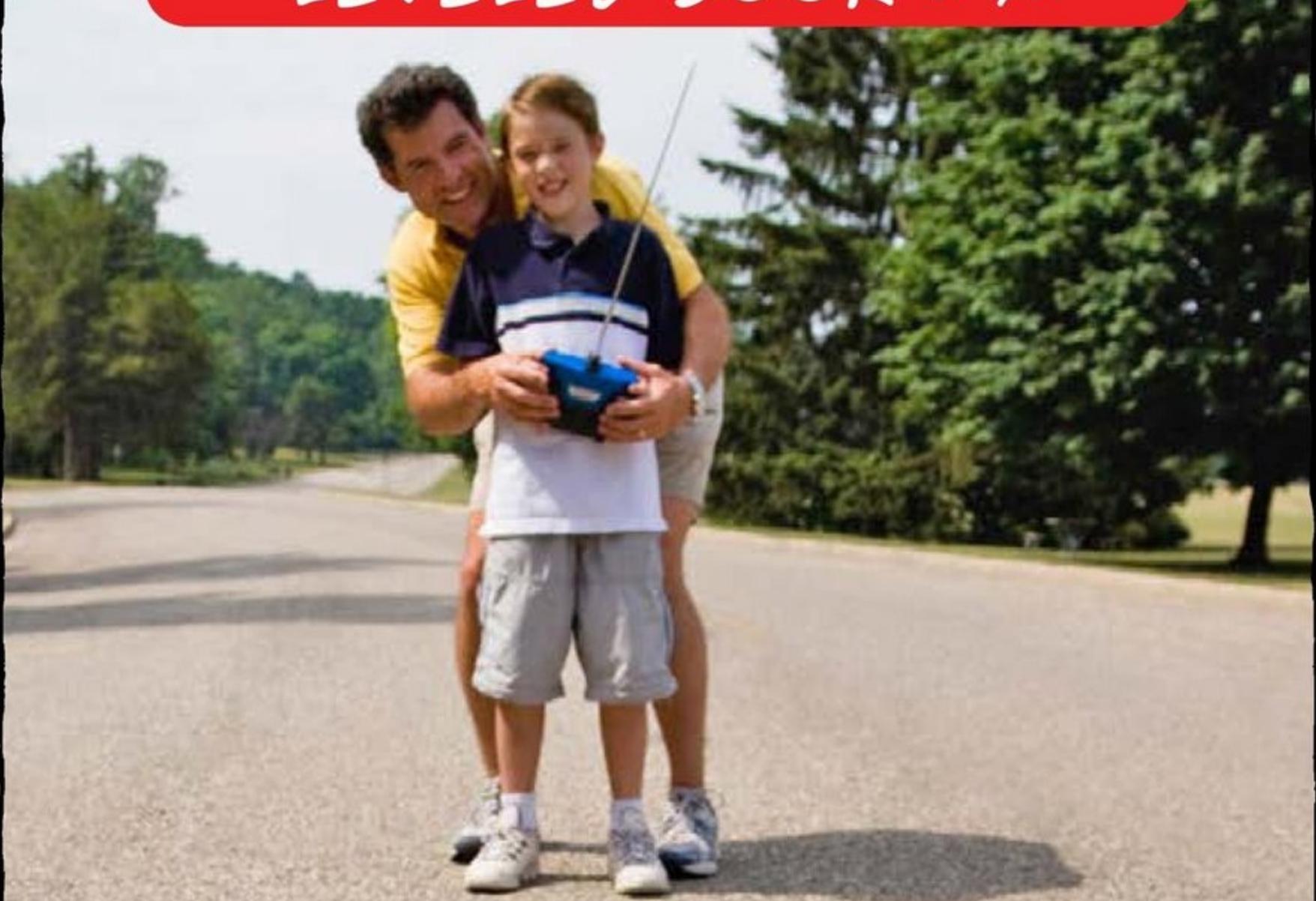


LEVELED Book • X



Fun by Remote Control



Written by John Perritano



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Focus Question

Why are remote-controlled vehicles popular?

Words to Know

aerobatic	receiver
drones	remote control
electromagnetic	replica
radiation	shock absorbers
maneuver	transistor
mechanics	transmitter
miniaturization	

Front cover: A father and son play with a remote-controlled airplane.

Title page: Nancy Archuleta, center, watches her granddaughters Mercy and Makayla drive remote-controlled cars at the JV Micro Motor Sports racetrack at the 23rd Annual Supernationals Custom Auto Show at Expo New Mexico on Sunday, February 2, 2014.

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Learn More

You can learn more about RC vehicles by visiting your local hobby shop. Many cities also have RC flying clubs where you can watch pilots fly. RC drivers and pilots are usually happy to talk about their vehicles and to share tips with people new to the hobby.

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Correlation

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Many people enjoy putting all the parts of a kit car together.

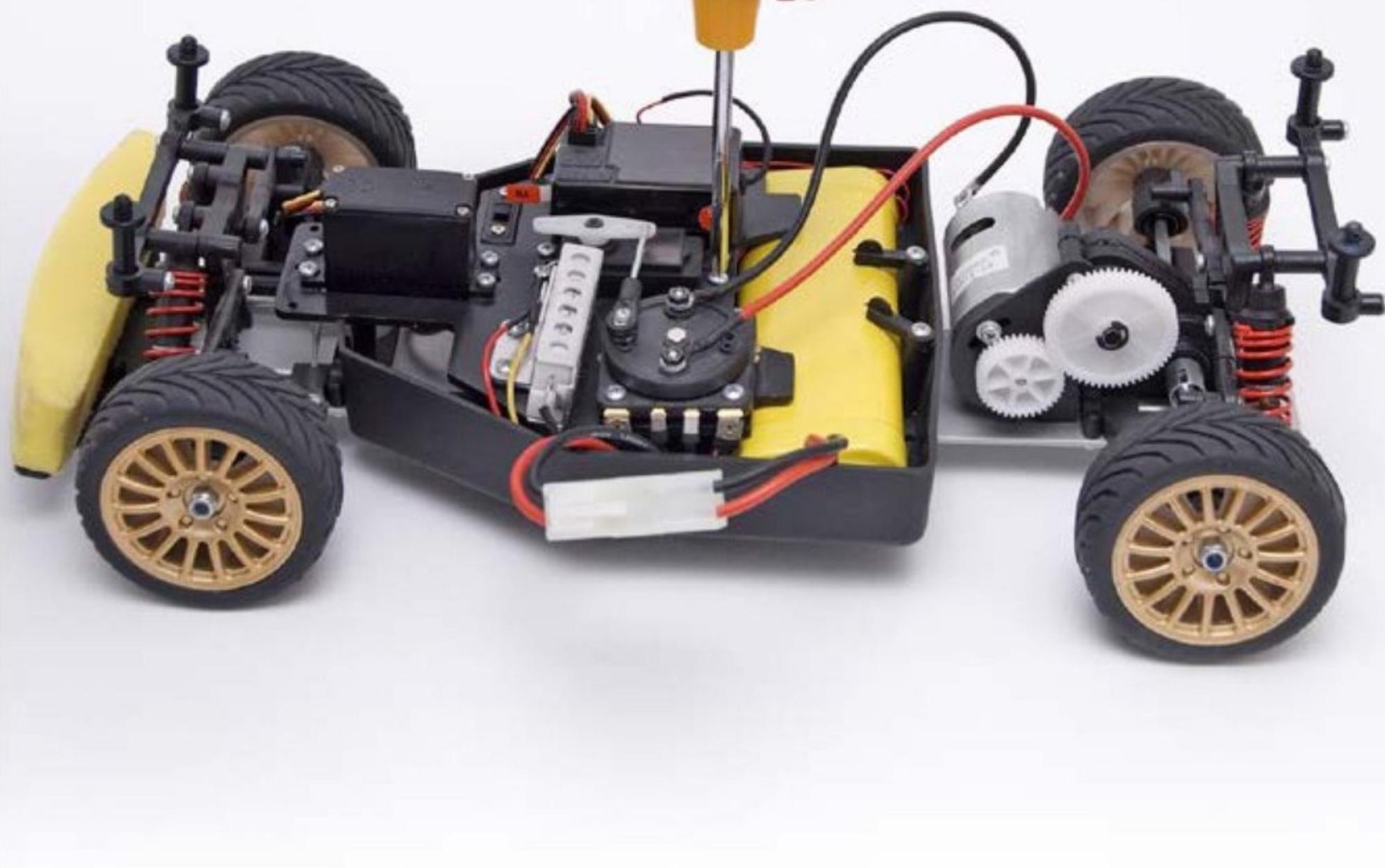


Table of Contents

A New Record	4
The Birth of Radio Control	5
Basics of RC	7
Four-Wheeled Fun	8
RC Racing	10
RC Flying	11
The Future of RC Technology	15
Glossary	16

Some radio-controlled aircraft, like the one shown here, use jet engines.



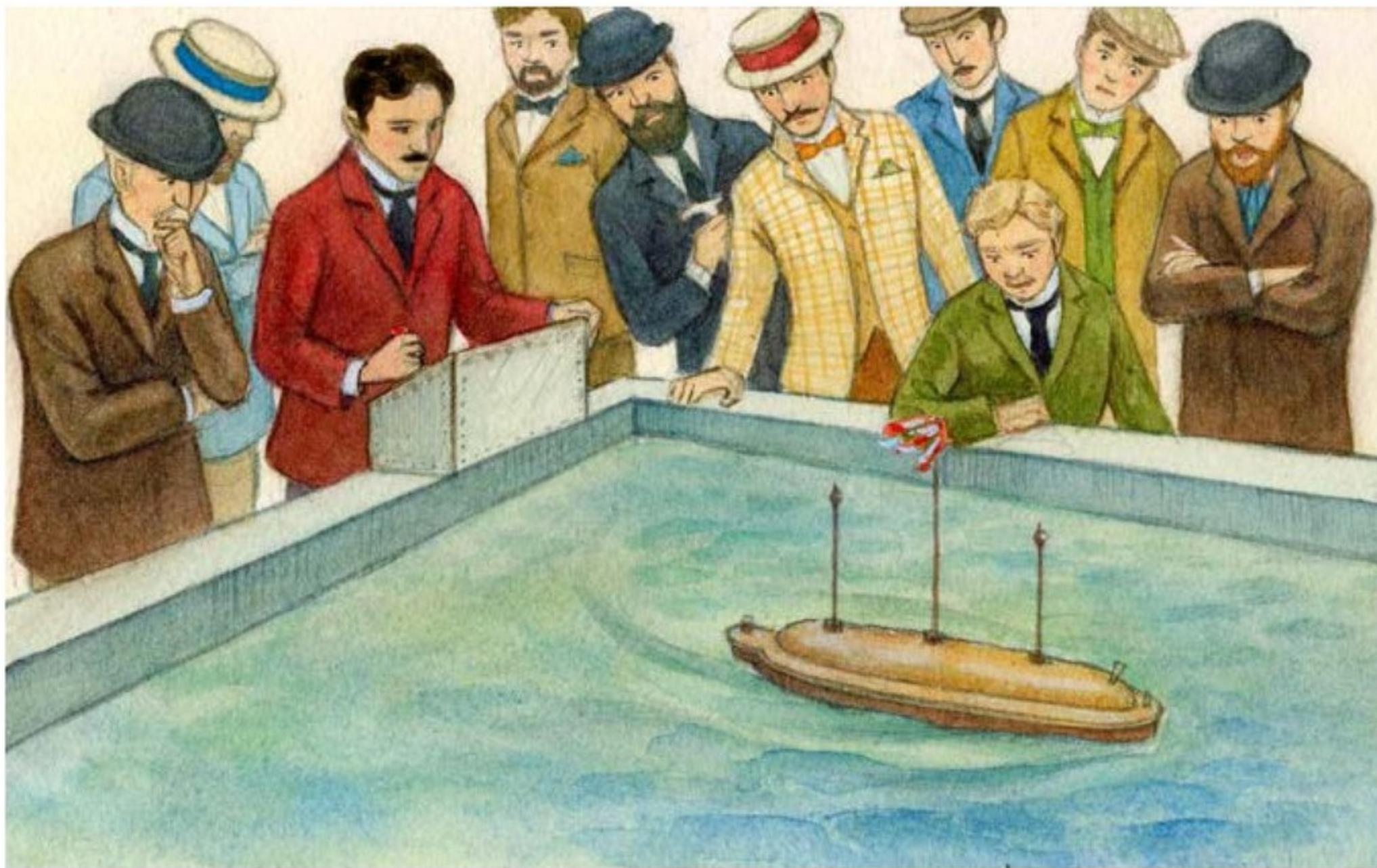
A New Record

Niels Herbrich goes through his preflight checklist before flying his red jet airplane with the swept-back wings. This is no ordinary jet, however. It's small enough to fit inside the trunk of a car and is nearly as speedy as an airliner. As for Herbrich, he's no ordinary pilot. He flies the plane without ever leaving the ground.

The plane's engine hums to life. Moments later, in an ear-splitting whine and a burst of flame, the jet skids across the grass and races into the sky.

Whoosh! The pilot uses a handheld radio **remote control** to **maneuver** the jet as it rolls and turns. Eventually, the radio-controlled (RC) jet hits a peak speed of 440 miles per hour (708 kph). Herbrich has just set a new world speed record.

Children and adults have been playing with RC planes, boats, cars, trucks, and helicopters for decades. Most RC machines aren't nearly as fast as Herbrich's jet plane, but they are every bit as fun.



Tesla's demonstration of the world's first radio-controlled boat caused a stir in 1898.

The Birth of Radio Control

We can thank Nikola Tesla for inventing the first radio-controlled machine. Born during a lightning storm in 1856, Tesla became an inventor whose experiments in electricity would inspire radios, radar, and robots.

As a young man, Tesla had the idea to use radio waves—invisible airborne ripples of **electromagnetic radiation**—to control a boat. Tesla's experiments eventually led the scientist to New York City's Madison Square Garden in 1898. It was there that Tesla first demonstrated a radio-controlled boat that shocked and delighted curious onlookers years before most people had ever heard of radio technology.

Using a homemade **transmitter**, Tesla sent a series of radio signals to the craft as it floated in a large tank of water built for the demonstration. The small boat moved gracefully around the tank in response to Tesla's silent commands. It even answered math questions from members of the audience by blinking its lights. The crowd was stunned. Some accused Tesla of using his mind to control the boat. Others said it must be magic or that perhaps a trained monkey was hidden inside. The demonstration was front-page news.

Tesla did not invent the boat as a toy. He hoped the U.S. Navy would buy his radio-controlled device to guide torpedoes through the water, but that never happened. However, the technology did see some use during World War I (1914–1918) and World War II (1939–1945).

In those days, most radio-control technology was best suited for large machines. The equipment and batteries needed to power electric motors were huge. That all changed in 1947 with the invention of the **transistor**.

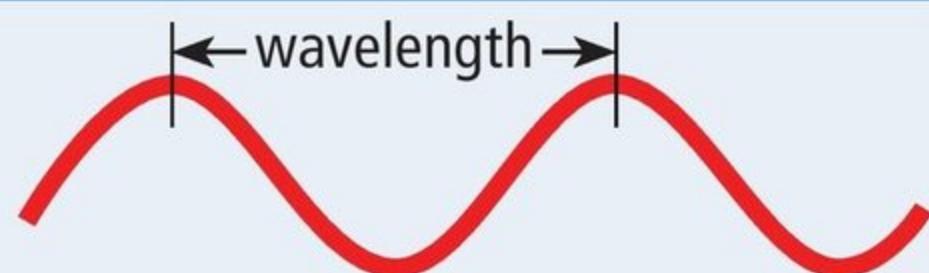
Transistors were tiny, yet they made electric currents more powerful. Engineers used transistors to shrink the size of electric motors. Some even began putting transistors into radio-controlled toys. A new hobby was born.

Basics of RC

People have created hundreds of different types of radio-controlled vehicles, from robots to boats. While the **mechanics** of how they work differ, all use the same basic technology. A transmitter, or remote control, sends radio signals over a specific frequency. A **receiver** inside the vehicle is constantly looking for signals from the transmitter. The receiver decodes the signals, sending electric currents to the motors, which move and guide the vehicle. The transmitter and receiver are both powered by batteries.



What Is Radio?



Radio is a type of electromagnetic energy—the same energy that we see as visible light. Radio energy travels in invisible waves through the air and can go through most walls. Electromagnetic energy comes in many forms, depending on the size of the waves and their frequency (number of waves per second). Radio waves range from longer than a football field to about the size of a person and have a frequency of 1 million to 100 million waves per second. Light, microwaves, and X-rays are also types of electromagnetic energy, but they have much shorter wavelengths and much higher frequencies than radio.



This 1/10th scale Ferrari P4 was one of the first RC model cars ever made. It was created by the Italian company El-Gi in 1969.

Four-Wheeled Fun

Toy makers first began to sell RC cars in the mid-1960s. Today's cars are smaller and more powerful. They are powered by gasoline, electricity, or something called *glow fuel*—a high-performance fuel mixture nicknamed *Nitro*.

Many toy stores sell basic RC cars that are inexpensive and easy to maintain, but serious RC drivers buy “hobby-grade” cars that can cost hundreds of dollars. Many people build hobby-grade RC cars from kits that come with all the parts boxed together. Drivers can replace parts, paint the body, and buy accessories. Many drivers also modify kit cars with bigger engines or motors. Others prefer ready-to-run (RTR) cars that come already assembled.



Three Nitro-powered RC cars (top) race around a track. Off-road buggies (bottom) catch big air on jumps during a national RC car competition in Kingsville Township, Ohio, on August 10, 2013.

Whether built from kits or bought already assembled, RC cars come in several shapes and sizes. For example, touring cars include such models as Ford Mustangs, Chevy Camaros, and Porsche 911s.

Off-road vehicles are popular since they come with large tires and heavy-duty **shock absorbers**. They can go just about anywhere, including uncut lawns, vacant lots, and dirt fields. Some resemble classic monster trucks. Others look like sporty pickup trucks or buggies.

RC Racing

Some people love to race their RC cars. While some drivers compete with friends in vacant lots or in parks, others race in organized competitions on tracks that look like real speedways. Organized racing categories are broken down by the size of the vehicle, its class, whether it is kit-built, and whether it gets its power from an electric motor or a gasoline-powered engine. The racing classes include touring cars, sports cars, and off-road vehicles (both two-wheel drive and four-wheel drive).

Some competitions are straight-line races that are usually held at a drag strip or airfield. Drivers also race around closed-course oval tracks. Some of the coolest off-road events occur at RC truck-and tractor-pulling competitions. RC trucks pull sleds that weigh from 35 to 100 pounds (16–45 kg). That's like pulling an average-sized bulldog or a German shepherd!

Word Wise

RC (or "R/C") stands for either "remote-controlled" or "radio-controlled." Remote-controlled vehicles include vehicles connected to a controller by a wire. However, most modern remote-controlled vehicles communicate wirelessly over radio frequencies.



RC planes perform stunts in the air during a competition in 2009.

RC Flying

Bob Motta of Danbury, Connecticut, remembers when the RC flying bug bit him. It was in the 1960s, and Motta took to the air in his first RC plane—an F4 Corsair, a **replica** of a World War II Navy plane.

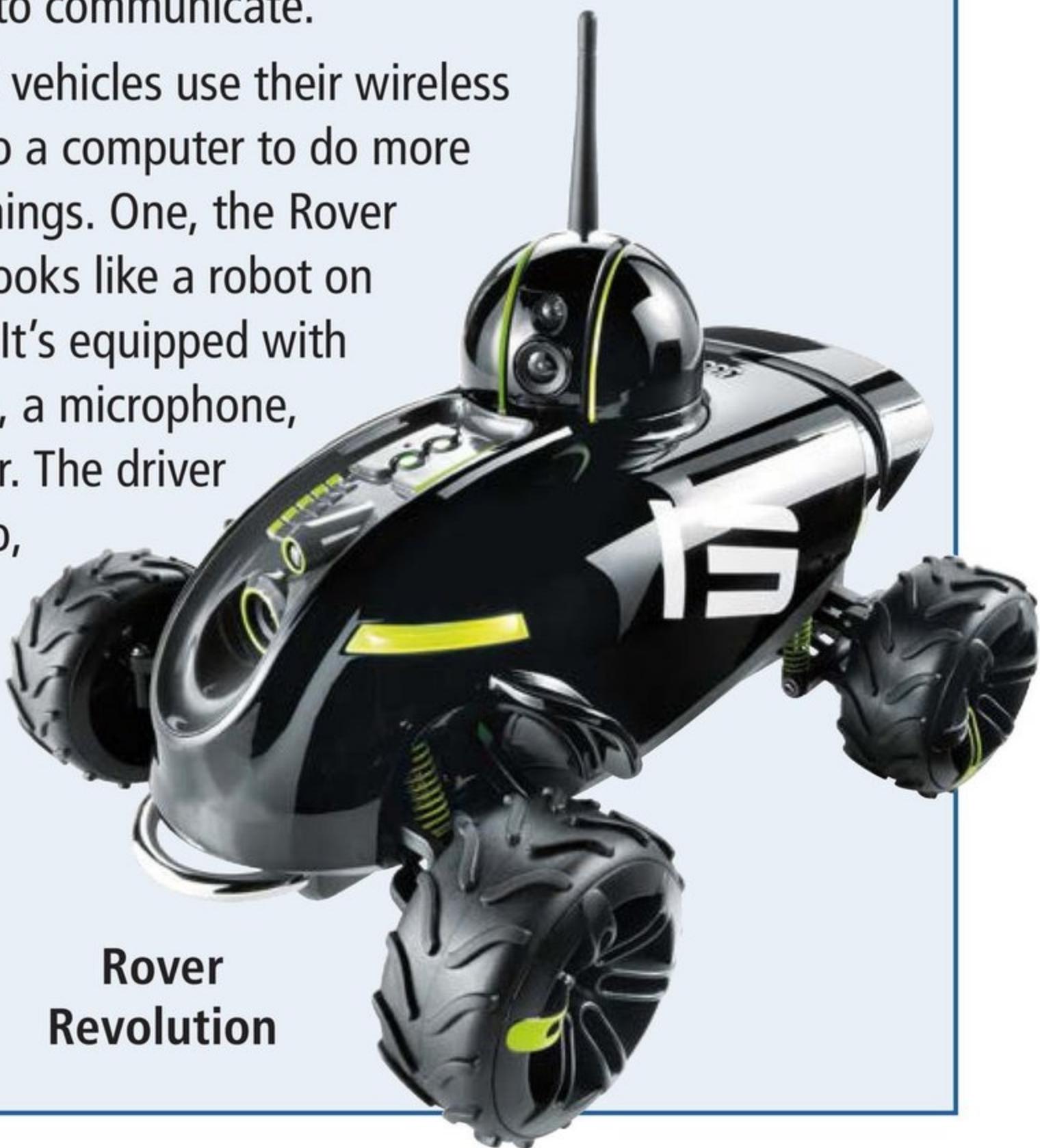
These days, Motta, 66, mainly pilots World War I models. He's amazed by how advanced the planes have become. "After the **miniaturization** of the electronics, things really took off," he says.

Whether piloting a plane, blimp, or helicopter, many hobbyists love taking to the sky in an RC aircraft. Most RC pilots learn the basics by flying training planes, or “trainers.” Trainers are designed to be simple to make flying easy. They are often made out of foam, which makes them lightweight and less likely to be seriously damaged in case of a crash.

Computerized RC

Some RC cars now use computer networking technology for communication. Drivers control vehicles using a wireless connection and a smartphone or tablet. These control systems work because wireless computer networks also use radio waves to communicate.

Some RC vehicles use their wireless connection to a computer to do more interesting things. One, the Rover Revolution, looks like a robot on four wheels. It's equipped with two cameras, a microphone, and a speaker. The driver can see video, talk, and listen as the rover moves about.



Rover
Revolution

Once pilots master the trainer, they often graduate to sport planes, which can perform complicated **aerobatic** maneuvers. Sport planes often have a special wing design that makes flying them upside down easier.

"I've had 747 pilots tell me that model airplanes are more of a challenge to fly than real planes," Motta said. "You have to stand on the ground and use all of your senses because what comes up must come down."

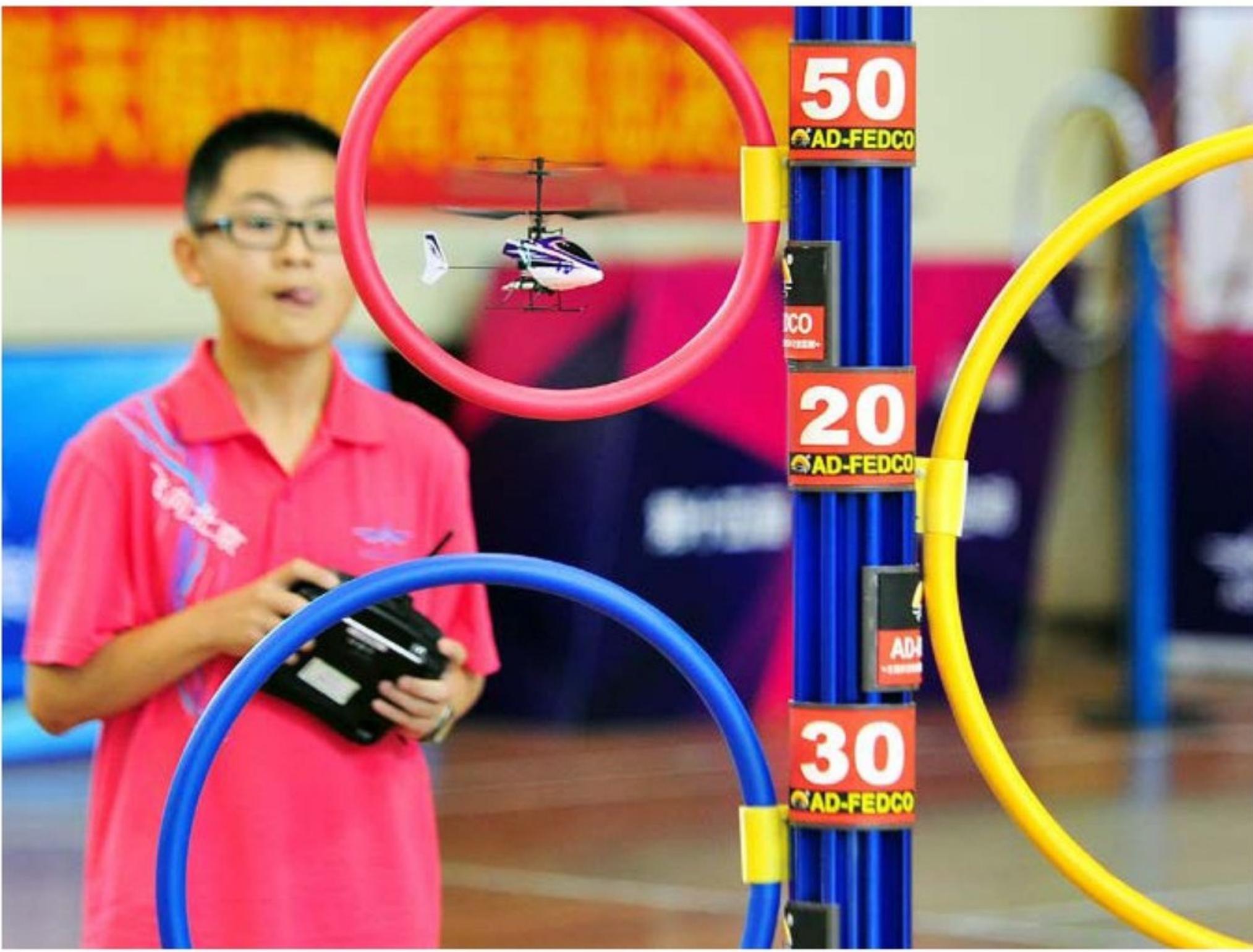
Many RC pilots love to fly replicas of airplanes that flew in World War I and World War II. Known as "warbirds," they come in kits or RTF models.



Warbirds, such as this German Triplane from World War I, are popular among RC hobbyists.

RC pilots can even build their own planes. Motta remembers spending hundreds of hours putting a plane together. When one crashes, he picks up the pieces that are not damaged and keeps them as spares for other planes.

Today, pilots can buy Almost-Ready-to-Fly (ARTF) planes. "Instead of two hundred hours building a plane, you can do it in about twenty," Motta says. "In that time, you'll have a plane that is respectable and good looking."



A boy flies his RC mini helicopter through an obstacle course as part of a competition in China in 2013.

While planes are challenging to fly, helicopters can be even more complicated to handle. Some types, such as mini helicopters, make learning to fly easier, especially indoors. Although these RC copters are small, they can still teach pilots many of the skills necessary to fly bigger helicopters.

Quadrocopters, also known as quadcopters, have four spinning blades and can fly in all directions. Autogyros look like a cross between a plane and a helicopter. A propeller at the front or back moves the aircraft forward, which causes the unpowered blades on top to spin and keep the autogyro airborne.



A quadcopter delivery drone carries a package on a test flight.

The Future of RC Technology

RC technology isn't all child's play. **Drones** flown by pilots sitting miles away use the same basic technology and can do a variety of jobs. Within the next few years, remote-controlled drones could be flying in your neighborhood.

Farmers might soon be using camera-carrying drones to locate crop-eating insects. Hospitals might use drones to fly human organs from one place to another for transplant. Some companies plan to use drones to deliver packages.

TV crews used drones to cover the 2014 Winter Olympic Games in Sochi, Russia. The drones, operated by the Olympic Broadcasting Service, flew across the ski and snowboarding courses.

What seemed like magic one hundred years ago is quickly becoming an important part of our everyday lives. It's still a blast to play with as well!

Glossary

aerobatic (<i>adj.</i>)	of or relating to challenging or thrilling movements of an aircraft in flight (p. 13)
drones (<i>n.</i>)	unmanned aircraft or ships that are operated remotely (p. 15)
electromagnetic radiation (<i>n.</i>)	energy in the form of electromagnetic waves (p. 5)
maneuver (<i>v.</i>)	to move around; to guide the motion of something (p. 4)
mechanics (<i>n.</i>)	the details of how something operates (p. 7)
miniaturization (<i>n.</i>)	the act or process of designing or making something in a smaller size (p. 11)
receiver (<i>n.</i>)	an electronic device that detects electromagnetic signals and converts them into sound, pictures, or another form (p. 7)
remote control (<i>n.</i>)	a handheld device that can be used to control something from a distance, such as a TV or a toy (p. 4)
replica (<i>n.</i>)	a copy or reproduction of something (p. 11)
shock absorbers (<i>n.</i>)	pieces of equipment connected to the wheels of a vehicle that make traveling over uneven surfaces feel smoother (p. 9)
transistor (<i>n.</i>)	a small electronic device that controls the flow of electricity in electronic items (p. 6)
transmitter (<i>n.</i>)	a device that sends out electromagnetic signals, such as radio or television signals (p. 6)

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Word Count: 1,401

Connections

Writing and Art

Design a remote-controlled vehicle that could help with a job. Draw a diagram of your vehicle. Write the script for a commercial persuading people to buy your vehicle.

Science

Research a remote-controlled vehicle that was designed to be helpful. Create an informational pamphlet describing the vehicle and its purpose.



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