# Ellison Onizuka

## Design a Satellite for a Mission

### MISSION SPECIALIST, AEROSPACE SYSTEMS ENGINEER

The first Asian-American in space, Onizuka was a systems engineer in the Air Force and was known for his problem-solving skills, especially in satellite and space systems.

### OBJECTIVE

Create a satellite model that meets specific mission goals.

### STUDENTS WILL:

1. Explore Onizuka's background in aerospace systems.
2. Choose a satellite mission.
3. Design and label the systems: power, sensors, comms, etc.
4. Present their satellite design.

### MATERIALS

- Cardboard, paper, tinfoil, plastic pieces
- Worksheet with satellite system checklist
- Satellite cards (Earth observation, weather, comms, etc.)

### EXTENSION

Use a satellite simulator or app to model orbit paths (e.g., NASA Eyes).

## STEP BY STEP INSTRUCTIONS

1. **Introduction:** Share Onizuka's contributions and interests in complex space systems.
    a. On board the Challenger, one of his NASA assigned mission goals was to ensure the satellite was functioning properly before it was released from the shuttle. This included checking complex space systems to ensure the communication signals could communicate to Earth and that it would maintain the correct orbit.
    b. See Biographical Data Sheet for his work experience with NASA
    c. Notable works of Onizuka:
        i. He was the first Asian-American in space.
        ii. As an aerospace engineer and pilot, he helped to advance spaceflight operations and complex shuttle systems based upon data obtained from test missions.

2. **Mission Card Selection:** Students draw or choose from cards with mission goals

3. **Satellite Student Worksheet:** Fill out the checklist for system requirements (power, comms, sensors, propulsion).
4. **Model Creation:** Build satellite models using recyclables.

5. **Label and Explain:** Annotate parts and describe functions.

6. **Presentation:** Share the satellite and justify the design choices.
    a. Have students complete the remaining questions on the back of the Satellite Student Worksheet before sharing their project. This allows them to gather their thoughts before presenting to the class.

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## Satellite Student Worksheet

### MISSION SPECIALIST, AEROSPACE SYSTEMS ENGINEER

The first Asian-American in space, Onizuka was a systems engineer in the Air Force and was known for his problem-solving skills, especially in satellite and space systems.

Choose Your Mission Type:

☐ Earth Observation ☐ Weather ☐ Mars Study ☐ Communication

☐ Other: _____

List the systems your satellite needs:

Power Source: _____

Communication: _____

Sensor Type: _____

Data Collection Method: _____

Sketch your satellite and label each part.

Explain how your satellite will complete its mission:

# Hurricane Tracker

**MISSION GOAL:**

Monitor tropical storms and hurricanes to improve early warning systems.

**KEY SYSTEMS:**

- High-resolution cameras
- Radar sensors
- Strong communication link to Earth
- Solar power

**CHALLENGE:**

Maintain orbit over the same region during storm season.

# Ocean Watcher

**MISSION GOAL:**

Measure ocean temperature, wave patterns, and pollution levels.

**KEY SYSTEMS:**

- Infrared sensors
- Water-color cameras
- Large solar panels

**CHALLENGE:**

Handle glare from ocean surfaces while maintaining consistent data.

# Forrest Guardian

**MISSION GOAL:**

Track deforestation and forest fires around the globe.

**KEY SYSTEMS:**

- Infrared imaging
- Optical sensors
- Data storage for long missions

**CHALLENGE:**

Detect small fires through cloud cover.

# Mars Mapper

**MISSION GOAL:**

Collect data about Mars' surface, atmosphere, and potential for water.

**KEY SYSTEMS:**

- Thermal sensors
- High-gain antennas
- Solar panels
- Long-range communication system

**CHALLENGE:**

Communicate across millions of miles and withstand cold temperatures.

# Asteroid Analyzer

**MISSION GOAL:**

Study the composition and orbit of a near-Earth asteroid.

**KEY SYSTEMS:**

- Spectrometer sensors
- Propulsion thrusters
- Radiation shielding

**CHALLENGE:**

Land briefly or orbit a moving asteroid safely.

# Lunar Relay Satellite

**MISSION GOAL:**

Help astronauts on the Moon send data and images back to Earth.

**KEY SYSTEMS:**

- Communication relays
- Precision orbit controls
- Backup power

**CHALLENGE:**

Stay in the correct orbit to maintain line-of-sight with both Moon and Earth.

# Global Connect

**MISSION GOAL:**

Provide internet and phone service to remote areas on Earth.

**KEY SYSTEMS:**

- Communication arrays
- Power storage
- Stable geosynchronous orbit

**CHALLENGE:**

Avoid signal interference with other satellites.

# Rescue Relay

**MISSION GOAL:**

Support emergency response by relaying signals from distress beacons on Earth.

**KEY SYSTEMS:**

- GPS receiver
- Emergency communication antennas
- Robust power source

**CHALLENGE:**

Maintain real-time connections with multiple beacons.

# Navigation Pathfinder

**MISSION GOAL:**

Enhance GPS accuracy for aviation and space travel.

**KEY SYSTEMS:**

- Atomic clock
- Data transmitters
- Orbit stabilization systems

**CHALLENGE:**

Maintain precise timing and position accuracy.

# Atmosphere Explorer

**MISSION GOAL:**

Measure greenhouse gases and air quality across the planet.

**KEY SYSTEMS:**

- Spectrometers
- Data transmitters
- Solar panels

**CHALLENGE:**

Filter out interference from sunlight and clouds.

# Polar Sentinel

**MISSION GOAL:**

Monitor melting ice caps and track global sea level changes.

**KEY SYSTEMS:**

- Radar altimeters
- Infrared cameras
- Long-duration power supply

**CHALLENGE:**

Survive extreme cold and low sunlight near the poles.

# Radiation Observer

**MISSION GOAL:**

Study cosmic rays and solar radiation to protect astronauts and technology.

**KEY SYSTEMS:**

- Radiation detectors
- Shielding
- Precision instruments

**CHALLENGE:**

Protect sensitive electronics while collecting accurate data.