Introduction to Aerospace Studies

Session Time: One, 50-minute session

DESIRED RESULTS

ESSENTIAL UNDERSTANDINGS

Develop interest in one or more aviation/aerospace career pathways and learn what is required to pursue future employment in the industry. (EU3)

Appreciate the global nature of the modern aviation/aerospace industry and embrace the discovery and inclusion of cultures outside the learner's typical experience. (EU7)

ESSENTIAL QUESTIONS

1. What would life be like today without the advantages offered by aviation?
2. Do we take aviation for granted?
3. Why study aviation and aerospace? Is there a difference?

LEARNING GOALS

Students Will Know

- Scope and depth of aerospace and aviation
- Importance and value of aviation and aerospace in the modern world
- How to compare and contrast the concepts of aviation and aerospace
- Common definitions and nomenclature for aviation and aerospace

Students Will Be Able To

- *Compare and contrast* opportunities available today with and without modern aviation and aerospace systems. (DOK-L3)
- *Explain* the similarities and differences between aerospace and aviation. (DOK-L2)

ASSESSMENT EVIDENCE

Warm-up
Students write to two to four complete sentences about how aviation changed the world forever.

Formative Assessment
Students will prepare a summary that compares and contrasts the opportunities available in the world today with and without modern aviation and aerospace systems.

Summative Assessment
Students will prepare and present a short speech about how their lives are enhanced by aviation.

LESSON PREPARATION

MATERIALS/RESOURCES

- Introduction To Aerospace Studies Presentation

LESSON SUMMARY

Lesson 1 Introduction to Aerospace Studies
Lesson 2 Engineering Practices in Action
Lesson 3 Aviation Careers Are For You!

Students will begin this lesson by discussing with a partner what they think life would be like without aviation. After they watch several short clips from a documentary, they will write two to four complete sentences about how aviation changed the world forever.

Students will then discuss the terms aviation and aerospace and learn about their similarities and differences. It will be emphasized that aerospace includes operating both aircraft and spacecraft within and beyond earth's atmosphere. Aviation deals with all aircraft within earth's atmosphere. Using a list of things we do everyday, students in teams of two to three, will compare and contrast what doing those things would be like with or without modern aviation and aerospace systems.

Finally, students will work in groups to prepare a short speech in which they will argue why they can't live without aerospace and aviation and how their life has been improved by them.

MISCONCEPTIONS

It is often thought that aviation and aerospace are different fields, but in reality, aerospace is just the larger category of which aviation is a subset. Within the aerospace field, there are the specialties of aeronautics (flight within the atmosphere) and astronautics (flight on the edge of the atmosphere and into space). Aviation is the term used to describe the operational field within aeronautics.

Students often think that aerospace careers are out of reach, or that working in aerospace and and aviation only means being a pilot. While careers will be explored in more detail later in the course, this lesson will include a brief introduction to the wide scope of possibilities in the aerospace field.

DIFFERENTIATION

To support student writing in the **ENGAGE, EXPLAIN** and **EVALUATE** sections of the lesson plan, provide examples of the type of writing that the students are expected to do. This allows students to identify effective elements to incorporate in their own writing.

LEARNING PLAN

ENGAGE

Teacher Material: Introduction to Aerospace Studies Presentation

Slides 1-3: Introduce the topic and learning objectives for today's lesson.

Slide 4: Conduct the **Warm-Up**. Show students two trailers from the movie *Living in the Age of Airplane*s, a documentary about how aviation has transformed the way the world connects. Filmed in 18 countries across all 7 continents, the movie illustrates how the airplane has changed just about everything people do and will renew appreciation for one of the most extraordinary and awe-inspiring aspects of the modern world.

- *Living in the Age of Airplanes* trailers (Length 2:37, 1:32)
  http://video.link/w/LCJd
  http://video.link/w/NCJd

Warm-Up

Ask students to discuss with a partner what they think life would be like without aviation, then show them trailers from the movie *Living In The Age Of Airplanes.* Ask students write two to four complete sentences about how aviation changed the world forever.

Collect student papers for grading when they are completed. Take no more than 5 minutes of class time to complete the warm-up. [DOK 3; formulate, hypothesize]

Questions

In their responses, students should mention that the invention of aviation has made it possible for people to travel faster and farther than ever before, and has led to a global increase in connection of commerce, people, and ideas. They should cite specific ways in which aviation has allowed these things to occur.

EXPLORE

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Review some examples of ways aviation and aerospace improves our lives.

Slide 5: We turn on the television and in a few seconds get access to hundreds of television channels from all over the world. This is only possible because we launch and maintain a huge network of satellites in orbit above the earth. It takes aerospace technology to launch and place those satellites into orbit.

Slide 6: When students next visit the grocery store, ask them to look to see where the produce was grown. They should take a moment to count the number of countries represented just in that section of the store. Aviation makes distribution of such produce possible while still ensuring that the produce is fresh when it gets to you.

Slide 7: Aircraft have made warehousing cheaper and more efficient because it is easier than ever to bring products to market. Have students determine the distance from China to their home or school. Have them contemplate how to move an object over that distance in 48 hours (aircraft are the only medium that can make it possible).

EXPLAIN

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Slide 8: Students may have heard the term “aviation” and “aerospace” used interchangeably before. Ask students if there is a difference between the two and if so, what those differences would be.

It is often thought that aviation and aerospace are different fields, but in reality, aerospace is just the larger category of which aviation is a subset. This will become more clear in the following slides.

Slide 9: Review the basic definitions of aviation and aerospace and their differences. Emphasize that aerospace includes operating aircraft and spacecraft both within and beyond earth's atmosphere. Aviation deals with all aircraft within earth's atmosphere.

Slide 10: Based on the definitions of aerospace and aviation the students just learned, they should "place" the icons scattered around the slide in the appropriate spheres.

Slide 11: Rockets, satellites and the space shuttle are all considered a part of aerospace. So is the operation of airplanes, helicopters and balloons. However, airplanes, helicopters and balloons belong to a special subset we call aviation.

Slide 12: Conduct the **Formative Assessment**.

Collect student papers when they are completed for grading. Take no more than 10 minutes of class time to complete the assessment. If time allows, ask groups to read their summaries to the class before they hand them in. [DOK 3; compare, contrast]

Formative Assessment

In teams of two to three, students will consider what doing a list of everyday things would be like with and without modern aviation and aerospace systems. They should write a summary of comparisons for each item below.

- Taking vacations
- Connecting with friends
- Shopping
- Other

Questions

Taking vacations

With - Fast international travel, very affordable, can go multiple places in a single year, can take short weekend vacations, can stay connected inflight and watch live television while en route

Without - Limited to travel via boat, automobile or train, a single trip takes significantly more time, probably only take one big vacation per year, may never be able to afford the time or money it costs to travel to a different continent.

Connecting with friends

With - internet and cellular connections on our handheld devices provided through satellite systems means we can communicate with anyone, anywhere at anytime

Without - would have to rely on sending letters or make calls via landlines

Shopping

With - can get international goods minutes away from your home, all types of fruits and vegetables are available all year around, goods from China take two days to arrive instead of two months, shipping is cheaper and products are cheaper

Without - all goods transported by trucks, trains or boats, takes weeks or months for goods to arrive from other countries, only local and regional fresh food is available

EXTEND

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Slide 13: Review just a few reasons why someone would want to study aerospace and make a career in aviation. Show students a video of aerobatic pilot Sean D. Tucker who introduces some aviation careers that students may not have thought about before. Ask students name other reasons they might want to get into the field of aerospace.

- "Careers in Aviation - Sean D. Tucker" (Length 00:53)
  http://video.link/w/2DJd

Slide 14: Review facts about two example aerospace careers: professional pilot and aerospace engineer.

EVALUATE

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Slide 14: Complete the **Summative Assessment**.

Split students into teams of three or four to prepare and present short speeches. They should take no more than 10 minutes of class time to complete the assessment. Use the 10-Point Scoring Rubric for grading. [DOK 4; argue, prepare, combine]

Summative Assessment

Students will prepare a short speech in which they argue why they can't live without aerospace and aviation and how their life has been improved by them. They should explain the similarities and differences between aerospace and aviation as appropriate when they provide their arguments. They will present these speeches to a group of three to four classmates.

Summative Assessment Scoring Rubric

- Follows assignment instructions
- Speech shows evidence of one or more of the following
  - Knowledge of the ways in which aviation affects their lives
  - Provides a convincing argument as to why life without aviation would be difficult
  - Explains the similarities and differences between aerospace and aviation as appropriate
  - Responds to questions of audience and instructor
- Shows understanding of concepts covered in the lesson.

Points	Performance Levels
9-10	Consistently demonstrates criteria
7-8	Usually demonstrates criteria
5-6	Sometimes demonstrates criteria
0-4	Rarely to never demonstrates criteria

GOING FURTHER

Consider watching the full-length feature film “Living In The Age Of Airplanes”: http://www.airplanesmovie.com/

STANDARDS ALIGNMENT

NGSS STANDARDS

Three-Dimensional Learning

- **HS-ETS1-1** - Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
    - Science and Engineering Practices
        - Asking Questions and Defining Problems
        - Constructing Explanations and Designing Solutions
    - Disciplinary Core Ideas
        - ETS1.A: Defining and Delimiting Engineering Problems
    - Crosscutting Concepts
        - Systems and System Models
        - Influence of Science, Engineering, and Technology on Society and the Natural World
- **HS-ETS1-3** - Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
    - Science and Engineering Practices
        - Constructing Explanations and Designing Solutions
    - Disciplinary Core Ideas
        - ETS1.B: Developing Possible Solutions
    - Crosscutting Concepts
        - Influence of Science, Engineering, and Technology on Society and the Natural World

COMMON CORE STATE STANDARDS

- **RST.9-10.2** - Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- **RST.9-10.4** - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

- **WHST.9-10.2** - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- **WHST.9-10.6** - Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- **WHST.9-10.8** - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

REFERENCES

https://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics/

https://www.bls.gov/oes/current/oes532011.htm

https://www.bls.gov/oes/current/oes172011.htm

http://aerospaceengineeringyoloswagg69.weebly.com/pros-and-cons.html