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UNIT 2 | SECTION B | LESSON 2 | PRESENTATION

FROM LOOKING AT STARS TO LIVING ON MARS

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LEARNING OBJECTIVES

At the end of this lesson, you will be able to:

- *Identify* emerging trends and directions in aerospace that will change the types of vehicles we fly into space and beyond Earth orbit.
- *Investigate* the STEM career fields that will play major roles in the design and implementation teams who will make the aerospace vehicles of tomorrow a reality.

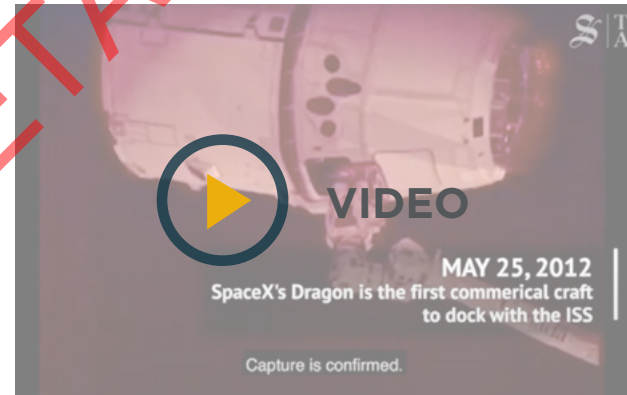


WARM-UP

Watch these videos:



Editorial credit: NowThis World



Editorial credit: The Age & Sydney Morning Herald

As you watch, reflect on the similarities and differences between the past and present space races.

WARM-UP

After watching the videos and reflecting on their content, please respond to the following questions:

- *What do you think were some of the major motivations for the original space race?*
- *Based on the video and what you know about history, what were some of the hurdles (scientific, political, economic, etc.) faced by NASA?*
- *What do you think are some of the major motivations for the new space race?*
- *What are some of the hurdles today's astronautics innovators face?*

KEY TAKEAWAYS FROM VIDEOS

- **Humanity is on the verge of a new space race.**
 - There is a big push from both governments and private companies for more space exploration.
 - New technologies are needed.
 - Many nations are involved in space exploration.

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ASTRONAUTICAL INNOVATIONS MAKING HEADLINES TODAY

How are some aeronautical challenges being met today?



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TRAVEL TO MARS

The problem: How do we learn about Mars before we travel there?

- *What do scientists, engineers, and astronauts need to know before traveling to Mars?*
- *What is the most effective way to learn about the planet before traveling there?*



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THE SOLUTION: PROBES

Since 1960, over 45 probes from a handful of nations have been sent to Mars in order to learn about the planet. Some of the latest ventures include:

- **Emirates Mars Mission Orbiter from the U.A.E.**
- **CNSA Tianwen 1 from China**
- **Perseverance and Ingenuity from the U.S.**
- **ExoMars 1 and 2 from the European Space Agency**



Editorial credit: NASA/JPL-Caltech

PEOPLE ON MARS

The problem: How do we get humans to the Red Planet?

- *What are some qualities that need to be considered when designing a spacecraft to carry humans to Mars?*
- *How might some of these issues be addressed?*



Editorial credit: NASA

INNOVATIONS IN MANNED SPACECRAFT

SpaceX Dragon

First private space vehicle to provide cargo and astronaut transportation to the ISS

Boeing CST-100 Starliner

Autonomous passenger and cargo transportation to the ISS designed by Boeing

Lockheed Martin Artemis III

Designed to transport astronauts to the Moon



A WEIGHTY ISSUE

How do we get heavy payloads into space?

What factors might scientists, engineers, and astronauts need to consider as they plan to launch larger payloads into space?

What is the most effective way to get materials and humans into space?



THE SOLUTION: NEXT-GENERATION LAUNCH SYSTEMS



Editorial credit: Wikipedia



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REFLECTING ON DEEP SPACE HAZARDS

What hazards might be part of a multi-year exploration in deep space?



Editorial credit: Twentieth Century Fox/NASA

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JIGSAW INVESTIGATION: HAZARDS OF DEEP SPACE TRAVEL

NASA has identified five main hazards of deep space travel:

1. Radiation
2. Isolation and confinement
3. Distance from Earth
4. Lack of gravity
5. Hostile or closed environments

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JIGSAW INVESTIGATION: HAZARDS OF DEEP SPACE TRAVEL

Complete the jigsaw investigation outlined in the Student Activity sheet.

- Each group will receive a Hazard Notes worksheet.
- As a group, brainstorm possible solutions to avoid or mitigate your assigned hazard.
- Be prepared to share your ideas with the class.

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WRAP-UP

- Turn in your group's Hazard Notes sheet.
- Reflect on the knowledge you learned and the skills you practiced in this lesson to prepare for the next lesson, when you will engage in the strategic planning necessary to realize an idea for a complex and multi-stage aerospace innovation.

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