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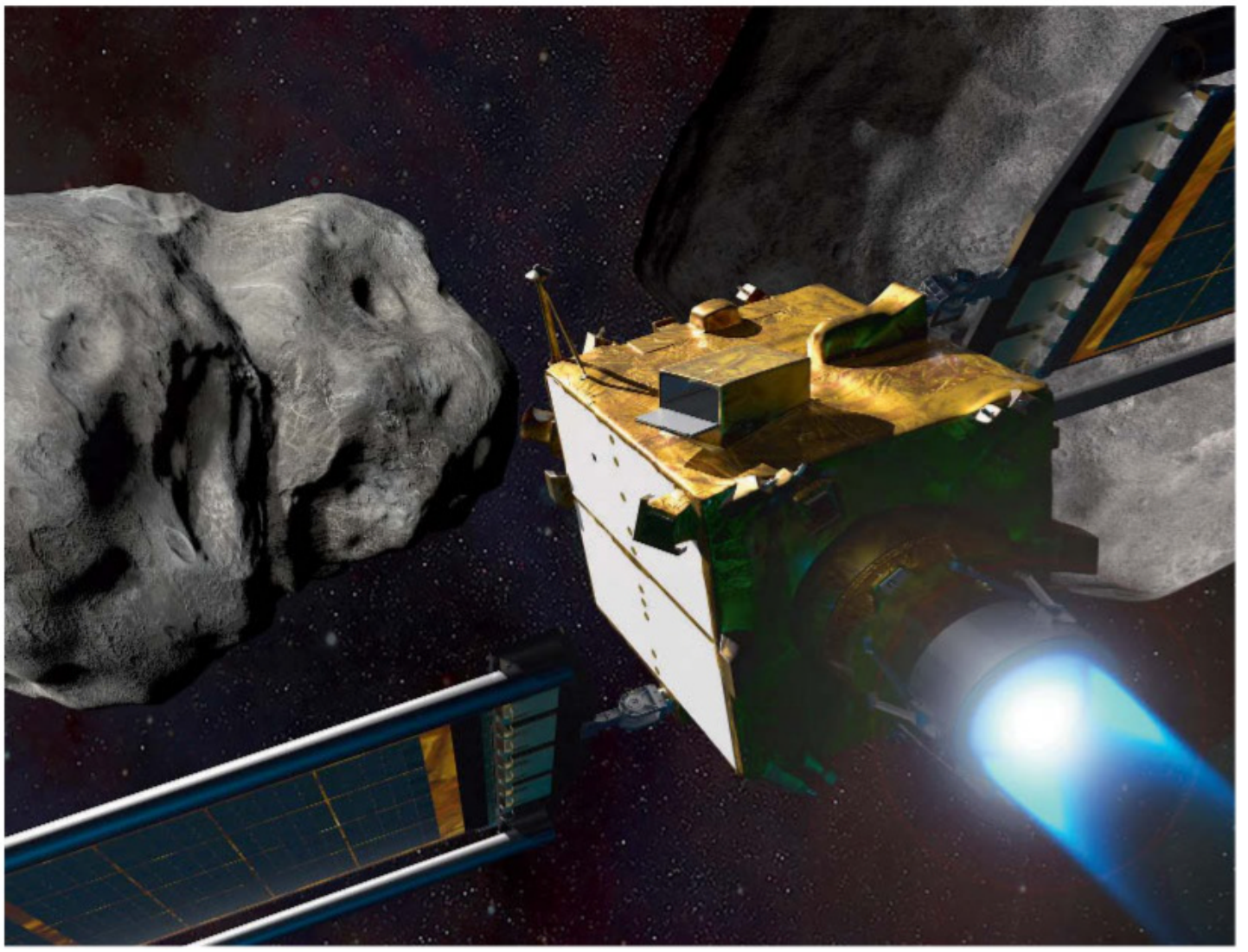

NASA

Artist's impression of DART and its asteroid target

Space

Testing Earth's defences

The first attempt to divert an asteroid could one day help prevent an impact on our home planet, reports **Alex Wilkins**

NASA's Double Asteroid Redirection Test (DART) spacecraft will smash into an asteroid next week, in the first ever real-world planetary defence mission.

The 500-kilogram DART craft launched on 24 November 2021 and is scheduled to reach its destination, the 780-metre-wide asteroid Didymos, on 26 September. Once it arrives, it will purposefully crash into Didymos's moon, the 160-metre-wide asteroid Dimorphos, in an attempt to divert the smaller rock's orbit around its parent.

Neither Didymos nor Dimorphos presents a threat to Earth, being 11 million kilometres away, but mission scientist Andy Rivkin at Johns Hopkins University in Maryland and his team hope the asteroid system can act as a test-bed for dealing with potentially deadly space rocks.

"This is an experiment at the kinds of scales that we want to use, or that we might use, if we ever need to deflect an asteroid for real," said Rivkin during a press conference at the Europlanet Science Congress in Granada, Spain, on 19 September.

The researchers will deem the mission a success if DART's impact, which will be at around 6.6 kilometres per second, changes the length of Dimorphos's orbit by at least 73 seconds, give or take 10 per cent – but they think that the real diversion could be closer to around 10 minutes.

Although DART has a camera onboard, the spacecraft will be destroyed on impact, so won't be able to see the outcome.

"This is an experiment at the scales we want to use if we ever need to deflect an asteroid for real"

Instead, the team will rely on LICIACube – a sister spacecraft from the Italian Space Agency that separated from DART on 11 September – to take detailed observations.

At a distance of 55 kilometres from the impact crater, LICIACube will use two cameras to capture images and record data of the strike, as well as measure its kinetic impact on Dimorphos and any resulting plume from the crash site. "There will be an impact that will change the trajectory, there will be a crater formed and, after, there will be ejecta that will propagate through space and LICIACube will photograph this," said Stavro Ivanovski at the Astronomical Observatory of Trieste in Italy during the press conference.

There will also be support from several ground-based telescopes and space observatories, including Hubble and James Webb, which will take measurements of Didymos's orbit and compare it with past observations. "When Dimorphos moves in front of Didymos, we can see a brightness drop due to the shadow," said Rivkin. "By measuring this brightness go up and down, we'll be able to measure the period that it takes for Dimorphos to go around Didymos."

While observations of the impact itself will be transmitted to Earth shortly after it happens, its effect on Dimorphos's orbit will take weeks or even months to measure to a high precision and thus reveal whether the mission was a success, said Rivkin. Alongside LICIACube's measurements, the European Space Agency plans to launch a spacecraft called Hera in 2024 to record the impact's aftermath in more detail. ▮