



NINTH GRADE CURRICULUM

BY UNIT

GRADE 9, OVERVIEW

The ninth-grade course will provide the foundation for advanced exploration in the areas of flying, aerospace engineering, and unmanned aircraft systems. Students will learn about engineering practices, problem solving, and the innovations and technological developments that have made today's aviation and aerospace industries possible. Students will also learn about the wide variety of exciting and rewarding careers available to them. The ninth-grade course will inspire students to consider aviation and aerospace careers while laying the foundation for continued study in grades 10 through 12 and beyond.

GRADE 9, SEMESTER 1

Launching Into Aviation

Unit 1 - Aviation 101

Students will explore the different types of aviation at work in the modern world. They'll learn the uses and benefits of various forms of aviation, including commercial, military, private, and drone flying, as well as space exploration. Students will also learn about different types of aircraft, from drones and rockets to airliners and general aviation airplanes. This unit will give students a taste of the exciting and varied career possibilities in these fields.

Section A – Introduction to Aviation and Aerospace

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

Section B - Overview of Commercial, Military and General Aviation

- Lesson 1 Introduction to Commercial Aviation
- Lesson 2 Introduction to Military Aviation
- Lesson 3 Introduction to General Aviation

Section C – Introduction to Unmanned Aircraft Systems

- Lesson 1 UAS Fundamentals
- Lesson 2 UAS Operation and Safety

Section D – Introduction to Space Exploration

- Lesson 1 Current and Future Space Exploration

**Unit 2: Taking Flight—Early Aviation Innovations**

Students will follow the path of aviation from its primitive beginnings to the dawn of powered flight. They will consider how observing birds influenced the earliest human attempts at flight before moving on to explore the first successful flight technologies, including lighter-than-air aircraft and gliders. The unit will culminate with an understanding of the technologies, innovative engineering, and design practices developed by the Wright Brothers. They'll also examine how the Wright Brothers' approach to problem solving is helping today's engineers address new challenges as they strive to break boundaries in aviation and aerospace.

Section A – Aviation's Primitive Beginnings

- Lesson 1 Flight in Greek Mythology
- Lesson 2 Da Vinci and his Flying Machines

Section B – Lighter Than Air

- Lesson 1 Hot Air and Gas Ballooning

Section C – Gliders

- Lesson 1 From Birds to Gliders
- Lesson 2 Glider Flight and Early Innovators

Section D – Powered, Controlled Flight

- Lesson 1 The "Wright" Approach
- Lesson 2 Build and Test a Wind Tunnel
- Lesson 3 The "Wright" Attitude



Unit 3: From Theory to Practical Reality—Rapid Developments in Powered Flight

Tracing the dramatic growth in aviation from its first practical applications through its use as an essential military tool, students will learn about the innovations that changed the way aircraft were made and flown. Topics will include the technological developments that led to the first commercial airline service, a transcontinental airmail system, and ultimately the fighters, long-range bombers, and transport aircraft of World War II. Students will learn how engineers, designers, and pilots solved the problems presented by aircraft that could fly further, faster, and higher than ever before.

Section A – First Practical Applications of Airplanes, Commercial and Military

- Lesson 1 Beginnings of U.S. Commercial Airline Service
- Lesson 2 Aviation and World War I
- Lesson 3 Airmail and the Transcontinental Airway System

Section B – Women in Early Aviation

- Lesson 1 Women in Early Aviation

Section C – World War II

- Lesson 1 Aviation Innovation and World War II
- Lesson 2 One For All, All For One

Unit 4: To the Stars—Making Jet and Space Travel Possible

Students will learn about the innovations that led to the jet age and consider how the expansion of military technology into the commercial sector led to widespread social changes. They will learn about the space race and the intense political competition that led scientists and engineers to overcome seemingly insurmountable obstacles to take machines and people into space, to the moon, and beyond. They'll look at the problem-solving processes and innovative leaps that took space exploration from the unimaginable to the common in a single generation.

Section A – The Jet Age

- Lesson 1 Development of the Jet Engine
- Lesson 2 Commercial Air Travel

Section B – The Space Race

- Lesson 1 The Space Race Begins
- Lesson 2 To the Moon
- Lesson 3 The Space Race Winds Down
- Lesson 4 The Shuttle Program



Unit 5: Creating the Future—What’s New and Next in Aviation and Aerospace

Modern aircraft navigation, fly-by-wire, “glass” cockpits, and composite structural materials are among the key innovations that students will explore as they consider how aviation continues to advance. Students will also look at how space exploration has changed as commercial enterprises have moved into that arena. The unit and the semester will culminate in a project in which students use their new understanding of aviation technology to design, build, and defend a museum exhibit based on the topics discussed during the semester.

Section A – Modern Aircraft Design

- Lesson 1 Fly-by-Wire and “Glass” Cockpits
- Lesson 2 Aircraft Navigation
- Lesson 3 Composites and Structures

Section B – Government and Commercial Space

- Lesson 1 Government and Commercial Space

Section C – End of Semester Project

- Lesson 1 End of Semester Project

PROPRIETARY

**GRADE 9, SEMESTER 2****Exploring Aviation and Aerospace****Unit 6: Aviation Safety and Oversight**

Exploring the regulatory and safety organizations and infrastructure that are essential to today's aviation environment, students will define safety and examine concepts such as perceived and accepted risk before developing their own safety management systems. They'll go on to investigate the role of regulation and oversight in creating and maintaining safety and efficiency within the aviation system and gain an understanding of the mission and responsibilities of the FAA. Later, students will consider the role of the National Transportation Safety Board and take an in-depth look at the accident investigation process as they take on the roles of various NTSB "Go Team" members in a simulated accident investigation. Finally, students will examine the government's role in delivering weather information and the importance of weather reporting to aviation safety.

Section A – Role of Government in Aviation Safety

- Lesson 1 Fundamentals of Aviation Safety
- Lesson 2 The Federal Aviation Administration

Section B – Accident Investigation

- Lesson 1 The Investigative Process
- Lesson 2 Accident Case Study

Section C – Aviation Weather Services

- Lesson 1 Aviation Weather Reports and Forecasting

Unit 7: Exploring Careers in Aviation and Aerospace

Students will learn about a variety of aviation and aerospace careers, as well as the education, training, and certification requirements needed for each. Students will begin by exploring flying careers, including airline, cargo and drone operations, military aviation, and flight instructing. Students will go on to explore aerospace engineering careers, including specialties such as propulsion and navigation. Finally, students will look at the unique skills needed to be a successful air traffic controller and participate in a simulation that demonstrates just how challenging the job can be. They'll complete the unit by exploring different types of aviation mechanic jobs.

Section A – Flying

- Lesson 1 Flying Aircraft and Drones

Section B – Engineering

- Lesson 1 Becoming an Aerospace Engineer

Section C – Other Great Aviation Careers

- Lesson 1 Becoming an Air Traffic Controller
- Lesson 2 Becoming an Aircraft Mechanic

**Unit 8: Aviation Innovation and Problem-Solving**

This unit offers students a look into the future of aviation and aerospace as they discover the challenges the industries face and the innovative technologies that will address those challenges. Students will begin this unit by looking at key environmental impacts of aviation—emissions and noise—and the emerging technologies designed to help reduce both. Next, they'll explore both the necessity and the complexities of modernizing our aviation system, increasing capacity, and bringing new types of flying machines into the mix of air traffic now traversing our skies. They'll go on to explore supersonic flight, discovering its history in commercial air travel and new efforts to make it viable as a means of transportation. They'll also look at how technology has increasingly automated flight and how fully autonomous aircraft may change the future of aviation. They'll go on to explore the unique advantages and challenges associated with developing electric aircraft before considering the possibilities associated with colonizing space, including the types of jobs that might be essential to a successful colony.

Section A – Going Green

Lesson 1 Improving Aviation's Environmental Impact

Section B – Modernizing Airspace

Lesson 1 Next Generation Air Transportation System

Lesson 2 Integrating Drones

Section C – Future Aircraft

Lesson 1 Supersonic Aircraft

Lesson 2 Autonomous Aircraft

Lesson 3 Electric Aircraft

Section D – Future Space Travel

Lesson 1 Colonizing Space

Unit 9: Innovation Challenge

In this unit, students will put their understanding of engineering design practices to the test as they design a "space condo." Students will work in teams to design a dwelling to protect residents from the harsh conditions on Mars, particularly the extremely low atmospheric pressure. Students will rigorously apply engineering design practices as they identify problems, brainstorm solutions, create a design, build and test a prototype, evaluate the results, refine their design, and share what they've learned. With limits on the types of materials and designs that may be used, students will have to exercise their creativity and work collaboratively at each stage of the project.

Section A – "Peep Odyssey"

Lesson 1 "Peep Odyssey" Innovation Challenge

**Unit 10: Thinking About a Career in Aviation**

Students will begin planning for a career in aviation and aerospace by writing a personal mission statement to help guide their future decisions. They'll go on to consider a range of training and educational options for different careers before selecting one potential career to explore further. Next, students will work on practical skills for presenting themselves to potential employers. Students will go on to evaluate the professional, technical, and communications skills they may already have and plan a path for developing additional skills in each of these areas. The unit will culminate with students building a career portfolio that they can use to support job and scholarship applications and grow throughout the remainder of their high school careers.

Section A – Preparing for an Aviation Career

- Lesson 1 Developing a Mission Statement
- Lesson 2 Investigating Education Options After High School

Section B – Developing Professionalism

- Lesson 1 Professional Skills and Conduct
- Lesson 2 Building Communication Skills

Section C – Career Planning Project

- Lesson 1 Building a Career Portfolio