# Michael Smith

## Simulates Spacecraft Landing

### PILOT, NAVAL AVIATOR

A Navy test pilot and engineer, Smith was responsible for controlling shuttle systems and assisting in landing. He was known for precision, testing protocols, and training.

### OBJECTIVE

Test parachute or glider designs for safe spacecraft landings.

### HOW WILL STUDENTS ACHIEVE THE OBJECTIVE?

1. Learn about Smith's role as a test pilot.
2. Discuss how spacecraft slow down and land.
3. Build and test landing devices.
4. Evaluate accuracy and redesign.

### MATERIALS

- Coffee filters, string, small weights (parachutes)
- Paper, tape (gliders)
- Rulers, timers
- Landing zone target
- Spacecraft Landing Worksheet

### OPTIONAL EXTENTION

Create a scenario (Mars, Moon, Earth) and adjust for gravity/atmosphere.

## STEP BY STEP INSTRUCTIONS

1. **Introduction:** Introduce Smith's career as a Navy pilot and engineer
    a. On board the Challenger, one of his NASA assigned mission goals was to operate the shuttle as the co-pilot. He was to assist the commander, Scobee, in navigating the shuttle to reach its goal.
    b. See Biographical Data Sheet for his work experience with NASA
    c. Notable works of Smith:
        i. Before joining NASA, he was a naval aviator and test pilot.
2. **Landing in Space:** Teach how spacecraft slow down with parachutes or retro-thrust.
    a. Landing a spacecraft presents many challenges for astronauts, ground control, and engineers. Upon re-entry to the Earth's atmosphere, a shuttle is traveling at a high rate of speed. The shuttle needs to be slowed down to ensure the safety of the crew and the spacecraft. Landing too quickly could cause extensive damage.
    b. Two things a spacecraft can use to help slow it down would be parachutes or retrothrust.
        i. When a parachute deploys while attached to the shuttle it catches the air underneath it. The parachute is pushing in the opposite direction of the air causing the shuttle to slow down.
        ii. Retrothrusts act like a break for the rocket. Small rockets are pointing in the opposite direction of the rocket counter-acting the speed from the craft allowing it to slow down.
3. **Design Task:** Students build either a parachute system (coffee filter + string + washer) or a paper glider.
    a. Discuss with students the two options – building a parachute or a paper glider. Share with them what supplies that are available for the building process.
    b. Have students complete the front side of the Spacecraft Landing Worksheet.
4. **Testing Zone:** Drop from a set height, aiming for a target.
5. **Record Data:** Record data on the back of the Spacecraft Landing Worksheet which includes drop height, landing accuracy, and time to land.
6. **Redesign:** Adjust based on test data.
7. **Final Test and Presentation:** Students explain how their design mimics real spacecraft landings.
    a. Have students complete the remaining questions on the back of the Spacecraft Landing Worksheet before sharing their project. This allows them to gather their thoughts before presenting to the class.


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## Spacecraft Landing Worksheet

### PILOT, NAVAL AVIATOR

A Navy test pilot and engineer, Smith was responsible for controlling shuttle systems and assisting in landing. He was known for precision, testing protocols, and training.

Which type of landing system did you design?

☐ Parachute ☐ Glider ☐ Other: _____

Sketch your design and describe the parts:

Testing Results:

Drop Height: _____ Landing Accuracy: _____ Time to Land: _____

What challenges did you face?

_____

_____

_____

_____

_____

How does your design relate to real spacecraft landings?

_____

_____

_____

_____

_____