



Venus? Maybe Later.

Article

PART 1

TOKYO, Japan. A Japanese space probe was supposed to insert itself into orbit around Venus in December 2010, but it missed. Instead, the probe was captured by the sun's gravitational pull. While this was a huge setback for Japan's space program, all is not lost—the probe may be able to continue the mission to Venus in six years.

After journeying for nearly eight months to reach the second planet, Venus, the probe, named Akatsuki, was expected to enter an elliptical orbit around the planet. To do this, Akatsuki needed to fire its engines as it neared Venus, pushing it into the proper orbit. Mission officials said they briefly lost contact with the probe. The next day, officials were able to assess that Akatsuki's engines malfunctioned and did not fire for a long enough period of time. This prevented the probe from attaining the desired orbiting position around Venus.

Still, it wasn't all bad news. Officials said communication with the probe had been restored, and Akatsuki appeared to be intact and functioning. The probe had passed Venus and headed off to orbit the sun. Officials hope that Akatsuki's engines will fire correctly when the probe nears Venus again.

"Unfortunately, [Akatsuki] did not attain an orbit [around Venus]," said Hitoshi Soeno of JAXA, Japan's space agency, adding, "But it appears to be functioning, and we may be able to try again when it passes by Venus six years from now."

Akatsuki was designed to monitor volcanic activity on Venus. In addition, its mission was to provide data on Venus' thick cloud cover and climate, including whether the planet has lightning. The probe was equipped with infrared cameras and other instruments to gather this information.

Scientists hoped that by monitoring the climate of Venus, more could be learned about how climate change works. Climate change involves change in weather over long periods of time and is thought to affect the atmosphere. Looking at this process on another planet may give scientists clues about what is happening on Earth. It may help scientists know more about what is causing a gradual increase in temperatures on Earth.

The probe, which cost \$300 million, would have been the first that Japan had put in orbit around another planet. Japanese scientists were extremely optimistic that the Venus probe would be successful, since the country recently brought back a probe from a trip to an asteroid. The failure of the Venus probe, at least for now, was a big letdown for Japan and a disappointment for scientists around the world.

"The Planetary Society regrets that the innovative Akatsuki spacecraft seems to have missed its opportunity to lock into an orbit of Venus," said Bill Nye, executive director of the Planetary Society, which is a U.S.-based private group that supports space exploration. "Although Akatsuki has already accomplished some remarkable things on its voyage, this

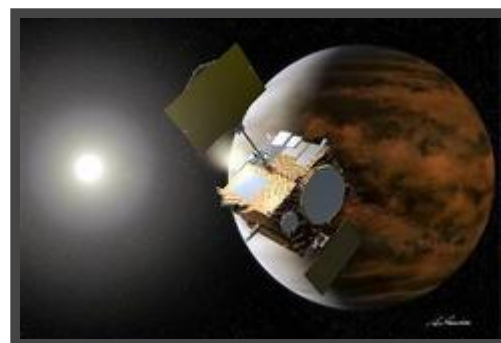


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AP/Akihiro Ikeshita via JAXA

The Japan Aerospace Exploration Agency (JAXA) sent a space probe to study Earth's neighbor, the planet Venus. The vessel was not able to enter Venus' orbit and won't be able to attempt to do so again for six years.

setback reminds us how difficult space exploration can be."

The Associated Press contributed to this story.

PART 2

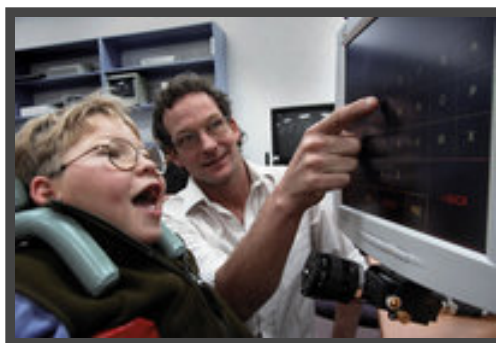
Dig Deeper

Although the Akatsuki probe failed to enter Venus' orbit in 2010, JAXA plans to try again in December 2015. JAXA and other space agencies know that space exploration enriches us in many ways. Throughout history, the study of stars and planets has inspired new ideas. As we meet the challenges of space exploration, we gain valuable technology.

The study of other worlds can teach us about our own. Scientists believe that Earth has changed considerably since its formation. By comparing Earth with other planets, scientists can learn more about the history of Earth's surface features and atmosphere. Scientists are hopeful that Akatsuki's second attempt will be able to monitor the climate on Venus, which could help them learn more about the changes occurring in Earth's climate.

But space exploration has done more than increase our knowledge. It has also provided us with technology that makes life on Earth easier. Each day, you probably benefit from some material or product that was developed for the space program. One of the most important benefits of space exploration has been the development of satellite technology. Images and data from weather satellites have greatly improved weather forecasting. Other satellites collect images of Earth's surface to show how it is being changed by natural events and human activity so that the data can be used for things like wildlife preservation and conservation of natural resources.

Have you ever come up with a new way to use something that was designed for a different purpose? Engineers at NASA, the U.S. space agency, often repurpose space technologies that were originally created to meet the special demands of space travel in order to improve life on Earth. Did you know that smoke detectors, cold weather gloves, bed mattresses, and ear thermometers are all spinoffs of space technology? Everything on a spacecraft must be as small and lightweight as possible because the heavier a spacecraft is, the more difficult it is to launch. Engineering design techniques developed to meet this need have improved devices used on Earth, such as tools for diagnosing diseases and devices that help people overcome disabilities.



Credit: NASA

NASA engineers helped develop a system that allows this boy to communicate by using eye movements.

Materials and parts on a spacecraft have to endure harsh conditions, such as extreme heat and cold. Many homes and buildings contain fire-resistant materials developed for the space program. Firefighters wear protective suits made from fabric originally used in space suits. NASA engineers have also helped design devices that allow firefighters to avoid injury from inhaling smoke. Humans need a safe environment in spacecraft and space stations. NASA has developed systems for purifying air, water, and food. These systems now help protect people on Earth as well as in space.

Dictionary

assess (*verb*) to calculate or determine

elliptical (*adjective*) oval-shaped

infrared (*adjective*) having to do with invisible light that has a heating effect

innovative (*adjective*) creative, especially in the way that something is done

satellite (*noun*) an object that orbits a more massive object

technology (*noun*) the use of scientific knowledge to solve problems or engineer new products, tools, or processes

Activity

PART 1

Question 1

Which of these had **not** yet happened when this article was written?

- (A) Japanese officials restored communications with Akatsuki, and it appeared to be intact and functioning.
- (B) Japanese scientists designed Akatsuki to monitor volcanic activity on Venus and provide data on Venus' thick cloud cover.
- (C) Japan's space probe Akatsuki missed the orbit around the planet Venus and was captured by the sun's gravitational pull.
- (D) Japan's space probe Akatsuki entered an orbit around the planet Venus and began monitoring volcanic activity.

Question 2

What is this article mainly about?

- (A) Akatsuki was designed to study places in space after being built by JAXA at a cost of \$300 million.
- (B) Japanese scientists hope that the climate of Venus can teach us about how climate change works and then apply that knowledge to Earth.
- (C) Japan sent a space probe to study Venus, but the probe malfunctioned and went into an orbit around the sun.
- (D) Bill Nye is the executive director of the Planetary Society, which is a U.S.-based private group that supports space exploration.

Question 3

The article states:

Japanese scientists were extremely *optimistic* that the Venus probe would be successful, since the country recently brought back a probe from a trip to an asteroid.

Which would be the closest **synonym** for the word *optimistic*?

- (A) Negative
- (B) Displeased
- (C) Confident
- (D) Restless

Question 4

According to the article, why did Akatsuki miss Venus?

- (A) The infrared cameras and other instruments designed to gather information on the probe used more power than expected, preventing the engines from running at full power.
- (B) The engines did not fire for a long enough period of time, which prevented the probe from attaining the desired orbiting position around Venus.
- (C) The engines were not given the proper data in time to analyze the correct orbiting position around Venus.
- (D) The climate changed when the engines were supposed to fire, which made it impossible for Akatsuki to enter the atmosphere of Venus.

Question 5

Based on the article, which is most likely to happen next?

- (A) Japan will discontinue JAXA, its space agency, until a space probe can successfully navigate Venus.
- (B) Japanese scientists will design a probe to replace Akatsuki with engines that will fire correctly when orbiting the sun.
- (C) Japanese scientists will monitor Akatsuki closely and hope that the engines fire correctly when it passes near Venus six years from now.
- (D) Japan will redirect its studies away from Venus and towards learning about Earth's gravitational pull.

Question 6

Which is the closest **synonym** for the word *assess*?

- (A) Imagine
- (B) Evaluate
- (C) Testify
- (D) Contradict

Question 7

Which question is **not** answered by the article?

- (A) Where was Akatsuki supposed to end up after it initially approached Venus?
- (B) What projects does JAXA plan to pursue while waiting for Akatsuki to return to Venus?
- (C) Where do scientists believe that Akatsuki is traveling at this time?
- (D) What did the scientists determine was the cause for Akatsuki missing Venus?

Question 8

Which of these statements should **not** be included in a summary of this article?

- Ⓐ After traveling for months, Akatsuki was expected to fire its engines as it neared Venus to push itself into an elliptical orbit around the planet.
- Ⓑ JAXA scientists hoped to study climatic conditions on Venus and learn more about climate change.
- Ⓒ Recently, JAXA brought back a space probe that had traveled to an asteroid.
- Ⓓ The Akatsuki space probe headed off to orbit the sun after being captured by its gravitational pull.