Beginning Screen

Introp1

- Welcome to the investigation of the 2003 Columbia Space Shuttle disaster! In this simulation you will be working to find out the three main factors that contributed to the explosion. Pay careful attention to details, use your provided tools, and help solve the mystery!...

Introp2

- Stage 1 will involve a puzzle that you should see in pieces in front of you, stage 2 will involve a simple device created with an arduino that you must interact with, and stage 3 will involve selecting some things on your screen...

Introp3

- The output you see here on your screen will guide you through this investigation and track your progress. If you are ready to get started click start to see the main menu!

Stage 1

StageP:

- Welcome to Stage 1\n\
  During the initial launch of Columbia on January 11, 2001, there were some\n\
  issues with external parts of the shuttle. Specifically, a chunk of material\n\
  was not secured and disregarded when it came loose. When you put\n\
  the puzzle in front of you together, you will see a diagram of the shuttle.\n\
  Identify which labeled hazard was the true issue that initiated the disaster.

StageDirections:

- Put together jigsaw puzzle\n\
  observe hazards labeled on puzzle\n\
  input the number of the hazard that\n\
  you believe caused the explosion

inputBox

- If correct input:
  Correct! Stage 2 is now unlocked
  Else:
  Try again

Stage 2

StageP:

- Welcome to Stage 2\n\
  You have correctly identified the object that caused damage to the shuttle.\n\
  Now it is time to determine the part of the shuttle that was affected by the\n\
  piece of foam. The foam was attached to an external tank on the left side of\n\
  the shuttle. The foam created a dent which affected the shuttle's ability to\n\
  maneuver through the atmosphere. The blinking light on the diagram you see\n\
  will indicate the affected part of the shuttle after you press the correct button.

StageDirections:

- Press button corresponding with the\n\
  number answer you got in the Stage 1\n\
  Observe the blinking light on the diagram\n\
  Select the part of the plane that was affected

inputBox

- If correct input:
  Correct! Stage 3 is now unlocked
  Else:
  Try again

Stage 3

StageP

- So far we know that a foam piece fell off of an external tank and damaged the \n\
  left wing. Determine the final factor that caused the shuttle to explode! Keep in \n\
  mind that the shuttle was entering the atmosphere as it disintegrated.

StageDirections

- Hover over an item in the table to learn more about it.\n\Click on it to make your
  selection

1 Engine on fire: There didn't seem to be anything wrong with the engine initially	2 Temperature sensors: Mission control stopped receiving temperature readings from the left wing	3 Tire pressure: The tire pressure readings from the left side of the shuttle disappeared	4 Lack of repair kit: There was no protocol for on-board repair kits prior to Columbia's launch	5 Poor management: 8 minutes before the shuttle disintegrated, signs of rising temperature were detected, but no one at mission control was monitoring it
6 Cabin pressure: As the shuttle fell apart, the crew was exposed to the atmosphere and the drop in air pressure caused the crew to lose consciousness	7 Atmospheric gases: Damage caused to the left wing prevented the heat shield from working properly and the heat from atmospheric reentry began melting the shuttle	8 Robotic arm: There was no camera to monitor the outside panels of the shuttle active for mission control to monitor	9 Helmets: There were not adequate head/neck supports in the crew's helmets which caused the crew to suffer head injury during extreme turbulence	10 Communication: Mission control lost contact with the astronauts at 9am

If correct:
Correct! It was the atmospheric gases that caused extreme heat to the damaged part of the shuttle that caused the final issue and disintegrated the shuttle.

Please select **Finish** in the main menu to recap the mystery!

Else:
Incorrect! Try again
Finish:
When Columbia initially launched on January 16, 2003. During the launch, large pieces of foam fell off of external tanks on the shuttle, but it was disregarded as mission control did not anticipate the following effects [1].

The foam struck the left wing of the shuttle which caused damage to its leading edge [2]. This damage made the heat shield ineffective which caused issues during Columbia's descent.

Columbia could not sustain the extreme heat caused by the atmospheric reentry of the shuttle, and the wing began melting. Eventually the shuttle disintegrated, killing the crew and sending almost 85,000 pieces of debris spread across the state of Texas [2].

This disaster halted launches for many years as NASA worked to improve safety precautions to prevent another similar catastrophe. The Columbia Disaster was a tragedy that prompted many critical changes to the space program to keep astronauts safe. The crew is remembered in many ways to honor their work and loss including the naming of seven asteroids in orbit between Mars and Jupiter. [2]

References:

Bibliography

[1] History.com Editors, “Columbia Space Shuttle mission ends in disaster,” *HISTORY*, Nov. 19, 2009. https://www.history.com/this-day-in-history/columbia-mission-ends-in-disaster (accessed Oct. 11, 2021).
[2] E. Howell, “Columbia Disaster: What happened and what NASA learned,” *Space.com*, Nov. 10, 2021. https://www.space.com/19436-columbia-disaster.html (accessed Oct. 27, 2021).