

In a first, NASA changed an asteroid's orbit around the sun—by accident

A new study shows that, not only did the agency's 2022 DART mission shift the orbit of the moonlet Dimorphos, it also changed the path of its parent asteroid around the sun.

<https://www.nationalgeographic.com/science/article/nasa-dart-asteroid-orbit-sun-didymos-dimorphos>

Sooner or later, humanity will spot an asteroid heading our way—one capable of destroying an entire city or even a whole country. That's why, back in 2022, NASA ran a dress rehearsal for defending the planet: They deliberately smashed an uncrewed spacecraft into an innocuous asteroid to change its path.

The target was a 525-foot-long moonlet named Dimorphos that orbits a 2,550-foot-long asteroid named Didymos. Neither poses a threat to Earth, and altering the smaller asteroid's orbit around its larger companion was extremely unlikely to change that. The mission, known as the Double Asteroid Redirection

Test (DART), was a success, demonstrating that swatting an asteroid away from Earth is possible.

But painstaking telescope observations of the pair now reveal that DART's kamikaze rendezvous with Dimorphos was so forceful that the recoiling moonlet gave Didymos a gravitational jostle, shifting both asteroids onto a different orbital racetrack around the sun.

In other words, "by hitting the moon as hard as we did, we also moved the giant thing next to it a little bit," says Andy Rivkin, a planetary astronomer at the Johns Hopkins University's Applied Physics Laboratory and one of the authors of the new study, published March 6 in the journal *Science Advances*. It marks the first time that humanity has changed the solar orbit of an asteroid.

DART's overachieving sucker punch

Binary asteroids, like Didymos and Dimorphos, share a gravitational center. That center is dominated by the heftier

object—in this case, Didymos, which is 200 times more massive than its moonlet. But if you give the smaller object a thwack, its larger sibling will also ‘feel’ it.

Prior to DART’s 2022 collision with Dimorphos, scientists had to think through every possible outcome to the mission, including several truly grim scenarios. “What if this experiment puts the Didymos system on a collision course with the Earth?” says Rahil Makadia, another study couthor and a planetary defense researcher at the University of Illinois at Urbana-Champaign. “That’s obviously not desirable. So, we looked into it.”

They found there would be no detectable effect on Didymos. It would notice the impact on Dimorphos, but Didymos itself wouldn’t budge.

At the time, NASA said that for the mission to be considered a success, DART would have to change Dimorphos’s orbit around Didymos by 73 seconds. Instead, the small, van-sized spacecraft ended up shrinking the asteroid’s orbit by 33 minutes—thanks to the force of DART’s sucker punch and the

eruption of rocky debris that blasted off Dimorphos upon impact.

Prior to the mission, astronomers suspected that Dimorphos was what's known as a rubble pile: instead of a behemoth singular rock, it's more like a fleet of boulders barely held together by the asteroid's weak gravity. Hit it with a spacecraft at 14,000 miles per hour, and some of it will inevitably be shorn off into space.

This passage about the accidental asteroid can be used as skimming, scanning and analytical reading. Skimming because they can learn the general idea of the passage, which is about that one-time NASA changed the course of the asteroid by accident. Scanning because they will need to read and find the key information in the passage to understand what the writer is trying to say in those passages. And analytical reading because they can try to think up scenarios where we will be using that experiment to create weapons or technology to destroy or divert the asteroid soon or not.

Short Answer comprehension:

1. What was the main goal of NASA's **DART mission** in 2022?
2. What are the names of the two asteroids involved in the experiment?
3. How did the spacecraft change Dimorphos's orbit compared to NASA's original expectation?
4. Why did scientists believe the asteroid Dimorphos would break apart easily when hit?
5. What unexpected effect did the collision have on the larger asteroid Didymos?

Multiple Choice

What was the main purpose of NASA's DART mission?

- A. To destroy the asteroid Dimorphos
- B. To test if a spacecraft could change an asteroid's path

- C. To collect rocks from an asteroid
- D. To land astronauts on Didymos

Which asteroid did the DART spacecraft hit?

- A. Didymos
- B. Dimorphos
- C. Vesta
- D. Eros

How much did DART change Dimorphos's orbit around Didymos?

- A. 73 seconds
- B. 10 minutes
- C. 33 minutes
- D. 2 hours

Why did scientists think Dimorphos would break apart easily?

- A. It is made mostly of ice
- B. It rotates very quickly
- C. It is a rubble pile of loosely held rocks
- D. It has a strong magnetic field

What unexpected result happened after the collision?

- A. Dimorphos disappeared completely
- B. The spacecraft bounced off the asteroid
- C. Didymos also shifted slightly in its orbit around the sun
- D. The asteroid started moving toward Earth

True/False

Dimorphos and Didymos are asteroids that pose a direct threat to Earth. (T/F)

NASA's DART mission intentionally crashed a spacecraft into Dimorphos. (T/F)

The mission only changed Dimorphos's orbit around Didymos and had no other effects. (T/F)

Dimorphos is believed to be a "rubble pile" made of many rocks loosely held together. (T/F)

The collision caused some rocky debris to blast off Dimorphos into space. (T/F)

Gap-Filling

Complete the paragraph using the correct words from the passage.

NASA's **DART mission** in 2022 tested whether a spacecraft could change the path of an (1) _____. The spacecraft intentionally crashed into a moonlet called (2) _____, which orbits a larger asteroid named (3) _____. Scientists expected the mission to change the moonlet's orbit by only (4) _____ seconds, but the impact actually changed it by about (5) _____ minutes.