



## 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 the engineering process, 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

#### Principles of Aviation and Aerospace

##### Unit 1 - Aviation and Aerospace Today

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

- Day 1 Introduction to Aerospace Studies
- Day 2 Engineering Design Process in Action
- Day 3 Aerospace Careers: What's Cool?

##### Section B - Overview of General, Commercial and Military Aviation

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

##### Section C – Introduction to Unmanned Aircraft Systems

- Day 1-2 UAS Fundamentals
- Day 3 UAS Operation and Safety

##### Section D – Introduction to Space Exploration

- Day 1-3 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 processes 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

Day 1	Chinese Kites
Day 2	Greek Mythology
Day 3-4	Da Vinci and his Flying Machines

### Section B – Lighter Than Air

Day 1-3	Hot Air and Gas Ballooning
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### Section C – Gliders

Day 1	From Birds to Gliders
Day 2-3	Glider Flight and Early Innovators

### Section D – Powered, Controlled Flight

Day 1-2	The "Wright" Approach
Day 3-7	Build and Test a Wind Tunnel
Day 8	The "Wright" Attitude

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### 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

Day 1	Beginnings of U.S. Commercial Airline Service
Day 2-3	Aviation and World War I
Day 4-5	Airmail and the Transcontinental Airway System

#### Section B – Women in Early Aviation

Day 1-2	Women in Early Aviation
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#### Section C – The Golden Age of Aviation

Day 1-2	Zeppelins and Barnstormers
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#### Section D – World War II

Day 1-3	Aviation Innovation and World War II
Day 4	Rivet to Victory!
Day 5	Women Airforce Service Pilots
Day 6	Tuskegee Airmen

### 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

Day 1-3	Development of the Jet Engine
Day 4-5	Commercial Air Travel

#### Section B – The Space Race

Day 1-3	The Space Race Begins
Day 4-6	To the Moon
Day 7	The Space Race Winds Down
Day 8-10	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

Day 1	Fly-by-Wire and “Glass” Cockpits
Day 2	Aircraft Navigation
Day 3	Composites and Structures
Day 4-5	Specialized Technology and its Implications

#### Section B – Government and Commercial Space

Day 1	NASA’s Role, Past and Present
Day 2	Government and Commercial Space
Day 3-5	Gaming the Future of Space Exploration

#### Section C – End of Semester Project

Day 1-5	End of Semester Project
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## 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

Day 1-2	Fundamentals of Aviation Safety
Day 3-4	Evolution of Civil Aviation Safety
Day 5	The Federal Aviation Administration

#### Section B – Accident Investigation

Day 1-3	The Investigative Process
Day 4-6	Accident Case Study

#### Section C – Aviation Weather Services

Day 1-2	Aviation Weather Reports and Forecasting
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### 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. Students will also put key engineering skills—problem solving and creative thinking—to work as they find ways to solve a real-world problem at their school. 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

Day 1-3	Flying Aircraft and Drones
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#### Section B – Engineering

Day 1-3	Becoming an Aerospace Engineer
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#### Section C – Other Great Aviation Careers

Day 1-2	Becoming an Air Traffic Controller
Day 3	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

Day 1-3 Improving Aviation's Environmental Impact

#### Section B – Modernizing Airspace

Day 1 Next Generation Air Transportation System

Day 2-4 Integrating Drones

#### Section C – Future Aircraft

Day 1-3 Supersonic Aircraft

Day 4-6 Autonomous Aircraft

Day 7-9 Electric Aircraft

#### Section D – Future Space Travel

Day 1-3 Colonizing Space

### Unit 9: Innovation Challenge

In this unit, students will put their understanding of the engineering design process 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 the engineering design process 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"

Day 1-14 "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, including developing an elevator speech, completing a job application, and developing a resume. 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

Day 1-2	Developing a Mission Statement
Day 3-4	Investigating Education Options After High School
Day 5	Job Application Practice
Day 6	Resume Development

#### Section B – Developing Professionalism

Day 1-2	Professional Skills and Conduct
Day 3-4	Building Communication Skills

#### Section C – Career Planning Project

Day 1-5	Building a Career Portfolio
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