

MARS HELICOPTER

It's up, up and away for a futuristic drone on the Red Planet.

NASA's latest robot rover, Perseverance, arrives on Mars this month and it has got a small surprise on board. With any luck, Ingenuity – a lightweight, self-flying helicopter – will become the first aircraft to fly through the sky of another planet. The air on the Red Planet is far thinner than it is on Earth, which presents some unique engineering challenges. To get off the ground, the Marscopter's rotor blades need to be bigger and spin faster than Earth-bound rotors. Ingenuity must be super-light and so only has a short range, travelling in short hops of about 300 metres and reaching a maximum height of just five metres. In between flights it recharges its batteries with solar electricity.

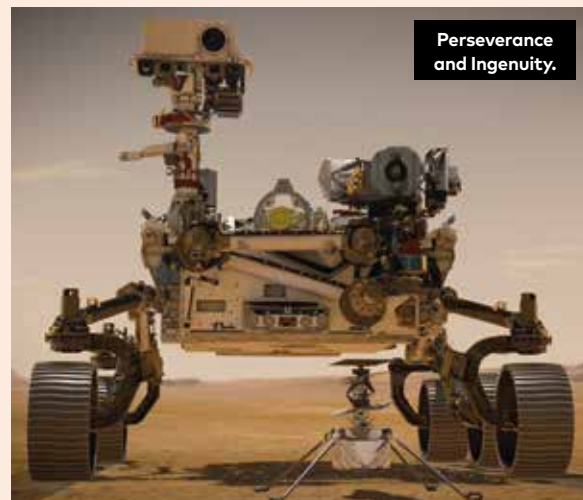
Ingenuity is neatly stowed underneath Perseverance. Once the rover has safely touched down on the Red Planet, the helicopter will unfold from its flight position and drop onto the dusty Martian soil. The rover will then roll away, giving Ingenuity space to take off (and to avoid damage if it crashes). NASA scientists hope their mini 'copter will offer a new way to explore far-flung planets, scouting out an area and taking a look at features that are too tricky for Perseverance to visit. If Ingenuity is a success, flying machines like this are sure to be used by the first human explorers on Mars.

NAMING CONTEST

The Marscopter got its name in a school competition that had 28,000 entries. "Ingenuity" was suggested by Vaneeza Rupani from the US state of Alabama.

Perseverance rover

Mars is about to get a new resident – Perseverance, NASA's latest and most advanced rover. Launched from Earth in July 2020, this car-sized robot explorer will be lowered gently to the Martian surface by a rocket-powered "sky crane" in mid-February. Its job is to study the red Martian rocks, searching for clues about how they formed. It aims to learn more about conditions on Mars in the past, and perhaps reveal if there was once life on the Red Planet.



Perseverance and Ingenuity.

NASA/JPL-CALTECH

Rotors

Two pairs of curved, lightweight rotors create a lifting force as they spin, pushing Ingenuity upwards. The carbon-fibre blades are 1.2 metres long and counter-rotate (spin in opposite directions) around 2,400 times a minute to create enough lift to fly in the Red Planet's thin air.

Lightweight machine

The force of gravity on Mars is only about a third of Earth's gravity. Ingenuity weighs 1.8 kilograms but on Mars that drops to 680 grams.

Landing gear

The Marscopter stands on four legs. These are folded away during the journey to Mars and must be locked in place before Ingenuity can release itself from Perseverance.

Shield

Batteries and electronics inside the helicopter are protected by a thin sheet of shiny plastic that traps heat. Temperatures on Mars can drop to -90°C at night, so delicate components are kept warm until sunrise by a built-in electric heater.

Short stature

Ingenuity stand just 49 centimetres high – a bit taller than a chicken but much better at flying.

Solar panels

Ingenuity uses solar panels to recharge its batteries, ready for the next flight.

Communications

Radio antennas under the solar panels keep Ingenuity in touch with Perseverance. The rover transmits information to spacecraft orbiting Mars, which then relay the data back to controllers on Earth.

Computer control

Ingenuity flies itself to pre-planned targets. It lands itself using built-in sensors and computers, known as avionics, fitted inside its cube-shaped body.

GOING SOLO

Radio signals take about 20 minutes from Mars to Earth and back, which means that Ingenuity cannot be remote-controlled from Earth.

Cameras

Flying like a drone, Ingenuity will snap pictures of the Martian surface from above. The two cameras also help Ingenuity to navigate and find safe landing sites.

Battery power

The onboard batteries use lithium ion technology, similar to a mobile phone or laptop. Fully charged, they can store enough power for a 90-second flight.

