02_How Aircraft Are Made

Content Area: **Technology**
Course(s):
Time Period: **Full Year**
Length: **10 Days**
Status: **Published**

General Overview, Course Description or Course Philosophy

Students will begin this unit by learning to identify the various parts of an aircraft, including the common and distinguishing features of airplanes, helicopters, unmanned aircraft, and some less common aircraft types. They will go on to look at aircraft construction with an emphasis on the materials used and the safety features of various aircraft types.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

ESSENTIAL UNDERSTANDINGS

The intended purpose and use of an aircraft drives aircraft design considerations and construction techniques, materials, and components. (EU1)

Innovations in aviation are driven by the desire to make aircraft safer, more capable, and more efficient. (EU3)

A deep understanding of how an aircraft operates enables a pilot to fly the aircraft to its maximum capabilities in both normal and abnormal situations. (EU5)

ESSENTIAL QUESTIONS

What is the most important part of an aircraft?

Are there any parts of an aircraft we can do without?

Are unmanned aircraft essentially the same as manned aircraft?

Objectives, essential questions and enduring understandings are outlined within each unit of study and/or Curricular Calendar.

Units of Study: https://drive.google.com/drive/folders/11Q8sFu-T8ZX9O-2dZC7LEy8PaMNVtJnX?usp=sharing

https://documentcloud.adobe.com/gsuiteintegration/index.html?state=%7B%22ids%22%3A%5B%221FqXECleJQDYTviGaFP-tC6mEammvwbdT%22%5D%2C%22action%22%3A%22open%22%2C%22userId%22%3A%221032526522

77395116399%22%2C%22resourceKeys%22%3A%7B%7D%7D

CONTENT AREA STANDARDS

CS.9-12.ED	Engineering Design
SCI.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.
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
TECH.8.1.12.A.2	Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
	Engineering design is a complex process in which creativity, content knowledge, research, and analysis are used to address local and global problems. Decisions on trade-offs involve systematic comparisons of all costs and benefits, and final steps that may involve redesigning for optimization.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

LA.W.9-10.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
LA.W.9-10.6	Use technology, including the Internet, to produce, share, 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.
LA.W.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 (MLA or APA Style Manuals).
LA.W.9-10.9	Draw evidence from literary or nonfiction informational texts to support analysis, reflection, and research.
LA.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.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.7	Look for and make use of structure.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.

CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.
9-12.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.
9-12.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
	Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

STUDENT LEARNING TARGETS

Student learning targets are outlined within each unit of study and/or Curricular Calendar.

Declarative Knowledge

Students Will Know

1. Names of major components of aircraft

2. Where major components of aircraft are located

3. How major components of aircraft influence flight

4. Location and function of primary structural components of unmanned aircraft.

5. Role of various components in sustaining and controlling flight.

6. How multirotor UAS are stabilized and controlled using a single flight system and no moving control surfaces

7. Location and function of primary structural components of unmanned aircraft.

8. Role of various components in sustaining and controlling flight.

9. How multirotor UAS are stabilized and controlled using a single flight system and no moving control

surfaces

Procedural Knowledge

Students Will Be Able To

1. Identify the location of the major components of fixed-wing airplanes, rotorcraft, and lighter than-air aircraft. (DOK-L1)

2. Explain the function of major components of fixed wing airplanes, rotorcraft, and lighter-than-air aircraft. (DOK-L2)

3. Make observations about the functionality of various aircraft components using simulated flight. (DOK-L2)=

4. Identify and recognize the location and function of components that make UAS flight possible. (DOK1)

5. Explain and analyze the effects of UAS flight control and stabilization systems. (DOK-L2, L4)

6. Identify and recognize the location and function of components that make UAS flight possible. (DOK1)

7. Explain and analyze the effects of UAS flight control and stabilization systems. (DOK-L2, L4)

EVIDENCE OF LEARNING

Formative Assessments

Students will build a simple model airplane, label the components, and describe the functions of each in a provided activity sheet.

Summative Assessments

Students will synthesize what they have learned about the components of various aircraft types and the function(s) of each component.

RESOURCES (Instructional, Supplemental, Intervention Materials)

Manned Aircraft Components Student Activity 1

Manned Aircraft Components Student Activity 2 Manned Aircraft Components Teacher Notes 1

Manned Aircraft Components Teacher Notes 2

Manned Aircraft Components Teaching Aid Modeling an Airplane's Components (per student)

Cardboard Paper towel or toilet paper rolls Scissors Tape or Glue Markers

Recommended Student Reading Pilot's Handbook of Aeronautical Knowledge Chapter Three, Aircraft Construction
https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/05_phak_ch3.pdf

Helicopter Flying Handbook Chapter Four, Helicopter Components, Systems and Sections
https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/helicopter_flying_handbook/media/hfh_ch04.pdf

Unmanned Aircraft Components Presentation Unmanned Aircraft Components Student Activity Unmanned Aircraft Components

Teacher Notes Drone Flying Activity (one per class)

Drone options for the classroom Tello Quadcopter Drone- $99 (Amazon) SYMA X5C 2.4G 6 Axis Gyro HD Camera RC Quadcopter with 2.0MP Camera- $36 (Amazon) DROCON Drone For Beginners X708W Wi-Fi FPV Training Quadcopter With HD Camera - $80 (Amazon)

INTERDISCIPLINARY CONNECTIONS

Students will be using Technology skills when building their model aircraft.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

To support students who struggle with the component terms in this lesson, consider creating a set of flashcards for each component for the different types of aircraft (airplane, rotorcraft, and balloon/airship). The front of the flashcard should feature the component's name and possibly an image of the component. The back should include the component's location and function.

To support student retention of knowledge, consider distributing blank diagrams of an aircraft from each category. As students learn about the location of each component, they should add this label to the diagram. This strategy will be especially effective to prepare students for Manned Aircraft Components Student Activity 1, which requires them to label the components on a model of a fixed wing airplane.