AOPA FOUNDATION HIGH SCHOOL AVIATION STEM CURRICULUM

PACING GUIDE

TENTH GRADE CURRICULUM

INTRODUCTION TO FLIGHT
SEMESTER ONE

In the Introduction to Flight Course, students pursuing the pilot and UAS tracks will take a closer look at the aircraft they may one day operate. Students will begin with an exploration of the types of aircraft in use today before going on to learn how aircraft are made and how they fly. Students will understand how aircraft are categorized, be able to identify their parts, and learn about aircraft construction techniques and materials. They will gain an in-depth understanding of the forces of flight—lift, weight, thrust, and drag—including how to make key calculations. They will then touch on aircraft design, looking at stability, aircraft controls, and maneuvering flight. The course will conclude with a focus on career skills related to these topics.

Unit 1 - Getting to Know Aircraft

Students will explore the types of aircraft operating in today's aviation environment, including traditional manned aircraft and remote piloted aircraft, or drones. They'll learn how the FAA categorizes aircraft and how to recognize aircraft of different types. Students will then investigate some of the factors affecting aircraft design, including how the aircraft will be used. This unit will give students a framework on which to build a deeper understanding of the variations in aircraft.

		No. of Sessions Per Lesson	Day of Semester
Pre-Course Exam		1	1
Section A – Introduction			
Lesson 1	You Can Fly!	1	2
Section B - Categories and Classes of Aircraft			
Lesson 1	Classifying Aircraft	1	3
Lesson 2	Classifying UAS	1	4
Section C – Design Considerations for Aircraft			
Lesson 1	Aircraft Roles and Mission	2	6
Unit 1 Exam		1	7

Total Sessions Unit 1 **7**
Semester Total **7**

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Unit 2: How Aircraft Are Made

Students will begin this unit by learning to identify the various parts of an aircraft, including the common and distinguishing features of airplanes, helicopters, unmanned aircraft, and some less common aircraft types. They will go on to look at aircraft construction with an emphasis on the materials used and the safety features of various aircraft types.

		No. of Sessions Per Lesson	Day of Semester
Section A – Identifying Parts of the Aircraft			
Lesson 1	Manned Aircraft Components	3	10
Lesson 2	Unmanned Aircraft Components	1	11
Section B – Aircraft Construction			
Lesson 1	Aircraft Structural Materials	2	13
Lesson 2	Aircraft Safety Features	2	15
Lesson 3	Unmanned Aircraft Materials	1	16
Unit 2 Exam		1	17

Total Sessions Unit 2 **10**
Semester Total **17**

Unit 3: Understanding Air

To understand flight, students must understand the medium in which aircraft operate. This unit will focus on the role air plays in flight, including its behavior as a fluid and the importance of air pressure. Students will also learn why the density of air is important, how it changes, and how to measure it. The concept of density altitude will be introduced.

		No. of Sessions Per Lesson	Day of Semester
Section A – Characteristics of Air			
Lesson 1	Air is a Fluid	2	19
Lesson 2	Air Density	3	22
Section B – Aeronautical Applications of Air Density			
Lesson 1	Density Altitude	3	25
Unit 3 Exam		1	26

Total Sessions Unit 3 **9**
Semester Total **26**

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Unit 4: Forces of Flight

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.

		No. of Sessions Per Lesson	Day of Semester
Section A – The Aircraft in Motion			
Lesson 1	Understanding Motion	2	28
Lesson 2	Four Forces	2	30
Lesson 3	Vectors of Flight	1	31
Section B – Lift			
Lesson 1	Theories of Lift	2	33
Lesson 2	Airfoils and Lift Production	2	35
Lesson 3	Calculating Lift	2	37
Lesson 4	Aerodynamic Stalls	3	40
Section C - Weight			
Lesson 1	Aircraft Weight and Balance	5	45
Section D - Thrust			
Lesson 1	In Thrust We Trust	3	48
Section E - Drag			
Lesson 1	What a Drag!	3	51
Unit 4 Exam		1	52

Total Sessions Unit 4 **26**
Semester Total **52**

Unit 5: Aircraft Stability and Control

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.

		No. of Sessions Per Lesson	Day of Semester
Section A – Types of Stability			
Lesson 1	Stability in Aircraft Design	3	55
Lesson 2	Rotorcraft Lift and Stability	2	57
Section B – Aircraft Flight Controls			
Lesson 1	Primary Flight Controls	2	59
Lesson 2	Secondary Flight Controls	1	60
Lesson 3	Flight Controls for Unmanned Aircraft	1	61
Section C – Structural Loads Encountered in Flight			
Lesson 1	Turns and Turning Flight	1	62
Lesson 2	Load Limits in Aircraft Design	2	64
Unit 5 Exam		1	65

Total Sessions Unit 5 13
Semester Total 65

Unit 6: Career Skills

Students will continue planning for a career in aviation and aerospace. 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 learn what a career portfolio is, how it can be used to develop their career, and prepare or revise their own personalized career portfolio.

		No. of Sessions Per Lesson	Day of Semester
Section A – Career Preparation			
Lesson 1	Job Application Practice	1	66
Lesson 2	Resume Development	1	67
Lesson 3	Building/Revising Your Career Portfolio	2	69

Due to the nature of the content in this unit, a quiz is available, but an end-of-unit exam has not been provided.

Post-Course Exam		1	70

Total Sessions Unit 6	**5**
Semester Total	**70**