

NASA launches spacecraft to kick an asteroid off course

November 23 2021, by Issam Ahmed



A NASA mission to deliberately smash a spacecraft into an asteroid has blasted off from California.

A NASA mission to deliberately smash a spacecraft into an asteroid—a test run should humanity ever need to stop a giant space rock from wiping out life on Earth—blasted off Tuesday from California.

It may sound like science fiction, but the DART (Double Asteroid Redirection Test) is a real proof-of-concept experiment, the goal of which is to slightly alter the trajectory of the asteroid Dimorphos.

The SpaceX rocket carrying the mission spacecraft lifted off at 10:21 pm Pacific Time Tuesday (0621 GMT Wednesday) from Vandenberg Space Force Base.

"Asteroid Dimorphos: we're coming for you!" NASA tweeted after the launch, adding later the DART spacecraft had successfully separated from the rocket's second stage.

"We've received our first signals from #DARTMission, which will continue to roll out its solar arrays in the coming hours and prepare for its 10-month, one-way trip to the asteroid," it added.

Dimorphos is a "moonlet" around 525 feet (160 meters, or two Statues of Liberty) wide, that circles a much larger asteroid called Didymos (2,500 feet in diameter). The pair orbit the Sun together.

Impact should take place in the fall of 2022, when the binary asteroid system is 6.8 million miles (11 million kilometers) from Earth, almost the nearest point they ever get.

Three techniques to avoid a catastrophic collision with an asteroid

Far from science fiction, experts are examining ways to protect the Earth

1 A nearby nuclear explosion.

Computer simulation

- ▶ Is only considered for very large objects (> 1 km)
- ▶ almost all large asteroids are known and none represent a danger in the coming centuries. Option when little warning but, risks splintering of asteroid

2 "Gravity tractor"

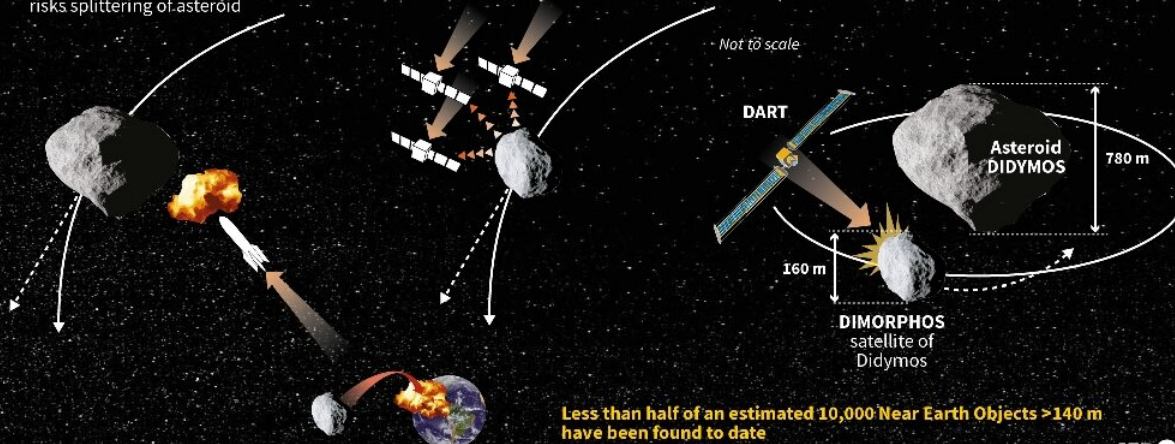
A massive group of artificial satellites are sent near the asteroid to use their gravitational attraction to modify its trajectory

- ▶ Requires a lot of time to react, could work on small objects

3 Crash into and deviate

The most advanced technique: NASA to launch DART spacecraft 0620 GMT Nov 24, to crash into a small body orbiting asteroid Didymos in late 2022, to test this method.

- ▶ For medium sized asteroids (50 to hundreds of metres in diameter)



Less than half of an estimated 10,000 Near Earth Objects >140 m have been found to date

Sources: ESA, NASA, Observatoire de Paris

AFP

Three techniques being considered by scientists to avoid a catastrophic collision between Earth and an asteroid.

No current threat

"What we're trying to learn is how to deflect a threat," NASA's top scientist Thomas Zurburchen said of the \$330-million project, the first of its kind.

To be clear, the asteroids in question pose no risk to our planet.

But they belong to a class of bodies known as Near-Earth Objects (NEOs), which approach within 30 million miles.

NASA's Planetary Defense Coordination Office is most interested in those larger than 460 feet in size, which have the potential to level entire cities or regions with many times the energy of average nuclear bombs.

There are 10,000 known near-Earth asteroids 460 feet in size or greater, but none has a significant chance to hit in the next 100 years.

One major caveat: scientists think there are still 15,000 more such objects waiting to be discovered.



The SpaceX Falcon 9 rocket with the DART spacecraft onboard at sunrise the day of liftoff.

15,000 mph kick

Planetary scientists can create miniature impacts in labs and use the results to produce sophisticated models about how to divert an asteroid—but these are always inferior to real-world tests.

Scientists say the Didymos-Dimorphos system is an "ideal natural laboratory," because Earth-based telescopes can be used to judge the time it takes the moonlet to orbit its big brother.

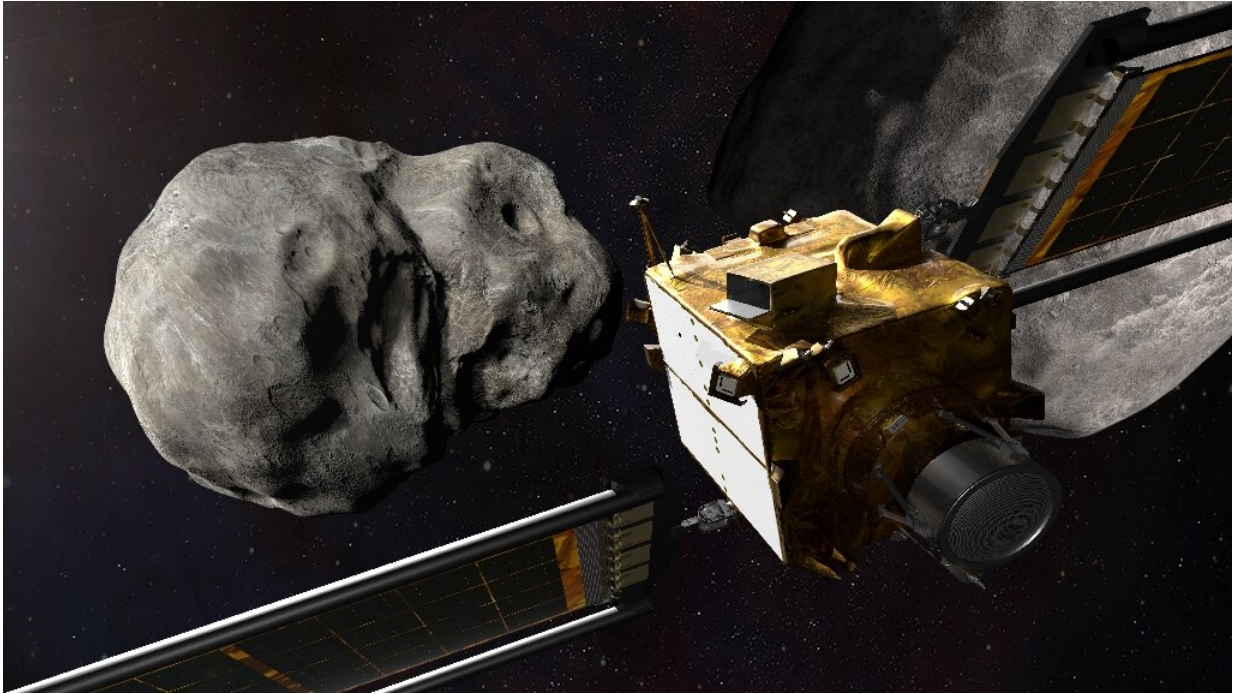
Since the current orbit period is known, the change will reveal the effect of the impact, scheduled to occur between September 26 and October 1, 2022.

What's more, since the asteroids' orbit never intersects our planet, they are thought safer to study.

The DART probe, a box the size of a large fridge with limousine-sized solar panels on either side, will slam into Dimorphos at just over 15,000 miles an hour.

Andy Rivkin, DART investigation team lead, said the current orbital period is 11 hours and 55 minutes, and the kick will shave around 10 minutes off that time.

There is some uncertainty about how much energy will be transferred by the impact because the moonlet's internal composition and porosity are not known.



This artist's illustration shows the DART spacecraft from behind prior to impact at the Didymos binary system.

The more debris that's generated, the more push will be imparted on Dimorphos.

"Every time we show up at an asteroid, we find stuff we don't expect," said Rivkin.

The DART spacecraft also contains sophisticated instruments for navigation and imaging, including the Italian Space Agency's Light Italian CubeSat for Imaging of Asteroids (LICIACube) to watch the crash and its after-effects.

"The CubeSat is going to give us, we hope, the shot, the most spectacular image of DART's impact and the ejecta plume coming off the asteroid.

That will be a truly historic, spectacular image," said Tom Statler, DART program scientist.

Nuclear blasts

The so-called "kinetic impactor" isn't the only asteroid diverting method, but it is the only technique ready to deploy with current technology.

Others that have been hypothesized include flying a spacecraft close by to impart a small gravitational force.

Another is detonating a nuclear blast close by—but not on the object itself, as in the films "Armageddon" and "Deep Impact"—which would probably create many more perilous objects.

Scientists estimate 460-foot asteroids strike once every 20,000 years.

Asteroids that are six miles or wider—such as the one that struck 66 million years ago and led to the extinction of most life on Earth, including the dinosaurs—occur around every 100-200 million years.

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