

## Introduction to Aviation and Aerospace

**Level:** 1

**Career Cluster:** Advanced Manufacturing

**Program:** Engineering

**Pathway:** Aerospace Engineering Technician, Engineering Applications - UAS

### Course Catalog Description

Introduces students to aviation and aerospace career pathways, systems, and the role of flight in society. Students explore aerodynamics, aircraft systems, weather, navigation, safety, and space exploration.

### Summary

This course introduces students to the aviation and aerospace industry through the study of career pathways, foundational systems, and the role of flight in modern society. Students examine the history of aviation and space exploration while building an understanding of aerodynamics, aircraft structures, propulsion systems, and the engineering concepts that make flight possible. The course also explores the flight environment, including atmosphere, weather, hazards, airports, airspace, navigation, and flight planning, with an emphasis on how these factors affect safety and operations. Students analyze human factors, risk management, and the ethical, legal, and professional responsibilities connected to aviation and aerospace careers. In addition, students investigate postsecondary opportunities in Colorado and evaluate how aviation and aerospace technologies influence transportation, infrastructure, and global connectivity. Through introductory design, analysis, and communication activities, students apply what they learn to aviation and aerospace problems and begin developing technical and career-ready skills.

### Notes

The updated course reflects a shift from a primarily content-focused overview of aviation topics to a more comprehensive, structured, and industry-aligned CTE program. While the original course emphasized foundational knowledge such as aerodynamics, aircraft systems, navigation, weather, and basic aviation concepts, the revised course expands these areas into clearly defined learning strands with measurable outcomes and stronger emphasis on analysis, application, and systems thinking. Additionally, the updated version integrates career exploration, leadership, work-based learning, and multiple opportunities for culminating design and assessment projects, along with a stronger focus on human factors, safety, and real-world aviation operations. These changes improve alignment with current CTE expectations by emphasizing career readiness, technical communication, and applied engineering practices while maintaining core aviation content.

## Student Learning Outcomes

### 1. Career Exploration and Postsecondary Opportunities

**Objective:** *Students will explore and analyze career pathways related to aerospace engineering technician by examining professional roles, tools, work environments, ethical and legal responsibilities, certifications, professional organizations, and Colorado postsecondary education options in order to make informed academic and career decisions*

- 1) Identify employment opportunities in various fields with a focus in the area of aerospace engineering technician
  - a. Recognize the work typically performed, tools and technology used, and nature of work environments
  - b. Identify potential certifications within the careers
  - c. Find membership organizations associated with the careers
  - d. Understand the necessary education associated within the careers
- 2) Define professionalism within the context of aerospace engineering technician
  - a. Criticism and evaluation
  - b. Presentation
  - c. Assessment
- 3) Recognize laws, regulations, and ethics significant to the fields of aerospace engineering technician
- 4) Identify postsecondary opportunities offered in the state of Colorado
  - a. Technical college, community college, 4-year institutions
  - b. Certificates, associates, bachelor, and advanced degree opportunities

### 2. Foundations of Aviation and Aerospace Systems

**Objective:** *Students will understand and analyze the aviation and aerospace industry and evaluate the role of flight systems in society.*

- 5) Define aviation, aeronautics, and astronautics.
- 6) Describe major sectors of the aviation and aerospace industry.
- 7) Explain how aviation systems influence transportation and global connectivity.
- 8) Analyze the impact of aerospace technologies on society and the economy.
- 9) Evaluate how aviation and space systems support modern infrastructure.

### 2. History of Aviation and Space Exploration

**Objective:** *Students will analyze historical developments and evaluate their impact on modern aviation and aerospace systems.*

- 10) Identify key events in the history of flight.
- 11) Describe milestones in aviation and space exploration.
- 12) Analyze how technological advancements influenced flight.
- 13) Compare early flight systems to modern aircraft and spacecraft.
- 14) Evaluate the significance of major aerospace innovations.

### 3. Principles of Flight and Aerodynamics

**Objective:** Students will apply and analyze aerodynamic principles to explain how aircraft achieve and maintain flight.

- 15) Define lift, drag, thrust, and weight.
- 16) Explain how aerodynamic forces interact during flight.
- 17) Describe how airfoils generate lift.
- 18) Analyze factors affecting flight performance.
- 19) Apply aerodynamic principles to predict flight behavior.

### 4. Aircraft Structures and Design

**Objective:** Students will examine and evaluate aircraft components and design considerations.

- 20) Identify major aircraft components and structures.
- 21) Describe the function of wings, fuselage, and control surfaces.
- 22) Analyze how design influences performance and safety.
- 23) Compare different aircraft configurations.
- 24) Evaluate the relationship between structure and function.

### 5. Aircraft Propulsion and Engines

**Objective:** Students will analyze and compare propulsion systems used in aviation and aerospace.

- 25) Describe how aircraft engines produce thrust.
- 26) Differentiate between propeller, jet, and rocket propulsion systems.
- 27) Explain the relationship between fuel, airflow, and propulsion.
- 28) Analyze engine performance and efficiency factors.
- 29) Evaluate propulsion systems for different applications.

### 6. Flight Environment and Atmosphere

**Objective:** Students will analyze atmospheric conditions and evaluate their effects on flight operations.

- 30) Describe layers of the atmosphere and their characteristics.
- 31) Explain how air pressure and temperature affect flight.
- 32) Analyze the relationship between altitude and aircraft performance.
- 33) Evaluate environmental factors that influence flight conditions.
- 34) Predict how atmospheric changes impact aircraft operations.

### 7. Aviation Weather and Hazards

**Objective:** Students will interpret weather information and evaluate its impact on aviation safety.

- 35) Identify common weather patterns affecting aviation.
- 36) Explain the formation of clouds, storms, and wind systems.
- 37) Interpret basic weather charts and forecasts.

- 38) Analyze weather hazards such as turbulence, icing, and storms.
- 39) Evaluate how weather conditions affect flight decisions.

## 8. Airports, Airspace, and Flight Operations

**Objective:** Students will analyze airport systems and airspace and evaluate how they support safe flight operations.

- 40) Describe the layout and function of airports.
- 41) Identify different types of airspace and their regulations.
- 42) Explain the role of air traffic control systems.
- 43) Analyze how airport operations ensure safety and efficiency.
- 44) Evaluate procedures used in managing air traffic.

## 9. Navigation and Flight Planning

**Objective:** Students will apply navigation principles and evaluate flight planning strategies.

- 45) Identify basic navigation tools and methods.
- 46) Explain concepts such as heading, altitude, and distance.
- 47) Apply navigation techniques to plan routes.
- 48) Analyze the role of technology in modern navigation systems.
- 49) Evaluate factors influencing flight planning decisions. [

## 10. Human Factors and Safety in Aviation

**Objective:** Students will analyze human performance factors and evaluate their role in aviation safety.

- 50) Describe how human factors affect flight operations.
- 51) Explain the impact of fatigue, stress, and environment on performance.
- 52) Analyze safety procedures and risk management strategies.
- 53) Evaluate accident case studies to determine causes.
- 54) Recommend strategies to improve aviation safety.

## 11. Space Flight and Aerospace Exploration

**Objective:** Students will understand and analyze principles of space flight and evaluate space exploration technologies.

- 55) Describe the basics of manned and unmanned space flight.
- 56) Explain how rockets operate using propulsion principles.
- 57) Analyze challenges associated with space travel.
- 58) Evaluate the impact of space exploration on technology and society.
- 59) Compare aviation and space systems.

## 12. Final Assessment Project

**Objective:** Students will apply engineering concepts to design, test, and communicate aviation or aerospace solutions.

- 60) Apply engineering design processes to solve aviation-related problems.
- 61) Design a model or concept for an aircraft or aerospace system.
- 62) Construct or simulate a prototype or design solution.
- 63) Evaluate design performance using testing or analysis.
- 64) Present and defend engineering solutions using technical communication.
- 65) Reflect on design decisions and engineering processes.

### 13. Leadership

**Objective:** *Students will develop leadership, collaboration, and professional skills through communication, teamwork, and participation in career and technical student organization activities.*

- 66) Demonstrate effective communication and collaboration skills in individual and team settings.
- 67) Apply leadership strategies to support group goals, decision-making, and project management.
- 68) Participate in CTSO or other leadership development activities connected to the program area.
- 69) Demonstrate professionalism, responsibility, and ethical behavior in academic and career contexts.
- 70) Reflect on leadership growth and identify areas for continued development.

### 14. Work-Based Learning

**Objective:** *Students will connect classroom learning to industry expectations through workplace experiences, career preparation activities, and reflection on employability skills.*

- 71) Explore workplace roles, expectations, and career pathways related to aviation and aerospace.
- 72) Demonstrate employability skills such as punctuality, communication, teamwork, and problem-solving.
- 73) Engage in work-based learning experiences such as industry guest speakers, job shadows, site visits, workplace tasks.
- 74) Analyze how classroom knowledge and technical skills apply in workplace settings.
- 75) Reflect on work-based learning experiences to evaluate personal strengths, interests, and career goals.

### 15. Final Assessment Project

**Objective:** *Students will synthesize course knowledge and technical skills to complete and present a culminating aviation or aerospace project.*

- 76) Apply course concepts and technical skills to complete a comprehensive aviation or aerospace project.
- 77) Plan, develop, and revise a project based on defined goals, criteria, and feedback.
- 78) Demonstrate problem-solving, creativity, and technical accuracy in the final product.
- 79) Present the completed project using appropriate technical vocabulary and communication

strategies.

80) Evaluate project outcomes and reflect on learning, growth, and future applications.

## 16. Career and Technical Student Organizations

**Objective:** *Using the CTSO Resource Document, chapter activities will provide some of the best opportunities CTSO members will have to learn by doing. A successful program of work creates a positive learning atmosphere in the classroom. CTSO members learn how to accept responsibility, work as a team, manage a budget, and handle success and failure. Per the CTE Admin Handbook, CTSOs are embedded into curriculum.*

### Professional Development

Prepare each member for entry into the workforce and provide a foundation for success in a career. Becoming a professional does not stop with acquiring a skill, but involves an increased awareness of the meaning of good citizenship and the importance of labor and management in the world of work.

### Community Service

Promote and improve goodwill and understanding among all segments of the community through services donated by CTSO chapters, and to instill in its members a lifetime commitment to community service.

### Business and Industry Connections

Increase awareness of quality job practices and attitudes, and increase the opportunities for employer engagement and eventual employment.

### Financial Leadership

Plan and participate in activities to allow all members to carry out the chapter's projects. Educate members on their own personal finance for current and future success.

### Public Relations

Make the general public aware of the good work that students in career and technical education are doing to better themselves and their community, state, nation, and world.

### Social Activities

To increase cooperation in the school and community through activities that allow CTSO members to get to know each other in something other than a business or classroom setting.

## Academic Standards Alignment

Colorado CTE courses are required to integrate academic and essential skills into course content. The following academic standards have been identified as aligned to this course and should be integrated throughout instruction.

[CO CTE Academic Standards Resources](#) (Rubrics, integration strategies, etc)

[CDE Colorado Academic Standards Online](#) (Online standards lookup tool)

*Note: Mathematics and Science standards will be added in the future. Visit the [Colorado Academic Standards](#) page for the most current version.*

## Reading, Writing and Communicating Crosswalk

Course: Introduction to Aviation Aerospace

Colorado Academic Standards – Reading, Writing and Communicating

| Standard                                  | Prepared Graduate Competency             | Description                                                                    | Course Evidence / Alignment                                                                                                                                                                                                                              |
|-------------------------------------------|------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard 1: Oral Expression and Listening | Prepared Graduate 1 – Collaboration      | Collaborate effectively as group members or leaders.                           | Students participate in collaborative class discussions about aviation systems and careers, work together on exploratory activities and introductory investigations, and listen actively while contributing ideas during foundational aviation learning. |
| Standard 1: Oral Expression and Listening | Prepared Graduate 2 – Oral Presentations | Deliver effective oral presentations for varied audiences and varied purposes. | Students orally explain basic aviation and aerospace concepts, present findings from introductory research on aviation careers, and share summaries of learned content with peers and instructors.                                                       |

|                                      |                                             |                                                                               |                                                                                                                                                                                                                                |
|--------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard 2: Reading for All Purposes | Prepared Graduate 4 – Informational Texts   | Read a wide range of informational texts to build knowledge.                  | Students read and interpret informational texts related to aviation history and aerospace systems, technical explanations of aircraft and navigation, and career-focused materials outlining roles, training, and pathways.    |
| Standard 2: Reading for All Purposes | Prepared Graduate 5 – Language in Context   | Understand how language functions in different contexts.                      | The course introduces foundational aviation and aerospace vocabulary, discipline-specific terminology used across technical, historical, and career contexts, and strategies for understanding unfamiliar technical terms.     |
| Standard 3: Writing and Composition  | Prepared Graduate 7 – Informational Writing | Craft informational/explanatory texts using techniques specific to the genre. | Students write brief explanatory summaries of aviation concepts, produce informational writing related to aircraft systems and careers, and organize information clearly to demonstrate understanding of introductory content. |

|                                         |                                            |                                                                                               |                                                                                                                                                                                                                                     |
|-----------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard 3: Writing and Composition     | Prepared Graduate 9 – Writing Process      | Demonstrate mastery of their own writing process.                                             | At an introductory level, students plan, draft, and revise short written explanations and reflections, focus on clarity and appropriate technical vocabulary, and produce polished written products aligned to course expectations. |
| Standard 4: Research Inquiry and Design | Prepared Graduate 10 – Research and Ethics | Gather information from a variety of sources; analyze and evaluate its quality and relevance. | Students research aviation and aerospace career options, gather information about training, certification, and industry expectations, and use sources ethically to report findings and compare career pathways.                     |

## Free Resource Links

### 1. Career Exploration and Postsecondary Opportunities

- CareerOneStop (career exploration certifications salary education pathways)  
[www.careeronestop.org](http://www.careeronestop.org)
- O\*NET Online (career profiles tools workplace skills job expectations)  
[www.onetonline.org](http://www.onetonline.org)
- Bureau of Labor Statistics Occupational Outlook Handbook (job outlook education pathways salary data)  
[www.bls.gov/ooh](http://www.bls.gov/ooh)
- Colorado Community College System (Colorado programs degrees certificates pathways)  
[www.cccs.edu](http://www.cccs.edu)

### 2. Foundations of Aviation and Aerospace Systems

- NASA STEM (aerospace systems engineering applications innovation)  
[www.nasa.gov/stem](http://www.nasa.gov/stem)
- MIT Open Learning (engineering systems aerospace fundamentals design concepts)  
[openlearning.mit.edu](http://openlearning.mit.edu)
- FAA Aviation Education (aviation fundamentals systems safety operations)  
[www.faa.gov/education](http://www.faa.gov/education)
- Aerospace Engineering Learning (aerodynamics propulsion systems fundamentals)  
[www.infobooks.org/free-pdf-books/engineering/aeronautical-engineering](http://www.infobooks.org/free-pdf-books/engineering/aeronautical-engineering)

### 3. History of Aviation and Space Exploration

- Smithsonian Air and Space Museum (history of flight aerospace milestones)  
[airandspace.si.edu](http://airandspace.si.edu)
- NASA History Office (space missions aviation milestones exploration timeline)  
[history.nasa.gov](http://history.nasa.gov)
- FAA History (aviation development innovation milestones)  
[www.faa.gov/about/history](http://www.faa.gov/about/history)
- National Geographic Space (aerospace exploration history technology impacts)  
[www.nationalgeographic.com/space](http://www.nationalgeographic.com/space)

### 4. Principles of Flight and Aerodynamics

- NASA Aeronautics (lift drag thrust weight flight principles)  
[www.nasa.gov/aeronautics](http://www.nasa.gov/aeronautics)
- PhET Simulations (forces motion aerodynamics interactive models)  
[phet.colorado.edu](http://phet.colorado.edu)
- CK 12 Physics Concepts (forces motion energy flight principles)  
[www.ck12.org](http://www.ck12.org)
- Aviation Theory (aerodynamic principles flight explanations)  
[aviationtheory.org](http://aviationtheory.org)

## 5. Aircraft Structures and Design

- Smithsonian Aircraft Collection (aircraft parts structure design)  
[airandspace.si.edu/collections](http://airandspace.si.edu/collections)
- NASA Aircraft Design (aircraft engineering structural design concepts)  
[www.nasa.gov/aeronautics/research/aircraft-design](http://www.nasa.gov/aeronautics/research/aircraft-design)
- Aerospace Engineering Guide (aircraft structures design materials systems)  
[fiveable.me/introduction-aerospace-engineering](http://fiveable.me/introduction-aerospace-engineering)
- Engineering Explained (aircraft design performance real world systems)  
[www.engineeringexplained.com](http://www.engineeringexplained.com)

## 6. Aircraft Propulsion and Engines

- NASA Propulsion (jet engines rockets thrust generation systems)  
[www.grc.nasa.gov/www/k-12/airplane/propulsion.html](http://www.grc.nasa.gov/www/k-12/airplane/propulsion.html)
- MIT Aerospace Programs (propulsion systems energy efficiency design)  
[micromasters.mit.edu/pom](http://micromasters.mit.edu/pom)
- FAA Resources (engine systems aviation operations fundamentals)  
[www.faa.gov](http://www.faa.gov)
- All About Circuits (energy systems electronics propulsion basics)  
[www.allaboutcircuits.com](http://www.allaboutcircuits.com)

## 7. Flight Environment and Atmosphere

- NOAA Education (atmosphere weather climate aviation impacts)  
[www.noaa.gov/education](http://www.noaa.gov/education)
- NASA Climate (atmosphere layers pressure temperature systems)  
[climate.nasa.gov](http://climate.nasa.gov)
- National Weather Service (atmospheric systems aviation weather understanding)  
[www.weather.gov](http://www.weather.gov)
- CK 12 Earth Science (atmospheric science environmental systems)  
[www.ck12.org](http://www.ck12.org)

## 8. Aviation Weather and Hazards

- Aviation Weather Center (weather charts hazards aviation safety)  
[aviationweather.gov](http://aviationweather.gov)
- FAA Weather Safety (weather impacts flight operations risk awareness)  
[www.faa.gov/pilots/safety](http://www.faa.gov/pilots/safety)
- NOAA Weather Resources (storms wind hazards atmospheric systems)  
[www.noaa.gov/weather](http://www.noaa.gov/weather)
- NASA Weather Education (weather science atmospheric patterns aviation impacts)  
[www.nasa.gov](http://www.nasa.gov)

## 9. Airports Airspace and Flight Operations

- FAA Airspace Resources (airspace classifications airport operations regulations)  
[www.faa.gov/air\\_traffic/publications](http://www.faa.gov/air_traffic/publications)
- Air Traffic Control Overview (ATC systems communication safety operations)  
[www.faa.gov/air\\_traffic](http://www.faa.gov/air_traffic)

- Airport Cooperative Research Program (airport systems design operations efficiency)  
[www.trb.org/acrp](http://www.trb.org/acrp)
- National Airspace System Overview (flight operations systems structure safety)  
[www.faa.gov/about/office\\_org/headquarters\\_offices/ato/service\\_units/systemops/nas](http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/nas)

## 10. Navigation and Flight Planning

- FAA Aeronautical Navigation (flight planning charts navigation systems)  
[www.faa.gov/air\\_traffic/flight\\_info/aeronav](http://www.faa.gov/air_traffic/flight_info/aeronav)
- SkyVector Charts (flight planning mapping route design tools)  
[skyvector.com](http://skyvector.com)
- NASA Navigation Systems (satellite navigation positioning flight guidance)  
[www.nasa.gov](http://www.nasa.gov)
- Aviation Navigation Guide (navigation techniques dead reckoning GPS basics)  
[www.e3aviationassociation.com](http://www.e3aviationassociation.com)

## 11. Human Factors and Safety in Aviation

- FAA Human Factors (pilot performance fatigue safety management)  
[www.faa.gov/pilots/safety](http://www.faa.gov/pilots/safety)
- NASA Human Integration (human performance aerospace systems)  
[www.nasa.gov/hrp](http://www.nasa.gov/hrp)
- Flight Safety Foundation (aviation safety research risk analysis)  
[flightsafety.org](http://flightsafety.org)
- CDC NIOSH (workplace safety human performance risk factors)  
[www.cdc.gov/niosh](http://www.cdc.gov/niosh)

## 12. Space Flight and Aerospace Exploration

- NASA Exploration (space missions spacecraft rockets exploration technology)  
[www.nasa.gov/exploration](http://www.nasa.gov/exploration)
- Space Foundation (space industry programs education resources)  
[www.spacefoundation.org](http://www.spacefoundation.org)
- European Space Agency Education (space missions international programs)  
[www.esa.int/Education](http://www.esa.int/Education)
- Aerospace Engineering Learning (space systems propulsion orbit fundamentals)  
[fiveable.me/introduction-aerospace-engineering](http://fiveable.me/introduction-aerospace-engineering)

## 13. Leadership

- NCC-CTSO (CTSO leadership career readiness student organizations)  
[www.ctsos.org](http://www.ctsos.org)
- OER Commons Know Your CTSO (leadership teamwork communication student reflection)  
[oercommons.org/courseware/lesson/105738/overview](http://oercommons.org/courseware/lesson/105738/overview)
- CTSO Chapter Resources (officer training meetings event planning leadership skills)  
[sites.google.com/teachliketed.org/resources/CTSOChapterResources](http://sites.google.com/teachliketed.org/resources/CTSOChapterResources)
- Colorado Young Leaders (service leadership public speaking community engagement)  
[coloradoyoungleaders.org/schools](http://coloradoyoungleaders.org/schools)

## 14. Work-Based Learning

- SkillsUSA Work-Based Learning (career readiness workplace skills industry exposure)  
[www.skillsusa.org/students/work-based-learning](http://www.skillsusa.org/students/work-based-learning)
- CareerOneStop Outreach Materials (career exploration job search employability resources)  
[www.careeronestop.org/Outreach/outreach-materials.aspx](http://www.careeronestop.org/Outreach/outreach-materials.aspx)
- NAF Work-Based Learning Experiences (mentorship internships career preparation)  
[naf.org/news\\_articles/work-based-learning-experiences-for-high-school-students](http://naf.org/news_articles/work-based-learning-experiences-for-high-school-students)
- Career Readiness Education Framework (career development workplace readiness reflection)  
[learning.teachforall.org/sites/default/files/2025-04/CareerReadinessEducationFramework\\_Apr2025.pdf](http://learning.teachforall.org/sites/default/files/2025-04/CareerReadinessEducationFramework_Apr2025.pdf)

## 15. Final Assessment Project

- NASA STEMonstrations Engineering Design Process (design challenges prototyping testing reflection)  
[www.nasa.gov/wp-content/uploads/2022/07/engineering\\_design\\_process\\_classroom\\_connections\\_508.pdf](http://www.nasa.gov/wp-content/uploads/2022/07/engineering_design_process_classroom_connections_508.pdf)
- NASA Engineering Design Process Worksheet (problem solving criteria constraints presentation)  
[www.nasa.gov/wp-content/uploads/2021/07/the\\_engineering\\_design\\_process\\_worksheet.pdf](http://www.nasa.gov/wp-content/uploads/2021/07/the_engineering_design_process_worksheet.pdf)
- OER Commons Engineering Design Process PowerPoint (design cycle prototype evaluation presentation)  
[oercommons.org/authoring/52647-engineering-design-process-powerpoint/view](http://oercommons.org/authoring/52647-engineering-design-process-powerpoint/view)
- Slidesgo Engineering Presentation Templates (project presentation visual communication)  
[slidesgo.com/engineering](http://slidesgo.com/engineering)



## Technology Student Association – National Competitive Events

### Flight Endurance

**Objective:** *Students will design, build, test, document, and fly a rubber-band-powered model aircraft that meets TSA Flight Endurance requirements for construction, inspection, documentation, and flight performance.*

- Research model aircraft design, flight technology, aerodynamics, propulsion, and stability principles.
- Design and construct a model aircraft that meets TSA requirements for wingspan, chord, fuselage length, propeller size, weight, wheels, landing gear, and rubber motor.
- Create a flight box that safely contains the model and meets TSA size requirements.
- Prepare a documentation portfolio that includes flight logs, trim adjustments, modifications, assembly drawings, and scaled engineered drawings of structural parts.
- Conduct test flights and make trim adjustments to improve flight endurance and landing performance.
- Participate in official flight trials, inspection, and flight-time scoring procedures.
- Evaluate the final aircraft using TSA criteria for flight time, landing bonus, model inspection, flight box, documentation, and technical quality.

### Resources

- Technology Student Association – Flight Endurance competition guidelines  
<https://tsaweb.org/competitions-programs/tsa/themes-problems>
- Academy of Model Aeronautics – Model aircraft and flight resources  
<https://www.modelaircraft.org/>
- National Free Flight Society – Free-flight aircraft resources  
<https://freeflight.org/>
- NASA Glenn Research Center – Beginner’s Guide to Aeronautics  
<https://www1.grc.nasa.gov/beginners-guide-to-aeronautics/>



## Technology Student Association – National Competitive Events

### Drone Challenge (UAV)

**Objective:** *Students will design, build, document, program, test, and present an open-source UAV drone that meets TSA Drone Challenge requirements for safety, flight performance, documentation, and mission completion.*

- Research the annual TSA Drone Challenge specifications, mission requirements, drone safety expectations, and relevant aviation regulations.
- Design or modify an open-source UAV drone that meets TSA requirements for size, motors, propellers, guards, payload, camera, and mission function.
- Assemble and wire drone components, including motors, flight controller, electronic speed controllers, camera, antenna, and related systems.
- Document the UAV through a portfolio that includes photo logs, wiring schematics, programming explanation, engineered drawings, bill of materials, and work log.
- Program and configure the drone for controlled flight, stabilization, and mission-specific operation.
- Complete safety inspection, testing, flight practice, and mission-performance procedures.
- Participate in an interview explaining the drone design, programming, components, aviation safety decisions, and mission performance.

### Resources

- Technology Student Association – Drone Challenge (UAV) competition guidelines  
<https://tsaweb.org/competitions-programs/tsa/themes-problems>
- Federal Aviation Administration – Drone safety and regulations  
<https://www.faa.gov/uas>
- ArduPilot Documentation – Open-source autopilot software  
<https://ardupilot.org/>
- PX4 Autopilot User Guide  
<https://docs.px4.io/>



## Technology Student Association – National Competitive Events

### Geospatial Technology

**Objective:** Students will collect, analyze, map, synthesize, and defend geospatial data in response to the annual TSA Geospatial Technology challenge.

- Research the annual TSA Geospatial Technology challenge and identify the geographic issue or prediction being investigated.
- Collect geospatial data such as imagery, boundaries, transportation data, earth observations, demographics, historical maps, or basemaps.
- Use an online mapping platform to represent and analyze geospatial data.
- Prepare a digital documentation portfolio explaining the challenge, collected data, analysis maps, prediction, resources, and work log.
- Create a visual infographic map that communicates the predicted outcome and clearly supports it with data.
- Present and defend the team's prediction during the semifinal presentation/interview.
- Evaluate the final entry using TSA criteria for data use, prediction quality, visual communication, analysis, creativity, and presentation.

### Resources

- Technology Student Association – Geospatial Technology competition guidelines  
<https://tsaweb.org/competitions-programs/tsa/themes-problems>
- ArcGIS Online – Mapping and geospatial analysis tools  
<https://www.arcgis.com/>
- National Geospatial-Intelligence Agency – Geospatial resources  
<https://www.nga.mil/>
- NASA Earthdata – Earth observation and geospatial data  
<https://www.earthdata.nasa.gov/>