

04_Forces of Flight

Content Area: **Technology**
Course(s):
Time Period: **Full Year**
Length: **26 Days**
Status: **Published**

General Overview, Course Description or Course Philosophy

This unit takes an in-depth look into the forces affecting aircraft in motion, including the four forces of flight—lift, weight, thrust, and drag. Students will start by gaining an understanding of how aircraft move above the surface of the Earth, including how the flight path is affected by forces such as wind. They will go on to explore how lift is produced, the role of airfoil design, how to calculate lift, and the meaning and significance of an aerodynamic stall. They will also learn how to determine weight and balance for an aircraft and how faulty weight and balance affect flight characteristics. Students will examine how the power developed by an aircraft engine is converted into thrust and how various types of drag affect aircraft performance.

Next Generation Science Standards

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

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>

CONTENT AREA STANDARDS

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| CS.9-12.8.2.12.ED.1 | Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.4 | Model with mathematics. |
| SCI.HS-ETS1-4 | Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. |
| 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. |
| 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-PS2-3 | Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. |

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| SCI.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. |
| SCI.HS-PS2-2 | Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. |
| SCI.HS-PS2-6 | Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. |
| SCI.HS-PS2-1 | Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. |
| TECH.8.2.12.C.7 | Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process through drawings that include data and materials. |

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

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| LA.W.9-10.1.B | Develop claim(s) and counterclaims avoiding common logical fallacies, propaganda devices, and using sound reasoning, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience’s knowledge level and concerns. |
| LA.SL.9-10.2 | Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. |
| LA.SL.9-10.4 | Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. |
| LA.RST.9-10.1 | Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. |
| LA.RST.9-10.2 | Determine the central ideas, themes, 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. |
| 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. |
| LA.RST.11-12.1 | Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. |
| LA.RST.11-12.7 | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| LA.WHST.9-10.2 | Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. |
| LA.WHST.9-10.4 | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LA.WHST.9-10.6 | Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically. |
| LA.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.

STUDENT LEARNING TARGETS

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

Declarative Knowledge

Declarative knowledge is outlined within each unit of study and/or Curricular Calendar.

Procedural Knowledge

Procedure knowledge is outlined within each unit of study and/or Curricular Calendar.

EVIDENCE OF LEARNING

Formative Assessments

Formative assessments are included and outlined in each unit of study.

Summative Assessments

Summative assessments are included and outlined in each unit of study.

RESOURCES (Instructional, Supplemental, Intervention Materials)

Materials and resources are outlined in each unit of study.

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary connections are outlined in each unit of study.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

Accommodations & Modifications are outlined in each unit of study.