

## READING CHALLENGE

# Apollo 13: Houston, We Have a Problem

*The incredible true story of the most dangerous space mission in history*

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|------------------|-------------------|
| <b>Level</b>     | B1 (Intermediate) |
| <b>Age Group</b> | Teens (11-16)     |
| <b>Topic</b>     | True Stories      |
| <b>Duration</b>  | ~20 minutes       |
| <b>Skill</b>     | Reading           |

On 11 April 1970, three American astronauts sat inside a tiny **spacecraft** at the Kennedy Space Center in Florida. Their names were Jim Lovell, Jack Swigert, and Fred Haise. They were about to begin one of the most famous journeys in history — not because everything went right, but because almost everything went wrong. Their **mission** was called Apollo 13, and its goal was to land on the Moon. Instead, it became the greatest survival story in the history of space travel.

## The Road to the Moon

By 1970, NASA had already landed astronauts on the Moon twice. Apollo 11 had made history in July 1969 when Neil Armstrong and Buzz Aldrin walked on the lunar surface. Apollo 12 followed successfully in November of the same year. The American public was starting to feel that going to the Moon was almost routine. Television networks were not even planning to broadcast the Apollo 13 **mission** live. People thought it would be just another safe trip. They were terribly wrong.

The **crew** of Apollo 13 had trained for months. Jim Lovell was the most experienced — he had already flown in space three times. Jack Swigert had actually joined the **crew** just three days before launch, replacing astronaut Ken Mattingly, who had been exposed to measles. Fred Haise was the lunar **module** pilot and was looking forward to walking on the Moon. None of them knew that they would never get that chance.

## Two Days of Smooth Flying

The Saturn V rocket launched perfectly at 13:13 Houston time. For the first two days, the flight was smooth and uneventful. The **spacecraft** had two main parts that the astronauts could use. The command **module**, named Odyssey, was where the **crew** lived and controlled the **spacecraft**. The lunar **module**, named Aquarius, was the small lander designed to carry two astronauts down to the Moon's surface. Behind Odyssey was the service **module**, which carried **oxygen** tanks, fuel cells, and the main engine.

On the evening of 13 April, about 320,000 kilometres from Earth, the **crew** finished a television broadcast. Hardly anyone on Earth had watched it. Jim Lovell said goodnight to **Mission** Control in Houston and the **crew** began their evening routine. Then, at 21:08 Houston time, Jack Swigert flipped a switch to stir the **oxygen** tanks — a completely normal procedure that had been done many times before.

## The Explosion

What happened next changed everything. There was a loud bang. The **spacecraft** shook violently. Warning lights flashed across the control panels. One of the two **oxygen** tanks in the service **module** had suffered a massive **explosion**. The blast also damaged the second **oxygen** tank, which began leaking its contents into space. Jack Swigert immediately radioed

**Mission** Control with the now-famous words: "Houston, we've had a problem."

At first, the engineers at **Mission** Control in Houston could not believe what they were seeing on their screens. The data seemed impossible. Two **oxygen** tanks failing at the same time? It had to be a computer error. But it was not. When Lovell looked out of the window, he could see gas streaming from the side of the service **module** into the darkness of space. Their **oxygen** was disappearing. Without **oxygen**, the fuel cells could not produce electricity or water. The command **module** Odyssey was dying.

## A Desperate Decision

Within hours, NASA made a critical decision. The Moon landing was impossible now. They had to **abort** the **mission** and focus on one thing only: bringing the **crew** home alive. But there was a serious problem. The **spacecraft** was already on a path towards the Moon. They could not simply turn around. Instead, they would have to fly around the Moon, using its **gravity** to swing them back towards Earth. This meant the **crew** would spend several more days in space with very limited resources.

The command **module** Odyssey had only a few hours of battery power left. The **crew** needed to shut it down completely to save those batteries for **re-entry** into Earth's atmosphere at the very end. Their only hope was to move into the lunar **module** Aquarius and use it as a lifeboat. Aquarius had its own **oxygen** supply, batteries, and a small engine. It was designed to support two astronauts for about two days on the Moon's surface. Now it had to keep three astronauts alive for nearly four days in the freezing cold of deep space.

## Life Inside the Lifeboat

Conditions inside Aquarius quickly became terrible. To save electricity, the **crew** turned off almost everything, including the heating system. The temperature inside dropped to about 3 degrees Celsius. Water droplets formed on the walls and windows. The astronauts wore their spacesuits to try to stay warm, but they were still shivering. They could not sleep properly because of the cold. They were also running low on drinking water because the **spacecraft** needed water to cool its systems. Each astronaut limited himself to about 200 millilitres of water per day — roughly one small glass. They became dehydrated and lost weight rapidly.

The astronauts had to **calculate** their course very carefully. Every engine burn had to be perfect. If they fired the engine for too long or at the wrong angle, they would miss Earth entirely and drift into space forever. Without the main computer, Jim Lovell used a special technique: he looked through the window, found the Earth, and kept it centred in his view while Fred Haise timed the engine burn with a wristwatch. It was an incredibly precise procedure done with the simplest tools.

## The Carbon Dioxide Crisis

As if the cold, thirst, and exhaustion were not enough, a new danger appeared. The **carbon dioxide** levels inside the lunar **module** were rising. Every time the astronauts breathed out, they added more **carbon dioxide** to the air. The lunar **module's** filters were becoming full and could no longer clean the air properly. If the **carbon dioxide** levels got too high, the astronauts would lose consciousness and die. To **survive**, they needed the square filters from the command **module** Odyssey. But Aquarius used round filters. The square ones would not fit.

On the ground in Houston, a team of engineers worked urgently to find a solution. They gathered the same materials that were available on the **spacecraft**: cardboard from flight manual covers, plastic bags, duct tape, and a sock. Then they designed a simple adapter that would make the square filter fit into the round hole. They had to **improvise** with whatever the astronauts could find on board. Within hours, they radioed the step-by-step instructions to the **crew**. Lovell, Swigert, and Haise built the device, connected it, and the **carbon dioxide** levels began to drop. It was an extraordinary moment of engineering creativity.

## Around the Moon

On 15 April, the **spacecraft** flew behind the Moon, about 254 kilometres above the lunar surface. For a brief time, the **crew** lost radio contact with Earth — something that happens to every lunar **orbit mission** because the Moon blocks the signal. Jim Lovell looked down at the grey, cratered landscape below. He had been to the Moon before on Apollo 8 in 1968 and had orbited it ten times. Now he was passing it again, but this time he knew he would never walk on its surface. It was a moment of deep sadness mixed with the urgent need to get home alive.

After passing behind the Moon, the **crew** fired the engine again to speed up their return. This burn was critical — it would shorten their journey home by about ten hours and put them on a path that would bring them back to the correct part of the Pacific Ocean. The entire operation depended on precise timing and exact angles. The **crew** performed it beautifully.

## Coming Home

As they approached Earth on 17 April, the **crew** faced their final challenge. They needed to power up the command **module** Odyssey, which had been completely shut down for days. No one had ever tried to restart a frozen **spacecraft** before. Engineers in Houston had worked around the clock to write a completely new start-up procedure. Normally, powering up the command **module** took many hours. They had created a shortened version that could be done in just two hours using the limited battery power available.

The astronauts climbed back into Odyssey and began following the new checklist. Amazingly, the systems came back to life. The **crew** then released the service **module** and, for the first time, could see the damage from the **explosion**. An entire panel had been blown away. Wires and pipes were exposed to space. Lovell later said it looked like the **spacecraft** had

been "hit by a bomb." The **crew** was shocked. It was a miracle they had survived at all.

Finally, they separated from Aquarius — the little lunar **module** that had saved their lives — and prepared for **re-entry**. There was one last moment of fear. During **re-entry**, all communication with a **spacecraft** is lost for about four minutes because of the extreme heat around the capsule. This period is called the "blackout." For Apollo 13, the blackout lasted longer than expected — about six minutes. In Houston, **Mission** Control waited in complete silence. Had the heat shield survived? Had the parachutes deployed?

Then, a voice crackled through the radio. The parachutes had opened. Odyssey was floating down towards the Pacific Ocean. At 13:07 Houston time on 17 April 1970, the capsule splashed down safely. Navy helicopters raced to pick up the **crew**. Nearly six days after launch, Jim Lovell, Jack Swigert, and Fred Haise were safe.

## A Successful Failure

Apollo 13 never landed on the Moon. In that sense, the **mission** was a failure. But in every other way, it was an extraordinary **triumph**. Three astronauts survived a disaster in the most hostile environment imaginable — deep space, 400,000 kilometres from home. They survived because of teamwork, quick thinking, and the determination of hundreds of engineers and scientists on the ground.

Jim Lovell called Apollo 13 a "successful failure." The **mission** taught NASA incredibly important lessons about safety and emergency planning. New procedures were created, backup systems were improved, and the culture of problem-solving at NASA became even stronger. The famous phrase "Houston, we have a problem" entered popular culture and became a symbol for any serious, unexpected crisis.

The story of Apollo 13 reminds us that the greatest human achievements are not always about reaching your destination. Sometimes, they are about finding a way home when everything goes wrong. The three astronauts and the team at **Mission** Control proved that courage, creativity, and cooperation can overcome even the most impossible situations. More than fifty years later, their story continues to inspire people around the world.

# Vocabulary

| Term                  | Definition  |
|-----------------------|---|
| <b>mission</b>        | an important task or journey, especially one involving space travel               |
| <b>crew</b>           | a group of people who work together, especially on a ship or spacecraft           |
| <b>oxygen</b>         | a gas that humans need to breathe in order to survive                             |
| <b>explosion</b>      | a sudden, violent burst of energy that can cause damage                           |
| <b>spacecraft</b>     | a vehicle designed to travel in outer space                                       |
| <b>survive</b>        | to continue to live through a dangerous or difficult situation                    |
| <b>orbit</b>          | the curved path that an object follows around a planet or star                    |
| <b>calculate</b>      | to work out a number or answer using mathematics                                  |
| <b>improvise</b>      | to create or do something quickly using whatever is available                     |
| <b>carbon dioxide</b> | a gas that humans breathe out, which is dangerous in large amounts                |
| <b>gravity</b>        | the invisible force that pulls objects toward a large body like Earth or the Moon |
| <b>abort</b>          | to stop a plan or mission before it is completed                                  |
| <b>module</b>         | a separate, self-contained section of a spacecraft                                |
| <b>re-entry</b>       | the process of returning to Earth's atmosphere from space                         |
| <b>triumph</b>        | a great victory or achievement, especially after difficulty                       |

# Comprehension Quiz

## 1. What caused the crisis on Apollo 13?

- A) A fire broke out in the command module
- B) An oxygen tank exploded in the service module
- C) The rocket engine failed during launch
- D) A meteorite hit the spacecraft

## 2. What did the astronauts use as a 'lifeboat' after the explosion?

- A) The service module
- B) A special emergency capsule
- C) The lunar module (Aquarius)
- D) The command module (Odyssey)

## 3. Why was rising carbon dioxide a serious problem in the lunar module?

- A) It made the spacecraft too hot
- B) It could poison the astronauts if it reached dangerous levels
- C) It damaged the electrical systems
- D) It used up all the remaining oxygen

## 4. How did NASA engineers solve the carbon dioxide filter problem?

- A) They sent a rescue spacecraft with new filters
- B) They told the astronauts to breathe less
- C) They designed an improvised adapter using materials available on board
- D) They opened the windows to let the gas escape

## 5. How long did the entire Apollo 13 mission last from launch to splashdown?

- A) Three days
- B) One week
- C) Nearly six days
- D) Two weeks

# Answer Key

| # | Answer   | Question   |
|---|----------|--|
| 1 | <b>B</b> | 1. What caused the crisis on Apollo 13?                                      |
| 2 | <b>C</b> | 2. What did the astronauts use as a 'lifeboat' after the explosion?          |
| 3 | <b>B</b> | 3. Why was rising carbon dioxide a serious problem in the lunar module?      |
| 4 | <b>C</b> | 4. How did NASA engineers solve the carbon dioxide filter problem?           |
| 5 | <b>C</b> | 5. How long did the entire Apollo 13 mission last from launch to splashdown? |