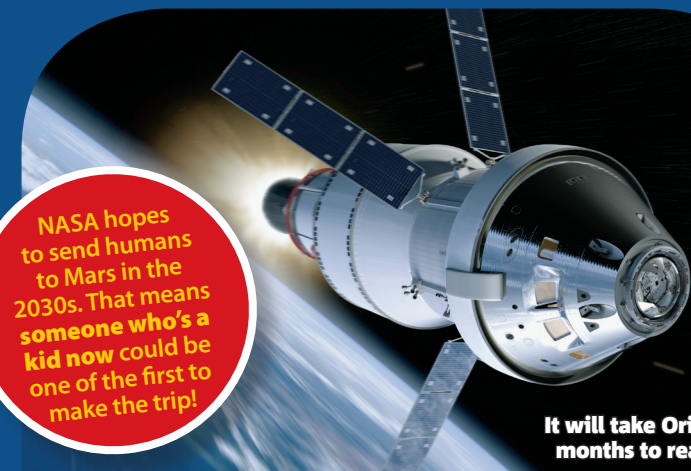


MISSION to MARS

Your guide to living on the Red Planet

 Congratulations! It's the year **2035**, and you've been selected to join NASA's newest astronaut class. Your assignment? To **travel to Mars**! Your crew will be the **first humans to set foot on the Red Planet**. We're sure you have questions. And we have the answers! Here's everything you need to know about surviving life on Mars...

HOW DO I GET THERE?



NASA hopes to send humans to Mars in the 2030s. That means someone who's a kid now could be one of the first to make the trip!

It will take Orion eight months to reach Mars

The **modern rockets** that travel to the **International Space Station** aren't powerful enough to make the **225-million-kilometre journey to Mars**. So NASA is developing a new spacecraft called **Orion**. Orion will be the fastest man-made object ever to blast through Earth's atmosphere, reaching a screaming **40,200kmph**!

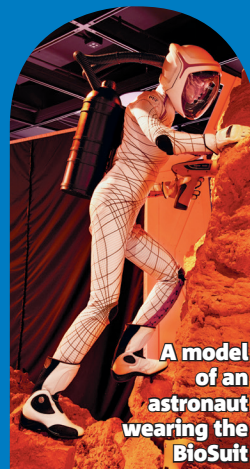
At **4.8m across**, the craft is about the size of a van. But if that sounds cramped, don't worry – scientists are investigating the possibility of hooking up Orion to a much **bigger ship in space** after it's launched from Earth. This ship doesn't exist yet – it's just one of the ideas scientists have to help make a roomier and more comfortable trip to Mars.



Scientists test spacesuits inside a model of the Orion spacecraft

WHAT DO I WEAR?

"On Mars, your space suit will be the only barrier between you and sudden death," says **Brad Holschuh**, a professor at the University of Minnesota in the USA. As well as **supplying you with oxygen** and **keeping you warm** during Mars' below-freezing nights, your space suit will protect you from the planet's **low pressure**. Without the suit, you would lose consciousness and quickly die.



A model of an astronaut wearing the BioSuit



Close-up of the BioSuit

Current space suits are like **gas-filled balloons** that push against the body at the correct pressure. But the suits are **hard to move in** and astronauts fall down a lot. So Professor Holschuh and his team have worked on a new **flexible space suit** called the **BioSuit**. Astronauts press a button that sends a current through the BioSuit, adjusting the suit's smart material to the correct pressure. Clever!

WHAT DO I EAT?

Today's **freeze-dried astronaut food** is nutritious – but definitely *not* tasty! "Astronauts use a lot of spicy sauce!" says **Trent Smith**, manager of NASA's **VEGGIE project**, who's hoping to transform astronauts' pre-packaged meals of mush with **fruits and vegetables** grown in space.

If an astronaut tried to water crops in **zero gravity**, the water would just **float away**. So when the VEGGIE scientists launched their galactic garden to the **International Space Station** in 2014, they packed lettuce seeds inside **pillows filled with fertiliser** and a special kind of **dirt**.



This is what a space garden might look like on Mars

An illustration shows how an astronaut could work in a Mars greenhouse

Astronauts placed the pillows under **LED lights** and regularly **injected** them with water, which **stuck to the dirt**, so the growing plants could slurp it up. One month later, the crew harvested the first **space salad**. Mars astronauts could use this technology to grow food in their spacecraft on the way to the Red Planet. Later, they may farm crops in Martian greenhouses (above).

HOW DO I GO TO THE LOO?

Mars is **drier than Earth's driest desert**. So all gadgets on your space base will be designed to **conserve every single drop** of water – even from the **toilets**!

Blue Diversion toilets are currently being developed for use in **countries where water is scarce**, but similar technology will probably be used on the Red Planet too. These toilets **recycle water**, meaning after you've gone to the loo, the water from the toilet goes to the sink for you to **wash your hands**. Sound gross? The toilet



After hand washing, the water goes back into the loo, completing the cycle

water is first pumped through a **filtration system**, making it **clean enough to drink**. Phew!

WASH HERE!

SIT HERE!

WHAT IF SOMETHING BREAKS?

"When a lightbulb blows on Earth, you go to the store for a new one," says NASA planetary scientist **Chris McKay**. But on Mars, the DIY shop is millions of kilometres away. Today's astronauts bring backup parts, but they take up valuable space. So astronauts will soon use **3-D printers** to 'print out' whatever they need. They work by layering materials to build an object. Amazing!



THIS ROCKET ENGINE FUEL PUMP WAS MADE BY A 3-D PRINTER!

