

05_Aircraft Stability and Control

Content Area: **Technology**
Course(s):
Time Period: **Full Year**
Length: **13 Days**
Status: **Published**

General Overview, Course Description or Course Philosophy

In this unit, students will learn how aircraft are controlled and the role stability plays in aircraft performance. Students will first look at how stability, and instability, are designed into aircraft. They will also look at both primary and secondary flight controls and how they are used to manage pitch, roll, and yaw. Students will also explore flight controls for unmanned aircraft.

Students will learn how an airplane turns during flight, with an emphasis on how airplanes make coordinated turns. The act of maneuvering an aircraft creates stresses that can affect the aircraft's performance and even its structural integrity. In this unit, students will also learn about the types of structural loads aircraft encounter during flight as well as the role of aircraft design in determining load limits. Finally, they will explore how the loads placed on an aircraft affect aerodynamic stalls and how flying in rough air can affect the loads on an aircraft.

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

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
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.
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-PS2-4	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-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-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.

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.

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.

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)

MA.K-12.2

Reason abstractly and quantitatively.

MA.K-12.4

Model with mathematics.

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.9-10.3

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in 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.9-10.7

Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LA.W.9-10.2

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.

LA.W.9-10.2.E

Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.

LA.W.9-10.2.F

Provide a concluding paragraph or section that supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

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.

LA.WHST.9-10.9	Draw evidence from informational texts to support analysis, reflection, and research.
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.

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 assessemnts 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.