

Introduction to Aerospace

Primary Career Cluster:	Transportation
Course Contact:	CTE.Standards@tn.gov
Course Code(s):	C20H15
Prerequisite(s):	None
Credit:	1
Grade Level:	9-10
Elective Focus - Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Transportation courses.
POS Concentrator:	This course satisfies one out of two required courses that meet the Perkins V concentrator definition, when taken in sequence in the approved program of study.
Programs of Study and Sequence:	This is the first course in the <i>Aviation Flight</i> program of study.
Aligned Student Organization(s):	SkillsUSA: https://www.skillsusatn.org/
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html .
Promoted Tennessee Student Industry Credentials:	Credentials are aligned with postsecondary and employment opportunities and with the competencies and skills that students acquire through their selected program of study. For a listing of promoted student industry credentials, visit https://www.tn.gov/education/career-and-technical-education/student-industry-certification.html
Teacher Endorsement(s):	512, 579, 594, 773, 774
Required Teacher Certifications/Training:	FAA Industry Certification
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-transportation-distribution-logistics.html Best for All Central: https://bestforall.tnedu.gov/

Course at a Glance

CTE courses provide students with an opportunity to develop specific academic, technical, and 21st century skills necessary to be successful in career and in life. In pursuit of ensuring every student in Tennessee achieves this level of success, we begin with rigorous course standards which feed into intentionally designed programs of study.

Students engage in industry relevant content through general education integration and experiences such as career & technical student organizations (CTSO) and work-based learning (WBL). Through these experiences, students are immersed with industry standard content and technology, solve industry-based problems, meaningfully interact with industry professionals and use/produce industry specific, informational texts.

Using a Career and Technical Student Organization (CTSO) in Your Classroom

CTSOs are a great resource to put classroom learning into real-life experiences for your students through classroom, regional, state, and national competitions, and leadership opportunities. Below are CTSO connections for this course, note this is not an exhaustive list.

- Participate in CTSO Fall Leadership Conference to engage with peers by demonstrating logical thought processes and developing industry specific skills that involve teamwork and project management.
- Participate in contests that highlight job skill demonstration. These include Career Pathways Showcase, Job Interview, Commercial sUAS Drone, and Aviation Maintenance Technology.

Using a Work-based Learning (WB) in Your Classroom

Sustained and coordinated activities that relate to the course content are the key to successful work-based learning. Possible activities for this course include the following. This is not an exhaustive list.

- **Standards 1-2** | Include a safety briefing in a visit to an airport.
- **Standards 3-5** | Have a pilot and maintenance technician visit the class to talk about careers.
- **Standards 9-16** | Visit an airfield and ask a pilot to give an overview of their aircraft.
- **Standards 17-23** | Ask a pilot to discuss flight environments and situations they have experienced.
- **Standard 24** | On an airplane, ask a navigator to talk with the students.

Course Description

Introduction to Aerospace is a comprehensive foundational course for students interested in pursuing careers in aviation. This course covers the basic principles governing flight and the regulation of flight that every aviation professional must know regardless of his or her occupation—as a pilot or an engineer, a salesperson or a specialist, a mechanic or a statistician. In addition to acquiring foundational knowledge of safety procedures and industry regulations, students will also gain essential understanding of aircraft structures, the flight environment, basic procedures, and navigation. Upon completion of this course, proficient students will be prepared for further study in advanced *Aviation Flight* and/or *Aviation Maintenance* courses.

Program of Study Application

This is the foundational course in the *Aviation Flight* and *Aviation Maintenance* programs of study. For more information on the benefits and requirements of implementing these programs in full, please visit the Transportation, Distribution, & Logistics website at <https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-transportation-distribution-logistics.html>.

Course Standards

Aviation Safety

- 1) The number one priority as a pilot is to maintain the safety of flight. Citing course materials such as textbooks and published guidelines including the Federal Aviation Regulations (FARs), identify the basic safety issues a pilot must be aware of before, during, and after each flight, including but not limited to: pilot's mental and physical condition, collision avoidance, weather conditions, maintaining minimum safe altitudes, visual scanning, right-of-way rules, flight over hazardous terrain, positive exchange of flight controls, and operating within the Federal Aviation Regulations (FARs).
- 2) Citing appropriate textual evidence, identify the basic safety issues relating to the aircraft, including but not limited to: aircraft airworthiness, taxiing in wind, operating within the aircraft's approved weight and balance, and airspeed limitations.

Careers in Aviation

- 3) Citing labor and workforce data from public sources such as the United States Bureau of Labor Statistics, research the wide range of career pathways available in aviation today. Create a graphic illustration of major occupations within each pathway, including but not limited to: pilots, airframe and powerplant mechanics (A&P), aeromechanical engineers, aircraft salespersons, airport operators, airline statisticians, air traffic controllers (ATC), and flight service specialists (FSS).
- 4) Citing supporting evidence from textbooks, industry magazines, and professional journals, summarize the essential knowledge and skills required for careers in aviation, and describe important aptitudes for success in these careers, such as mechanical, verbal, scientific, manipulative, numerical, administrative, social, and artistic. Complete one or more career

aptitude surveys, analyze the results, and discuss how they might inform career decisions in various aviation pathways.

- 5) Investigate regulatory agencies, governing bodies, and professional organizations related to the aviation industry, such as the Federal Aviation Administration (FAA), National Transportation Safety Board (NTSB), and National Aeronautics and Space Administration (NASA). Gather information from their websites and available publications to produce a coherent explanation of their functions, jurisdictions, and importance within the industry.

History of Aviation

- 6) Synthesize course readings to create an illustrated timeline of historical milestones in the development of flight. Describe the major obstacles that were overcome to achieve controlled, sustained, and powered heavier-than-air flight.
- 7) Research major contributors to the field of aviation, including scientists, inventors, pilots, and other historical figures, and determine what each person contributed. Discuss their impact on both the development of flight as well as the industry as a whole.

Aircraft Structures

- 8) Explain the specific functions of various aircraft structures. For example, be able to understand and communicate the purpose for the aircraft's wings, tail, cabin, and other structures. Incorporate relevant design and mathematics concepts as appropriate when explaining how specific aircraft structures function. For example, relate how the design of an aircraft's wings leverage the principles of aerodynamics.

Aircraft Overview

- 9) Draw on aviation handbooks and other course materials to outline the specific functions of each aircraft's flight control. Describe the purpose of the aircraft's ailerons, elevators, rudder, and flaps, and explain the effect that each of these controls has on the aircraft's controllability.
- 10) Draw on aviation handbooks and other course materials to describe in a verbal or written format how a typical reciprocating engine is used on a general aviation aircraft. Compare and contrast the advantages and disadvantages of a reciprocating engine versus a turbine engine on a training aircraft.
- 11) In a graphic illustration such as an annotated diagram or electronic presentation, explain the typical application and operation of the basic electrical system, including but not limited to:
 - a. Battery
 - b. Alternator / Generator
 - c. Circuit Breakers
 - d. Master Switch(es)

- 12) Explain how fuel systems operate on a typical aircraft, and cite specific dangers and associated precautions that aircraft personnel should take when inspecting, filling, and draining fuel systems. Given a scenario or diagram assigned by the instructor, demonstrate the ability to identify and describe the characteristics of the fuel system, including but not limited to:
 - a. Fuel tanks
 - b. Fuel selector valves
 - c. Fuel filters and drains

- 13) Explain the typical application and operation of the basic ignition system, including but not limited to:
 - a. Magnetos
 - b. Spark plug wires
 - c. Spark plugs

- 14) Explain the typical application and operation of the basic flight instruments, including but not limited to:
 - a. Airspeed Indicator
 - b. Attitude Indicator
 - c. Altimeter
 - d. Turn Coordinator
 - e. Directional Indicator
 - f. Vertical Speed Indicator

- 15) Explain the typical application and operation of the basic engine instruments, including but not limited to:
 - a. Oil Pressure Gauge
 - b. Oil Temperature Gauge
 - c. Cylinder Head Gauge

- 16) Explain the typical application and operation of the basic communication and navigation radios and instrumentation, including but not limited to:
 - a. Comm # 1
 - b. Comm # 2
 - c. Nav # 1
 - d. Nav # 2

Flight Environment

- 17) Research and develop illustrative models that compare and contrast characteristics of the two basic types of airspace:
 - a. Controlled
 - b. Uncontrolled

- 18) Consult FAA guidelines to synthesize understanding of air traffic control (ATC) procedures related to visual flight rules (VFR) and instrument flight rules (IFR) operations. Explain the circumstances and conditions of operation regarding:

- a. Airport operations
 - b. Local area procedures
- 19) Cite textual evidence from course materials and industry guidelines to explain the importance of meteorological knowledge among aviation professionals. Outline key concepts and terminology for the following:
- a. Basic weather theory
 - b. VFR Minimums
 - c. IFR Minimums

Basic Procedures

- 20) Under normal conditions, determine adequate benchmarks surrounding the basic aspects of pre-flight, such as:
- a. Pilot's mental and physical health
 - b. Airworthiness of aircraft
 - c. Weather
 - d. Weight and balance
 - e. Fuel requirements
 - f. Departure and destination airport conditions
- Accurately assess basic situations and conditions in order to make a go/no go decision.
- 21) Explain and demonstrate in a mock situation or drill (including but not necessarily involving a digital flight simulator) the following basic procedures:
- a. Pre-flight inspection
 - b. Starting the engine
 - c. Taxiing technique(s)
 - d. Takeoffs
 - e. Fundamentals of flight
 - f. Airport traffic patterns
 - g. Wake turbulence
 - h. Collision avoidance techniques
 - i. Landings
- 22) Under normal conditions, determine adequate benchmarks surrounding the basic aspects of in-flight actions, such as:
- a. Changes in pilot's mental and physical health
 - b. Actual wind and weather conditions
 - c. Fuel reserve
 - d. Destination and alternate airport conditions
- Accurately assess current conditions in order to evaluate a decision to return to departure airport, land at an enroute airport, or continue to destination.
- 23) Under normal conditions, determine adequate benchmarks surrounding the basic aspects of post-flight actions, such as:
- a. Post flight aircraft inspection to determine airworthiness of aircraft
 - b. Evaluation of forecast versus actual weather encountered

c. Comparison of estimated fuel requirements versus actual fuel consumption
Accurately assess basic situations and conditions experienced in order to make better future go/no go decisions.

Basic Navigation

24) Explain how basic Pilotage and Dead Reckoning (DR) techniques work, and recognize when they are appropriate. Describe how pilots use such techniques in order to fly from one point or location to another , drawing on textbooks and other course materials to provide accurate analyses of different flight situations.

Judgment Training

25) Explore techniques for improving pilot judgment and decision-making skills. Develop an original mock scenario in which a pilot must react to an in-flight complication or malfunction. Outline a strategy or how-to guide for remaining calm under pressure, maintaining lines of communication, and making sound decisions.

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills [Framework for 21st Century Learning](#)
 - o Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.