

NASA gladly loses a spacecraft

Level 3 | Advanced

1 Key verbs

Fill the gaps using forms of these key verbs from the text.

vaporise
ensue

excavate
monitor

obliterate
eject

probe
estimate

1. To _____ means to happen after something else, often as the result of it.
2. If you _____ something, you guess or calculate it from the available information.
3. If something is _____, it is changed into steam or hot air.
4. If you _____ something, you observe it closely and check it regularly.
5. To _____ means 'to make a hole in the ground'.
6. If something is _____, it is completely destroyed.
7. If you _____ something, you investigate it carefully.
8. The literal meaning of to _____ is 'to throw out'.

2 What do you know about space exploration?

1. What is TNT?
2. What does NASA stand for?
3. What is a comet?
4. What is a crater?
5. What is a person who studies the stars called?

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By Tim Radford

A little American spacecraft flew into a comet the size of a city last week 133m km from Earth, taking pictures at the rate of one a minute before it vaporised in an explosion equivalent to exploding five tonnes of TNT.

The \$335m mission involved split-second timing, collision speeds of 37,000km/h and a triumphant series of pictures that ended with a close-up just three seconds before the craft's own destruction. "Right now we are minus one spacecraft," a delighted NASA engineer said, while a colleague at the Jet Propulsion Laboratory in Pasadena said, "There is a comet in the sky wondering what the hell hit it." Deep Impact was a July 4 fireworks display which took many years to plan and which ended in a flash.

A mothership dropped a copper projectile the size of a washing machine in the path of comet Tempel 1 and then photographed the resulting jet of ice, dust and organic chemicals from the surface, as the explosion excavated a huge impact crater and dramatically intensified the native brightness of the mysterious visitor.

The celestial traffic accident obliterated the projectile but barely affected the comet: experts estimate that the impact would have slowed it by no more than 1/10,000th of a millimetre a second. The aim was to probe for the first time the interior of one of the ghostly visitors that have haunted human imagination throughout history. It is likely to become one of the most intensely studied encounters made in space. Deep Impact's copper-coated bullet carried its own camera and radio.

The mothership steered a course 480km from the explosion and observed the impact, and the ensuing jet eruption, with instruments for 800 seconds. Seven satellites, including the Hubble space telescope, monitored the moment of drama, and over the next day and night an estimated 50 earthbound telescopes locked on the tiny, faraway flare.

The first to produce pictures in Britain, even ahead of NASA, were pupils from King's

school, Canterbury, using data from the 2m Faulkes telescope in Hawaii, an instrument intended for schools. But long before giant telescopes could begin to analyse the minutiae of the collision in the optical ultraviolet, infrared and x-ray wavelengths, astronomers and planetary scientists from the US and around the world were enjoying a moment of triumph. For the first time, they had clear and close-up studies of a comet. They could count the impact craters on its surface, they could hazard an early guess at its density and they could estimate the firmness of its surface from the violence of the flare after the collision. And in the gusts of material ejected from the collision crater, they could begin to see the pristine raw material of the whole solar system.

Frequent visitors such as comet Halley fly close to the sun and have been weathered and altered by solar radiation. But comets such as Tempel 1 have spent most of the past 4.6bn years parked far beyond the orbit of the outermost planets. Because of their relative isolation, these icy time capsules could hold the secrets of the planets, the Earth's oceans and even of the primeval organic chemistry from which life must have been fashioned. "If you are thinking of comets as possible sources of organic material, then you want the organic elements carbon, hydrogen, oxygen, nitrogen. And we now know enough about comets to know that some of these elements are in the form of organic molecules," said John Zarnecki of the Open University.

For Andrew Coates of the Mullard space science laboratory of University College London, it was one of the most audacious experiments in history. "You have the comet getting bigger and bigger in the field of view, the level of detail on the comet getting better and better," he said. "We know that comets produce jets. What we have now is the first artificial jet from a comet," he added. "The fact that there are craters tells us the surface has a solid type of composition. We see a relatively dark surface, probably some organic molecules and silicates, and it is the composition of that mixture which is going to be really exciting."

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3 Comprehension check

Choose the best answer.

1. Why were scientists at NASA pleased that they had lost a spacecraft?
 - a. because the spacecraft was old and was no longer useful.
 - b. because they wanted to see what would happen when it crashed into the comet.
 - c. because they preferred it to crash into a comet rather than a planet.
2. What was the effect of the collision?
 - a. it produced clouds of smoke.
 - b. it produced a crater and ejected clouds of material.
 - c. it produced hydrogen, nitrogen, carbon and oxygen.
3. Why are comets like Tempel 1 interesting to scientists?
 - a. because they are outside the solar system.
 - b. because they are isolated.
 - c. because they might hold the secrets of the planets.
4. What did scientists have for the first time as a result of the experiment?
 - a. craters full of material.
 - b. the pristine raw material of the whole solar system.
 - c. clear close-up studies of a comet.

4 Vocabulary 1 - Find the adjective

Find the adjectives that mean:

1. extremely successful
2. very large
3. clean, neat and new (in a natural state)
4. relating to the period when the earth first began to exist
5. very bold or daring
6. relating to the sky
7. happening very often
8. very distant

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5 Vocabulary 2 - Clusters

Make 5 three-word expressions beginning with each of the words in Box 1 and adding two from Box 2. Check your answers in the text.

Box 1

split
celestial
pristine
primeval
icy

Box 2

second
raw
timing
organic
time
traffic
accident
chemistry
material
capsules

6 Grammar focus

Look at this example from the text:

It is likely to become one of the most intensely studied encounters made in space.

Rewrite these sentences using the word *likely*.

1. The Deep Impact mission will probably be regarded as a landmark in space exploration.
2. Scientists will almost certainly get valuable information from the data they record.
3. The mission probably won't be the last of its type.
4. Scientists will probably be able to learn a lot about the solar system.
5. Comets like Tempel 1 may hold the secrets of the planets.
6. The impact probably won't affect the comet at all.

7 Discussion

Should money be invested in space exploration or used to fund more urgent projects on Earth?

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KEY

1 Key verbs

- | | |
|--------------|----------------|
| 1. ensue | 5. excavate |
| 2. estimate | 6. obliterated |
| 3. vaporised | 7. probe |
| 4. monitor | 8. eject |

2 What do you know about space exploration?

1. An explosive
2. North American Space Agency
3. A bright object in space with a tail of dust and gas
4. A large round hole caused by an explosion of some kind
5. An astronomer

3 Comprehension check

1. b; 2. b; 3. c; 4. c

4 Vocabulary 1 – Find the adjective

- | | |
|---------------|--------------|
| 1. triumphant | 5. audacious |
| 2. huge/giant | 6. celestial |
| 3. pristine | 7. frequent |
| 4. primeval | 8. faraway |

5 Vocabulary 2 – Clusters

1. split-second timing
2. celestial traffic accident
3. pristine raw material
4. primeval organic chemistry
5. icy time capsules

6 Grammar focus

1. The Deep Impact mission is likely to be regarded as a landmark in space exploration.
2. Scientists are likely to get valuable information from the data they record.
3. The mission is unlikely to be the last of its type.
4. Scientists are likely to be able to learn a lot about the solar system.
5. Comets like are likely to hold the secrets of the planets.
6. The impact is unlikely to affect the comet at all.