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CTE Standards Unpacking
Aviation

Course: Aviation
Course Description: This course provides students with an understanding of the science of flight and the history, regulations, and possible career paths within the aviation industry. It also covers the relationships of weight and balance, principles of navigation and flight control, ground and airport operations and services, and Federal Aviation Agency regulations.
Career Cluster: STEM
Prerequisites: None
Program of Study Application: Aviation is a pathway course in the aviation pathway. Students in this pathway would generally complete foundation courses and one of the STEM cluster courses prior to participating in aviation.

INDICATOR #AV 1: **Identify events in the history of flight.**		
SUB-INDICATOR 1.1 (Webb Level: 2 Skill/Concept): Identify flight in the ancient world		
SUB-INDICATOR 1.2 (Webb Level: 2 Skill/Concept): Identify the development of flight in the early 1900s.		
SUB-INDICATOR 1.3 (Webb Level: 2 Skill/Concept): Identify the development of flight during the Golden Age of Flight (1918 to 1939)		
SUB-INDICATOR 1.4 (Webb Level: 2 Skill/Concept): Identify the development of flight innovation during World War II (1939 to 1945)		
SUB-INDICATOR 1.5 (Webb Level: 2 Skill/Concept): Identify the development of flight innovation during the Cold War (1945 to 1991)		
SUB-INDICATOR 1.6 (Webb Level: 2 Skill/Concept): Identify the development of flight innovation (1991 to present)		
SUB-INDICATOR 1.7 (Webb Level: 3 Strategic Thinking): Analyze current trends in flight.		
Knowledge (Factual): Learn the concepts of aviation technology and how unmanned technologies work History of flight innovation and its development	**Understand (Conceptual):** Understand how the hardware and mechanical components of drones are design and integrated. Understand how components work together.	**Skills (Application):** Perform research on the historical and current unmanned systems.

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Benchmarks

Students will be assessed on their ability to:

- Design a simple drone plan. Create a drone to perform simple tasks.
- Identify the importance of Kites and Balloons in China during third century
- Distinguish the difference between lighter-than-air and heavier-than air vehicles
- Identify the importance of blimps
- Identify the contribution of Wright Brothers
- Identify the importance of V2-rocket
- Identify the importance of early Jets
- Identify the importance of commercial aviation
- Identify the importance of Space flights
- Identify the importance of space shuttle program
- Identify the importance of military aviation
- Evaluate the challenges that arises with emerging flight technologies
- Investigate the importance of unnamed flight

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	**Sample Performance Task Aligned to the Academic Standard(s):**
K-12.H.1 Students will analyze how major events are chronologically connected and evaluate their impact on one another. K-12.H.2 Students will analyze and evaluate the impact of people, events, ideas and symbols upon history using multiple sources. K-12.H.3 Students will analyze and evaluate historical events from multiple perspectives.	When given a product, research the types of unmanned flying object fields, necessary for the product to have been created. Compare and contrast career opportunities related to different fields of aviation. Create a report explaining the interaction between Microprocessor, Sensors, Intelligent Controls, and Motors.

INDICATOR #AV 2: **Investigate the principles of flight.**

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SUB-INDICATOR 2.1 (Webb Level: 3 Strategic Thinking): Investigate the basic parts and control surfaces on aircraft.		
SUB-INDICATOR 2.2 (Webb Level: 3 Strategic Thinking): Investigate the four forces of flight.		
SUB-INDICATOR 2.3 (Webb Level: 4 Extended Thinking): Investigate basic aerodynamics.		
SUB-INDICATOR 2.4 (Webb Level: 3 Strategic Thinking): Investigate airplane stability.		
Knowledge (Factual): Investigate the basic parts and control surfaces on aircraft. Investigate the forces of flight. Investigate basic aerodynamics. Investigate airplane stability.	**Understand (Conceptual):** Robots work under command. Identify human-machine interactions related to aviation operations. Understand the impact of the Bernoulli Effect and Venturi Effect.	**Skills (Application):** Examine the utilization of the airfoil, wings, tails and the propeller. Concepts of lift versus weight and thrust versus drag. Explore the concept of pitch, roll, and yaw.
Benchmarks *Students will be assessed on their ability to:* • Examine the utilization of airfoil, wings, tail and propeller • Apply Newton's Three Laws of Motion to flight. • Compare Static versus Dynamic Pressure. • Explore concept of pitch, roll, yaw		
Academic Connections		
ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard): Federal Aviation Administration: https://www.faa.gov/regulations_policies/ HS-PS2-1 Analyze data to support the claim that Newton's Second Law of motion describes the mathematical	**Sample Performance Task Aligned to the Academic Standard(s):** Write a report and present to your classmates and community. Communication with your teammates to make sure the project is viable. Write a biography about a historic person in the field of aviation such as	

relationship among the net force on a macroscopic object, its mass, and its acceleration. (SEP: 4; DCI: PS2.A; CCC: Cause/Effect) HS-PS2-4 Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. (SEP: 5; DCI: PS2.B; CCC: Patterns)	Wright Brothers. Research and report on a specific career of interest in the aviation fields.

INDICATOR #AV 3: **Understand the flight environment.**		
SUB-INDICATOR 3.1 (Webb Level: 2 Skill/Concept): Comprehend air safety.		
SUB-INDICATOR 3.2 (Webb Level: 2 Skill/Concept): Comprehend the airport layout, inclusive of safety elements.		
SUB-INDICATOR 3.3 (Webb Level: 3 Strategic Thinking): Comprehend airspace control.		
SUB-INDICATOR 3.4 (Webb Level: 2 Skill/Concept): Comprehend radio communications.		
Knowledge (Factual): Comprehend air safety. Comprehend radio communications	**Understand (Conceptual):** Comprehend the airport layout, inclusive of safety elements. Comprehend airspace control.	**Skills (Application):** Present a report on air safety concerns. Present a report on the Federal Aeronautics Administration (FAA) regulations.
Benchmarks *Students will be assessed on their ability to:* • Identify causes of runway accidents. Design a safe and effective airport layout. • Comprehend airspace control. • Demonstrate procedures of radio communications during conduct of a flight.		

- Demonstrate cockpit management of radio systems.
- Be able to list types of airports.

Academic Connections	
ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard): ELA: 11-12.W.1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. a. Introduce precise, 11-12.W.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. 11-12.W.4 -Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	**Sample Performance Task Aligned to the Academic Standard(s):** Given a model airport layout, identify the safety concerns and plan of action to rectify hazards. Write a report to present to the airport officials communicating these conclusions.

INDICATOR #AV 4: **Understand aircraft systems and performance**
SUB-INDICATOR 4.1 (Webb Level: 2 Skill/Concept): Know the basic aircraft instruments.
SUB-INDICATOR 4.2 (Webb Level: 2 Skill/Concept): Know aircraft systems.
SUB-INDICATOR 4.3 (Webb Level: 3 Strategic Thinking): Predict aircraft performance.

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SUB-INDICATOR 4.4 (Webb Level: 3 Strategic Thinking): Calculate weight and balance.		
Knowledge (Factual): Know aviation terminologies, Know the basic aircraft instruments. Know aircraft systems	**Understand (Conceptual):** Aircraft instruments are of different types and knowing these components are important Understanding of how to solve the percentage problem and ratio and proportion problems Understanding of computing the loaded weight and loaded weight center of gravitation	**Skills (Application):** Calculate weight and balance. Calculate the speed and direction of wind and its effect on the flight. Describe the latest innovations in fly-by-wire flight control systems. Solve percentage problems (percent of power for turbine engines, flap position percent indicators) Solve ratio and proportion problems (compression ratios of an aircraft, glide ratios)

Benchmarks:

- Identify the six basic aircraft instruments (Airspeed indicator, attitude indicator, altimeter, turn coordinator, heading indicator, and vertical speed indicator)
- Interpret the reading of each instrument to confirm an accurate 'instrument scan'.
- List the basic flight control systems (mechanical, hydromechanical and fly-by-wire).
- Determine the weight and the balance of the flying object. Design a wind and project plan. Calculate the effect of environment of the flight. Predict an unmanned flight performance

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	**Sample Performance Task Aligned to the Academic Standard(s):**
9-12-ETS1-3. Evaluate a solution to a complex real-world problem based on	Presented with problem situations, make all appropriate calculations. Use

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. CCSS.MATH.CONTENT.HSG.MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).* CCSS.MATH.CONTENT.HSN.VM.A.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.	open ended task situations to develop higher level thinking skills.

INDICATOR #AV 5: **Understand the relationships between weather and flight**		
SUB-INDICATOR 5.1 (Webb Level: 2 Skill/Concept): Explain basic weather theory.		
SUB-INDICATOR 5.2 (Webb Level: 2 Skill/Concept): Describe weather patterns and clouds.		
SUB-INDICATOR 5.3 (Webb Level: 2 Skill/Concept): Explain weather hazards.		
SUB-INDICATOR 5.4 (Webb Level: 3 Strategic Thinking): Interpret weather data.		
SUB-INDICATOR 5.5 (Webb Level: 2 Skill/Concept): Identify sources of weather information.		
Knowledge (Factual): Explain weather theory and patterns and weather sources.	**Understand (Conceptual):** Understanding the effect of weather conditions on flight	**Skills (Application):** Create a simple weather device to measure humidity, dew point,

Describe weather patterns and clouds Explain weather hazards Interpret weather data Identify sources of weather information.	Knowing the basic weather theory Understand the weather patterns and weather sources and how they behave and act Weather hazards and its impact on flight Understanding of weather data interpretation and finding the weather data source	wind directions, weather pressures. Identify the types of clouds (stratus, cumulonimbus, and cirrus) at different elevations and the potential hazards that may exist. Interpret current weather conditions using a weather map. Collect and analyze local weather data. Understand Significant Meteorological Information Service (SIGMET) Define the role of the Aviation Data Service (ADDS)

Benchmarks:

Students will be assessed on their ability to:

- Explain the composition of earth's atmosphere
- Explain how temperature variation influences flight performance
- Analyze pressure systems at different attitudes on a surface map.
- Compare and contrast the common weather hazards when flying Identify safe and corrective actions for common weather hazards as suggested by the Federal Aeronautics Administration (FAA)
- Interpret current weather conditions using a weather map
- Collect and analyze local weather data
- Understand Significant Meteorological Information Service (SIGMET)
- Define the role of Aviation Data Service (ADDS)

Academic Connections

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ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	**Sample Performance Task Aligned to the Academic Standard(s):**
CCSS.MATH.CONTENT.HSS.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). CCSS.MATH.CONTENT.HSN.VM.A.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors.	Students journal weather data, plot the data, and analyze the data looking for patterns. Given a weather scenario, students calculate an optimal flying elevation based upon velocity and weather limitations.

INDICATOR #AV 6: **Understand navigation in aviation**		
SUB-INDICATOR 6.1 (Webb Level: 1 Recall): Understand basic navigation.		
SUB-INDICATOR 6.2 (Webb Level: 1 Recall): Understand dead-reckoning and pilotage.		
SUB-INDICATOR 6.3 (Webb Level: 2 Skill/Concept): Utilize a flight computer.		
SUB-INDICATOR 6.4 (Webb Level: 3 Strategic Thinking): Utilize aeronautical charts.		
SUB-INDICATOR 6.5 (Webb Level: 2 Skill/Concept): Comprehend radio navigation.		
Knowledge (Factual): Define and understand the terminologies such as basic navigation Understand the flight computer and aeronautical charts. Comprehend radio navigation.	**Understand (Conceptual):** Understand the aeronautical charts are utilized and a flight computer work. It is important to know the basic navigation system	**Skills (Application):** Design an aeronautical charts and flight patterns. List and describe the essential navigational information a pilot needs to know (starting point, ending point, direction, distance, speed, fuel capacity, and weight and balance)

		Understand the basic concepts of a flight computer. List the advantages and disadvantages of Visual Flight Rules (VFR) flying. Define dead-reckoning and pilotage. Calculate a flight course using the elements of course line, airspeed, course heading and elapsed time. Plot a course using an aeronautical chart. Evaluate flight plans for improved efficiency. Distinguish between the types of Radio Navigation: Very High Frequency Omnidirectional Range (VOR), Distance Measuring Equipment (DME), Instrument Landing System (ILS), Global Positioning System (GPS), Inertial Navigations Systems (INS)

Benchmarks

Students will be assessed on their ability to:

- Learn how to evaluate Aviation concepts. Learn how to utilize aeronautical

charts and a flight computer.
- Use a flight computer to file a flight plan.

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	**Sample Performance Task Aligned to the Academic Standard(s):**
CCSS.MATH.CONTENT.HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. CCSS.MATH.CONTENT.HSN.VM.A.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors. CCSS.MATH.CONTENT.HSN.VM.B.4.B Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.	Utilizing aeronautical charts, use vectors to model magnitude and direction of flights. Incorporate wind velocity vectors to determine the effect on the flight plan.

INDICATOR #AV 7: **Understand aviation physiology**

SUB-INDICATOR 7.1 (Webb Level: 1 Recall): Know the effect on the body in the flight environment.

Knowledge (Factual):	**Understand (Conceptual):**	**Skills (Application):**
Know the effect on the body in the flight environment.	Environment affects the body while in flight.	Identify the potential hazards on the body during flight.

Benchmarks

Students will be assessed on their ability to:

- List and describe the safety procedures to prevent aviation accidents due to physical distress.

Academic Connections	
ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard): HS-PS1-6 Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.* (SEP: 6; DCI: PS1.B, ETS1.C; CCC: Stability/Change)	**Sample Performance Task Aligned to the Academic Standard(s):** Communicate with your teammates and others in the class as well as with the community to describe your project. Use correct relevant term.

INDICATOR #AV 8: **Understand aerospace science and technology**		
SUB-INDICATOR 8.1 (Webb Level: 2 Skill/Concept): Understand key concepts affecting exploration of space.		
SUB-INDICATOR 8.2 (Webb Level: 2 Skill/Concept): Understand basic rocket theory and space flight.		
SUB-INDICATOR 8.3 (Webb Level: 1 Recall): Analyze existing space platforms.		
Knowledge (Factual): Understand key concepts affecting exploration of space. Understand basic rocket theory and space flight.	**Understand (Conceptual):** Rocket and space theory in flight. Aviation careers and occupations.	**Skills (Application):** Identify the effect of zero gravity, lack of atmosphere and friction on flight. Note the major developments in space

Investigate aviation career fields and occupations.		flight. List the scientific purposes of unmanned space explorations.

Benchmarks
Students will be assessed on their ability to:

- Analyze the stages of space flights
- Write a biographical article of spaceflight pioneers.
- Write an article on the scientific purposes of unmanned space explorations.
- Analyze the stages of development and importance of the International Space Station.
- Summarize the development and impact of the Hubble Space Telescope.

Academic Connections	
ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard): 9-12-ETS1-1.Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. 9-12-ETS1-2.Design a solution to a complex real-world problem by breaking it down into smaller, more managable problems that can be solved through engineering.	**Sample Performance Task Aligned to the Academic Standard(s):** Aviation Lesson Guide: http://www.theteachersguide.com/Aviationlessons.html NASA online

***INDICATOR #AV 9:* Explore the multiple careers in aviation.**
SUB-INDICATOR 9.1 (Webb Level: 2 Skill/Concept): Investigate aviation career fields and occupations.

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Knowledge (Factual):	**Understand (Conceptual):**	**Skills (Application):**
Know how to do a reliable research. Know ow to interview aerospace professionals.	Understand the requirements for career in aerospace fields. Be able to determine the relationships among skills, educations, and job opportunities.	Interview a professional working in an occupation that is of interest to them. Research aerospace career opportunities of interest by participating in career exploration activities. Explore the requirements, skills, wages, education, and geographic opportunities in one career associated with aerospace. Identify employability skills preferred by different aviation occupations

Benchmarks

Students will be assessed on their ability to:

- Investigate aviation career fields. Visit an industry related to aviation and unmanned flying objects. Shadow an aviation engineer or designer, or a pilot of unmanned flying object.
- Present the results of your career exploration and resources

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	**Sample Performance Task Aligned to the Academic Standard(s):**
11-12.SL.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range or formal and informal tasks.	Make to follow the social, ethical, legal, and security aspects of the flight patterns. Consider the ethical aspects of camera installed flying objects.

11-12.SL.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest	

Additional Resources
Please list any resources (e.g., websites, teaching guides, etc.) that would help teachers as they plan to teach these new standards.

https://www.faa.gov/education/educators/curriculum/middle/media/Middle_Aviation_Curriculum_Guide.pdf

https://www.aviationweather.gov/

https://www.aviationweather.gov/radar

http://www.aviationjobsearch.com/designer

http://www.aefco.org/summer.html

http://www.naa.edu/page/admissions_high_school_student

http://schools.nyc.gov/ChoicesEnrollment/High/Directory/school/?sid=4690