AOPA 11th Grade Aviation STEM Curriculum Standard Alignment

Overview: This course will cover the remaining topics necessary for students to take the Federal Aviation Administration's Private Pilot Knowledge Test. Students will review regulations, cross-country flight planning, weight and balance, performance and limitations, human factors, chart use, night operations, navigation systems, and aeronautical decision making. At the end of this course, a school may choose to arrange for students to be signed off to take the Federal Aviation Administration's Private Pilot written exam.

PILOT Track: Flight Planning, Semester 2

Unit 6 Plotting, Pilotage, Paperwork

Description: An in-depth review of sectional aeronautical charts and instruction in the use of a plotter and mechanical flight computer called the E6B allows students to plan a short cross country flight.

Next Generation Science Standards

Three-dimensional Learning

- **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.
    - Science and Engineering Practices
        - Asking Questions and Defining Problems
        - Constructing Explanations and Designing Solutions
    - Disciplinary Core Ideas
        - ETS1.A: Defining and Delimiting Engineering Problems
        - ETS1.C: Optimizing the Design Solution
    - Crosscutting Concepts
        - None
- **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.
    - Science and Engineering Practices
        - Constructing Explanations and Designing Solutions
    - Disciplinary Core Ideas
        - ETS1.B: Developing Possible Solutions
    - Crosscutting Concepts
        - None
- **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.
    - Science and Engineering Practices

- Using Mathematics and Computational Thinking
- Disciplinary Core Ideas
  - ETS1.B: Developing Possible Solutions
- Crosscutting Concepts
  - Systems and System Models

Common Core State Standards

- **RST.11-12.2** - Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- **RST.11-12.4** - 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 11-12 texts and topics.
- **WHST.11-12.6** - Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- **WHST.11-12.8** - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- **WHST.11-12.9** - Draw evidence from informational texts to support analysis, reflection, and research.

FAA Airman Certification Standards

Private Pilot

I. Preflight Preparation

Task D. Cross-Country Flight Planning

- Knowledge - The applicant demonstrates understanding of:
  - **PA.I.D.K1** Route planning
  - **PA.I.D.K2** Altitude selection accounting for terrain and obstacles, glide distance of the airplane, VFR cruising altitudes, and the effect of wind.
  - **PA.I.D.K3** Calculating:
    - PA.I.D.K3a Time, climb and descent rates, course, distance, heading, true airspeed, and groundspeed
    - PA.I.D.K3b Estimated time of arrival to include conversion to universal coordinated time (UTC)
    - PA.I.D.K3c Fuel requirements, to include reserve
- Skills - The applicant demonstrates the ability to:
  - **PA.I.D.S1** Prepare, present, and explain a cross-country flight plan assigned by the evaluator including a risk analysis based on real-time weather, to the first fuel stop.
  - **PA.I.D.S2** Apply pertinent information from appropriate and current aeronautical charts, Chart Supplements; NOTAMs relative to airport, runway and taxiway closures; and other flight publications.
  - **PA.I.D.S3** Create a navigation plan and simulate filing a VFR flight plan.

Task E. National Airspace System

- Knowledge - The applicant demonstrates understanding of:
  - **PA.I.E.K1** Types of airspace/airspace classes and associated requirements and limitations.
  - **PA.I.E.K2** Charting symbology.
  - **PA.I.E.K3** Special use airspace (SUA), special flight rules areas (SFRA), temporary flight restrictions (TFR), and other airspace areas.

VI. Navigation

Task A. Pilotage and Dead Reckoning

- Knowledge - The applicant demonstrates understanding of:
  - **PA.VI.A.K1** Pilotage and dead reckoning.
  - **PA.VI.A.K2** Magnetic compass errors.
  - **PA.VI.A.K3** Topography
  - **PA.VI.A.K4a** Selection of appropriate route
  - **PA.VI.A.K4b** Altitude(s)
  - **PA.VI.A.K4c** Checkpoints
  - **PA.VI.A.K5a** Plotting a course, to include determining heading, speed, and course
  - **PA.VI.A.K5b** Wind correction angle
  - **PA.VI.A.K5c** Plotting a course, to include estimating time, speed, and distance
  - **PA.VI.A.K7** Planned versus actual flight plan calculations and required corrections.
- Skills - The applicant demonstrates the ability to:
  - **PA.VI.A.S1** Prepare and use a flight log.
  - **PA.VI.A.S3** Navigate by means of pre-computed headings, groundspeeds, and elapsed time.
  - **PA.VI.A.S5** Verify position within three nautical miles of the flight-planned route.

Task B. Navigation Systems and Radar Services

- Knowledge - The applicant demonstrates understanding of:
  - **PA.VI.B.K1** Ground-based navigation (orientation, course determination, equipment, tests, and regulations).
  - **PA.VI.B.K2** Satellite-based navigation (e.g., equipment, regulations, database considerations, and limitations of satellite navigation).
- Risk Management The applicant demonstrates the ability to identify, assess and mitigate risks, encompassing:
  - **PA.VI.B.R1** Failure to manage automated navigation and autoflight systems.
  - **PA.VI.B.R2** Distractions, loss of situational awareness, or improper task management.
  - **PA.VI.B.R3** Limitations of the navigation system in use.
  - **PA.VI.B.R4** Loss of a navigation signal.
- Skills - The applicant demonstrates the ability to:
  - **PA.VI.B.S1** Use an airborne electronic navigation system.
  - **PA.VI.B.S2** Determine the airplane's position using the navigation system.
  - **PA.VI.B.S5** Recognize signal loss or interference and take appropriate action, if applicable.
  - **PA.VI.B.S4** Recognize and describe the indication of station or waypoint passage, if appropriate.
  - **PA.VI.B.S5** Recognize signal loss or interference and take appropriate action, if applicable.

Task C. Diversion

- Skills - The applicant demonstrates the ability to:
  - **PA.VI.C.S5** Utilize flight deck displays of digital weather and aeronautical information, as applicable.

Unit 7 Aircraft Performance

Description: "Will I have enough fuel for this trip? How much baggage can I bring aboard the aircraft? Is the runway length at my destination long enough for landing and takeoff?" Answering these important preflight safety questions requires a pilot to know how to read aircraft performance charts. In this unit, students will learn flight planning procedures that involve determining aircraft performance, which could be affected by weight, atmospheric conditions, the runway environment, and more. Students will learn to use performance charts to determine takeoff, climb, range, endurance, descent, and landing performance.

Next Generation Science Standards

Three-dimensional Learning

- **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.
  - Science and Engineering Practices
    - Asking Questions and Defining Problems
    - Constructing Explanations and Designing Solutions
  - Disciplinary Core Ideas
    - ETS1.A: Defining and Delimiting Engineering Problems
  - Crosscutting Concepts
    - None
- **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.
  - Science and Engineering Practices
    - Constructing Explanations and Designing Solutions
  - Disciplinary Core Ideas
    - ETS1.B: Developing Possible Solutions
  - Crosscutting Concepts
    - None

Common Core State Standards

- **RST.11-12.2** - Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- **RST.11-12.4** - 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 11-12 texts and topics*.
- **WHST.11-12.6** - Use technology, including the Internet, to produce, publish, and update individual or

shared writing products in response to ongoing feedback, including new arguments or information.

- **WHST.11-12.8** - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- **WHST.11-12.9** - Draw evidence from informational texts to support analysis, reflection, and research

FAA Airman Certification Standards

Private Pilot

I. Preflight Preparation

Task F. Performance and Limitations

- **Knowledge** The applicant demonstrates understanding of:
  - **PA.I.F.K1** Elements related to performance and limitations by explaining the use of charts, tables, and data to determine performance.
  - **PA.I.F.K2** Factors affecting performance, to include:
    - **PA.I.F.K2a** Atmospheric conditions
    - **PA.I.F.K2b** Pilot technique
    - **PA.I.F.K2c** Airplane configuration
    - **PA.I.F.K2d** Airport environment
    - **PA.I.F.K2e** Loading (e.g., center of gravity)
    - **PA.I.F.K2f** Weight and balance
  - **PA.I.F.K3** Aerodynamics.
- **Risk Management** The applicant demonstrates the ability to identify, assess and mitigate risks, encompassing:
  - **PA.I.F.R1** Inaccurate use of manufacturer's performance charts, tables, and data.
  - **PA.I.F.R2** Exceeding airplane limitations.
  - **PA.I.F.R3** Possible differences between calculated performance and actual performance.
- **Skills** The applicant demonstrates the ability to:
  - **PA.I.F.S2** Utilize the appropriate airplane manufacturer's approved performance charts, tables, and data.

Unit 8 Aeromedical Factors: Am I Safe to Fly?

Description: Aircraft move and operate in many different environments, and sometimes pilots are subjected to conditions that can affect their health and safety. Optical illusions and spatial disorientation are just two of the conditions students will learn about in this unit.

Additional topics include medical certification requirements, drug and alcohol use, and aeronautical decision making strategies.

Next Generation Science Standards

Three-dimensional Learning

- **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.
    - Science and Engineering Practices
        - Using Mathematics and Computational Thinking
    - Disciplinary Core Ideas
        - ETS1.B: Developing Possible Solutions
    - Crosscutting Concepts
        - Systems and System Models

Common Core State Standards

- **RST.11-12.2** - Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- **RST.11-12.4** - 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 11-12 texts and topics*.
- **WHST.11-12.6** - Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- **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.
- **RST.11-12.9** - Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- **WHST.11-12.2** - Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- **WHST.11-12.8** - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- **WHST.11-12.9** - Draw evidence from informational texts to support analysis, reflection, and research

FAA Airman Certification Standards

Private Pilot

I. Preflight Preparation

Task A. Pilot Qualifications References

- Knowledge - The applicant demonstrates understanding of:
    - **PA.I.A.K1** Certification requirements, recent flight experience, and recordkeeping.

- **PA.I.A.K2** Privileges and limitations.
- **PA.I.A.K3** Medical certificates: class, expiration, privileges, temporary disqualifications.
- **PA.I.A.K4** Documents required to exercise private pilot privileges.
- **PA.I.A.K5** Part 68 BasicMed privileges and limitations.

- Skills - The applicant demonstrates the ability to:
  - **PA.I.A.S1** Apply requirements to act as PIC under Visual Flight Rules (VFR) in a scenario given by the evaluator

Task H. Human Factors

- Knowledge The applicant demonstrates understanding of:
  - **PA.I.H.K1** The symptoms (as applicable), recognition, causes, effects, and corrective actions associated with aeromedical and physiological issues including:
    - PA.I.H.K1a Hypoxia
    - PA.I.H.K1b Hyperventilation
    - PA.I.H.K1c Middle ear and sinus problems
    - PA.I.H.K1d Spatial disorientation
    - PA.I.H.K1e Motion sickness
    - PA.I.H.K1f Carbon monoxide poisoning
    - PA.I.H.K1g Stress
    - PA.I.H.K1h Fatigue
    - PA.I.H.K1i Dehydration and nutrition
    - PA.I.H.K1j Hypothermia
    - PA.I.H.K1k Optical illusions
    - PA.I.H.K1l Dissolved nitrogen in the bloodstream after scuba dives
  - **PA.I.H.K2** Regulations regarding use of alcohol and drugs.
  - **PA.I.H.K3** Effects of alcohol, drugs, and over-the-counter medications.
  - **PA.I.H.K4** Aeronautical Decision-Making (ADM).
- Risk Management The applicant demonstrates the ability to identify, assess and mitigate risks encompassing:
  - **PA.I.H.R1** Aeromedical and physiological issues.
  - **PA.I.H.R2** Hazardous attitudes.
  - **PA.I.H.R3** Distractions, loss of situational awareness, or improper task management.
- Skills The applicant demonstrates the ability to:
  - **PA.I.H.S1** Associate the symptoms and effects for at least three of the conditions listed in K1a through K1l above with the cause(s) and corrective action(s).
  - **PA.I.H.S2** Perform self-assessment, including fitness for flight and personal minimums, for actual flight or a scenario given by the evaluator.

Unit 9 FAA Regulations Overview

Description: Throughout your study of aviation in the United States, students have seen references to the Federal Aviation Regulations or FARs. The United States Code of Federal Regulations has many parts (called Titles) regulating activities in the USA. Title 14 relates to Aeronautics and Space, and it is commonly known as the FARs. This unit covers the most common private pilot-related regulations in Part 61 (certification for pilots) and Part 91 (general operating and flight rules).

Common Core State Standards

- **RST.11-12.2** - Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- **RST.11-12.4** - 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 11-12 texts and topics*.
- **RST.11-12.9** - Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- **WHST.11-12.6** - Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- **WHST.11-12.7** - Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- **WHST.11-12.8** - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- **WHST.11-12.9** - Draw evidence from informational texts to support analysis, reflection, and research

FAA Airman Certification Standards

Private Pilot

I. Preflight Preparation

Task A. Pilot Qualifications

- Knowledge - The applicant demonstrates understanding of:
  - **PA.I.A.K1** Certification requirements, recent flight experience, and recordkeeping.
  - **PA.I.A.K2** Privileges and limitations.
  - **PA.I.A.K3** Medical certificates: class, expiration, privileges, temporary disqualifications.
  - **PA.I.A.K4** Documents required to exercise private pilot privileges.
  - **PA.I.A.K5** Part 68 BasicMed privileges and limitations.
- Risk Management - The applicant demonstrates the ability to identify, assess and mitigate risks, encompassing:

- **PA.I.A.R1** Failure to distinguish proficiency versus currency.
- **PA.I.A.R2** Flying unfamiliar airplanes, or operating with unfamiliar flight display systems, and avionics.

- Skills - The applicant demonstrates the ability to:
  - **PA.I.A.S1** Apply requirements to act as PIC under Visual Flight Rules (VFR) in a scenario given by the evaluator.

Task B. Airworthiness Requirements

- Knowledge - The applicant demonstrates understanding of:
  - **PA.I.B.K1** - General airworthiness requirements and compliance for airplanes, including:
    - **PA.I.B.K1c** - Airworthiness Directives and Special Airworthiness Information Bulletins

Task E. National Airspace System

- Knowledge - The applicant demonstrates understanding of:
  - **PA.I.E.K3** - Special use airspace (SUA), special flight rules areas (SFRA), temporary flight restrictions (TFR), and other airspace areas.

II. Preflight Procedures

Task D. Taxiing (ASEL, AMEL)

- Knowledge - The applicant demonstrates understanding of:
  - **PA.II.D.K1** - The applicant demonstrates understanding of current airport aeronautical references and information resources such as the Chart Supplement, airport diagram, and NOTAMS

III. Airport and Seaplane Base Operations

Task A. Communications, Light Signals, and Runway Lighting Systems

- Knowledge - The applicant demonstrates understanding of:
  - **PA.III.A.K8** - The applicant demonstrates understanding of National Transportation Safety Board (NTSB) accident/incident reporting.

Unit 10 Private Pilot Projects

Description: In this final unit, students get to practice being ground instructors as they select a topic from the Pilot's Handbook of Aeronautical Knowledge, craft a lesson, teach their lesson to the class, and administer an assessment. This hands-on experience further develops their aviation knowledge in preparation for the FAA Private Pilot Knowledge Test.

Students are also given time to assess and update their career portfolio with reflections, artifacts, and documentation from any work experiences, interviews, competitions, or coursework they have participated in throughout the year.

Common Core State Standards

- **RST.11-12.2** - Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- **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.

- **RST.11-12.9** - Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- **WHST.11-12.2** - Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- **WHST.11-12.4** - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- **WHST.11-12.5** - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- **WHST.11-12.6** - Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- **WHST.11-12.7** - Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- **WHST.11-12.8** - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- **WHST.11-12.9** - Draw evidence from informational texts to support analysis, reflection, and research.
- **WHST.11-12.10** - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.