

Avionic Wiring - AES

Level: 2

Career Cluster: Advanced Manufacturing and Transportation, Distribution & Logistics

Program: Engineering

Pathway(s): Aerospace Engineering Technician

Course Catalog Description

Introduces students to aerospace and aircraft wiring systems, electrical fundamentals, safety, and fabrication techniques. Students build skills in installation, inspection, troubleshooting, and technical documentation used in aerospace manufacturing, maintenance, and avionics work.

Summary

Prepares students for continued study and entry-level work in aerospace, aviation maintenance, and aerospace engineering technician pathways by developing the knowledge and skills needed to build, inspect, install, and troubleshoot aircraft wiring systems. Students explore aerospace career opportunities, workplace expectations, professionalism, safety practices, and postsecondary options in Colorado while learning foundational electrical concepts such as voltage, current, resistance, continuity, and the use of electrical measuring tools. Throughout the course, students identify and select aircraft wires and cables, apply proper preparation and fabrication techniques including cutting, stripping, crimping, soldering, and wire bundling, and construct wiring harnesses and connector systems using accepted aerospace and aviation industry practices. Students also practice routing and securing wiring to prevent chafing, strain, and interference, analyze electrical load and system performance, interpret diagrams and schematics, document technical work clearly, and use systematic troubleshooting methods to isolate and correct faults. Emphasis is placed on quality workmanship, standards, aerospace reliability, and safe aircraft operation, culminating in a project in which students design, fabricate, test, troubleshoot, and present a completed avionic wiring assembly for an aerospace application.

Notes

The updated course reflects a shift from a primarily technical, task-based wiring course to a more comprehensive, industry-aligned aerospace systems program. The original course focused largely on basic electrical concepts, wiring procedures, and component handling with an emphasis on isolated technical skills. In contrast, the revised course expands these fundamentals into a structured framework that emphasizes system-level understanding, quality workmanship, safety, and integration of wiring within aircraft and aerospace systems. Additionally, the updated version places greater emphasis on troubleshooting, technical documentation, electrical load analysis, and real-world installation practices, while incorporating career exploration, leadership, work-based learning, and a culminating project. These changes strengthen alignment with current CTE expectations by highlighting precision, reliability, industry standards, and career readiness in aviation and aerospace contexts while maintaining core wiring competencies.

Student Learning Outcomes

1. Career Exploration and Postsecondary Opportunities

Objective: *Students will analyze career pathways in aerospace engineering, avionics, and aerospace engineering technician fields by exploring industry roles, workplace expectations, required education, certifications, professional organizations, and postsecondary opportunities available in Colorado in order to make informed academic and career decisions.*

- 1) Identify employment opportunities in aviation, aerospace manufacturing, space systems, and aerospace engineering technician fields.
 - 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, ethics, and quality expectations significant to aviation and aerospace industries.
- 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 Avionic Wiring Systems

Objective: *Students will understand and analyze the role of avionic wiring in aircraft and aerospace systems and explain how wiring supports safe and reliable operation.*

- 5) Define avionic wiring and explain its role in aircraft electrical and electronic systems.
- 6) Describe how wiring systems connect aircraft components and support troubleshooting tasks.
- 7) Identify common types of aircraft wires and cables used in avionic systems.
- 8) Explain how avionic wiring differs from general-purpose wiring in non-aviation settings.
- 9) Analyze why proper wiring practices are critical for aircraft reliability and safety.

3. Safety and Shop Practices for Avionic Wiring

Objective: *Students will apply safety concepts and demonstrate proper shop practices when working with aircraft wiring, aerospace electrical components, and mission-critical assemblies.*

- 10) Describe general lab and shop safety rules and procedures for wiring work.
- 11) Explain OSHA's role in workplace safety and why safety standards matter in technical environments.
- 12) Use required personal protective equipment appropriately during wiring and electrical tasks.
- 13) Demonstrate safe procedures for handling tools, test equipment, wires, and components.
- 14) Apply basic rules for working with static discharge and sensitive electronic components.

15) Evaluate how safe work habits reduce mistakes, damage, and hazards in avionic wiring projects.

4. Basic Electricity for Aviation Systems

Objective: *Students will understand and apply foundational electricity concepts to aircraft wiring and electrical maintenance tasks.*

- 16) Define basic electrical concepts such as voltage, current, resistance, and continuity.
- 17) Explain how electricity is used in aviation repair and maintenance tasks.
- 18) Identify electrical measuring instruments and describe their applications.
- 19) Read simple electrical diagrams used in aircraft systems.
- 20) Inspect and check aircraft electrical systems using appropriate procedures and test tools.
- 21) Analyze how voltage and current are controlled in DC generator or alternator systems.

5. Wire and Cable Identification and Selection

Objective: *Students will identify, compare, and select aircraft electrical wires and cables based on use, condition, and installation needs.*

- 22) Identify different types of aircraft electrical wires and cables.
- 23) Describe the characteristics and uses of common aircraft wiring materials.
- 24) Compare wire and cable types based on insulation, flexibility, and application.
- 25) Examine wire condition and determine whether it is acceptable for safe use.
- 26) Select appropriate wire or cable for a given aircraft wiring task based on stated requirements.

6. Wire Preparation and Fabrication Techniques

Objective: *Students will apply wire preparation and fabrication techniques to create safe, functional aircraft wiring assemblies.*

- 27) Demonstrate proper cutting techniques for aircraft wire.
- 28) Demonstrate proper stripping techniques without damaging conductors.
- 29) Crimp connectors using correct tools and procedures.
- 30) Solder electrical connections using safe and appropriate methods.
- 31) Tie and secure wiring bundles using accepted fabrication practices.
- 32) Evaluate workmanship quality in fabricated wire assemblies.

7. Wiring Harnesses and Connector Systems

Objective: *Students will construct and evaluate wiring harnesses and connector assemblies used in avionic systems.*

- 33) Describe the purpose of wiring harnesses in aircraft systems.
- 34) Identify common connector types and their uses in avionics work.
- 35) Assemble simple wiring harnesses using proper routing and terminal methods.
- 36) Inspect harnesses and connectors for quality, fit, and workmanship.
- 37) Repair minor defects in wiring harnesses or connector assemblies using accepted methods.
- 38) Analyze how connector and harness quality affects system reliability.

8. Wiring Installation and Routing Practices

Objective: Students will apply installation standards to route and secure aircraft wiring safely and effectively.

- 39) Explain the importance of wire segregation in aircraft installation.
- 40) Demonstrate proper tie-wrapping and wire-bundle securing methods.
- 41) Identify areas where chafing may occur and propose prevention methods.
- 42) Install wiring in a way that protects against strain, abrasion, and interference.
- 43) Analyze installation issues that could reduce safety or performance in aircraft systems.
- 44) Evaluate completed wiring installations for neatness, accessibility, and compliance with stated standards.

9. Electrical Loading, Power, and System Checks

Objective: Students will analyze aircraft electrical performance and apply procedures related to generators, alternators, and system output.

- 45) Describe how electrical load is managed in aircraft systems.
- 46) Explain how equalization of electrical load is accomplished in systems with two DC generators or alternators.
- 47) Read and record voltage and output for generators or alternators in an operating system.
- 48) Adjust voltage regulators and load equalization in an operating system when directed by procedure.
- 49) Demonstrate flashing of a generator field.
- 50) Check operation of reverse current cutout relays.

10. Troubleshooting and Fault Isolation

Objective: Students will diagnose and troubleshoot avionic wiring and basic electrical faults using systematic methods.

- 51) Describe a step-by-step troubleshooting process for aircraft wiring systems.
- 52) Use electrical test equipment to isolate simple faults in wiring circuits.
- 53) Differentiate between open circuits, shorts, poor connections, and damaged insulation.
- 54) Analyze aircraft wiring faults to determine probable root causes.
- 55) Recommend corrective actions based on test results and observed conditions.
- 56) Evaluate whether a repair resolved the original fault safely and effectively.

11. Technical Diagrams, Documentation, and Communication

Objective: Students will interpret and produce technical information related to avionic wiring systems.

- 57) Interpret basic aircraft electrical diagrams and schematics.
- 58) Describe circuit conditions and repairs using appropriate technical vocabulary.
- 59) Document wiring inspections, repairs, and test results clearly and accurately.
- 60) Prepare simple wiring layouts or connection plans for classroom projects.
- 61) Communicate troubleshooting steps and repair decisions in written or oral form.
- 62) Evaluate technical documentation for completeness and clarity.

12. Standards, Quality, and Workmanship

Objective: *Students will evaluate avionic wiring work according to quality expectations, aerospace standards, and responsible technical practice.*

- 63) Explain why standards and specifications matter in aircraft and aerospace wiring work.
- 64) Inspect completed work for proper routing, secure connections, and workmanship quality.
- 65) Analyze common causes of poor workmanship in fabricated or installed wiring.
- 66) Apply quality checks to ensure projects meet stated requirements.
- 67) Evaluate completed wiring work using a rubric or checklist aligned to safe practice.

13. Final Assessment Project

Objective: *Students will synthesize avionic wiring knowledge and skills to design, fabricate, test, and present a completed wiring project for an aircraft or aerospace application.*

- 68) Plan a wiring project that addresses a defined aircraft, spacecraft-support, or aerospace training scenario.
- 69) Construct a wiring assembly or small system using proper preparation, fabrication, and installation methods.
- 70) Test the completed project for continuity, function, and safe operation.
- 71) Troubleshoot issues discovered during testing and revise the project as needed.
- 72) Present the completed project, methods, and results using appropriate technical language.
- 73) Reflect on design decisions, workmanship quality, and lessons learned.

14. Leadership

Objective: *Students will develop leadership skills that support effective teamwork, ethical decision-making, communication, and responsibility in aerospace and technical work environments.*

- 74) Demonstrate leadership behaviors such as responsibility, initiative, dependability, and accountability during individual and team tasks.
- 75) Apply effective communication and active listening skills when collaborating with classmates, instructors, and industry partners.
- 76) Use problem-solving and decision-making strategies to address challenges and support team goals in technical projects.
- 77) Demonstrate ethical behavior, professionalism, and respect for others in classroom, lab, and workplace settings.

15. Work-Based Learning

Objective: *Students will connect classroom learning to workplace expectations through career preparation experiences, reflection, and application of technical and professional skills in authentic industry contexts.*

- 78) Identify the purpose and value of work-based learning experiences such as job shadows, internships, mentorships, industry projects, and school-based enterprises.
- 79) Demonstrate workplace readiness skills including punctuality, appropriate dress, communication, teamwork, and safe work habits.

- 80) Apply technical knowledge and employability skills in a workplace, project-based, or industry setting related to aerospace or avionics.
- 81) Reflect on work-based learning experiences to evaluate performance, identify areas for growth, and connect learning to future career goals.

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 aerospace, aviation maintenance, and related technical careers. 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 opportunities for employer engagement, mentorship, internships, and eventual employment within aviation, aerospace, and advanced technical industries.

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: Avionic Wiring

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 who listen actively and respectfully; pose thoughtful questions, acknowledge the ideas of others; and contribute ideas to further the group's attainment of an objective.	Work collaboratively to build, inspect, and troubleshoot avionics wiring systems for aircraft and aerospace applications; communicate clearly about procedures, safety practices, and task sequencing; and listen to and apply feedback during lab-based technical work.
Standard 1: Oral Expression and Listening	Prepared Graduate 2 – Oral Presentations	Deliver effective oral presentations for varied audiences and varied purposes.	Verbally explain wiring layouts, system functions, and installation steps; communicate troubleshooting findings and safety concerns; and describe technical work to instructors and peers using

			appropriate industry language.
Standard 2: Reading for All Purposes	Prepared Graduate 4 – Informational Texts	Read a wide range of informational texts to build knowledge and to better understand the human experience.	Read and interpret wiring diagrams, schematics, and industry manuals; use technical specifications and installation standards; and follow safety documentation related to avionics systems.
Standard 2: Reading for All Purposes	Prepared Graduate 5 – Language in Context	Understand how language functions in different contexts, command a variety of word-learning strategies to assist comprehension, and make effective choices for meaning or style when writing and speaking.	Use precise avionics and electrical terminology; interpret symbols, labels, and technical conventions; and adjust language for documentation, explanation, and safety contexts.
Standard 3: Writing and Composition	Prepared Graduate 7 – Informational Writing	Craft informational/explanatory texts using techniques specific to the genre.	Write explanations of wiring processes and system behavior; document installation steps and test results; and create explanatory notes supporting maintenance and troubleshooting.
Standard 3: Writing and Composition	Prepared Graduate 9 – Writing Process	Demonstrate mastery of their own writing process with clear, coherent, and error-free polished products.	Draft, revise, and finalize technical documentation; produce clear, accurate, professional written products; and apply industry expectations for clarity, accuracy, and completeness.

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; and use it ethically to answer complex questions.	Research avionics standards, wiring practices, aerospace component specifications, and industry quality requirements; analyze system requirements and constraints before installation; and use information ethically to support safe, compliant aerospace work.
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Free Resource Links

1. Career Exploration and Postsecondary Opportunities

- O NET Online (aviation aerospace careers job requirements skills)
<https://www.onetonline.org/>
- Aviation Technician Education Council (certifications aviation careers training)
<https://www.atec-amt.org/>
- CareerOneStop (career pathways certifications aviation)
<https://www.careeronestop.org/>
- CDOT Division of Aeronautics (Colorado aviation aerospace education grants careers)
<https://www.codot.gov/programs/aeronautics/programs>

2. Foundations of Avionic Wiring Systems

- FAA Aviation Maintenance Handbook (aircraft wiring systems fundamentals)
https://www.faa.gov/regulations_policies/handbooks_manuals/aviation
- Electronics Tutorials (basic electronics circuits wiring)
<https://www.electronics-tutorials.ws/>
- All About Circuits (circuit fundamentals wiring systems)
<https://www.allaboutcircuits.com/>
- Khan Academy Electrical Engineering (electricity basics systems)
<https://www.khanacademy.org/science/electrical-engineering>

3. Safety and Shop Practices for Avionic Wiring

- OSHA (workplace safety electrical standards)
<https://www.osha.gov/>
- FAA Safety Briefing (aviation safety procedures practices)
<https://www.faa.gov/newsroom/safety-briefing>
- CDC Workplace Safety (safety procedures hazard prevention)
<https://www.cdc.gov/niosh/>
- Tool Box Talks (shop safety techniques procedures)
<https://www.toolbox-talks.com/>

4. Basic Electricity for Aviation Systems

- Khan Academy Electrical Engineering (voltage current resistance)
<https://www.khanacademy.org/science/electrical-engineering>
- SparkFun Learn (circuits electronics fundamentals)
<https://learn.sparkfun.com/>
- HyperPhysics Electricity (electrical theory explanations)
<http://hyperphysics.phy-astr.gsu.edu/>
- Electronics Club (electrical basics components circuits)
<https://electronicsclub.info/>

5. Wire and Cable Identification and Selection

- Aircraft Spruce (aviation wiring materials specifications)
<https://www.aircraftspruce.com/>
- FAA Advisory Circulars (wire selection standards aviation)
https://www.faa.gov/regulations_policies/advisory_circulars/
- Engineering Toolbox (wire types properties materials)
<https://www.engineeringtoolbox.com/>
- Mouser Electronics Resources (components wire specifications)
<https://www.mouser.com/>

6. Wire Preparation and Fabrication Techniques

- NASA Workmanship Standards (wire fabrication soldering crimping)
<https://workmanship.nasa.gov/>
- IPC Training Resources (soldering electronics assembly skills)
<https://www.ipc.org/>
- Digi Key Tutorials (wire preparation electronics techniques)
<https://www.digikey.com/en/resources>
- EEVblog Tutorials (electronics soldering wiring techniques)
<https://www.eevblog.com/>

7. Wiring Harnesses and Connector Systems

- Molex Connector Guide (connectors wiring harness design)
<https://www.molex.com/>
- TE Connectivity (connectors systems aerospace wiring)
<https://www.te.com/>
- Amphenol (connector systems aviation electronics)
<https://www.amphenol.com/>
- Wiring Harness News (harness design installation techniques)
<https://www.wiringharnessnews.com/>

8. Wiring Installation and Routing Practices

- FAA Standard Practices (aircraft wiring installation guidelines)
<https://www.faa.gov/>
- Skybrary Aviation Safety (installation routing safety aviation)
<https://www.skybrary.aero/>
- Aircraft Maintenance Engineers Network (installation practices aviation)
<https://www.amtonline.org/>
- Engineering Toolbox Cable Routing (routing protection design)
<https://www.engineeringtoolbox.com/>

9. Electrical Loading Power and System Checks

- FAA Electrical Systems Guide (aircraft systems generators alternators)
<https://www.faa.gov/>
- All About Circuits Power Systems (electrical load power analysis)
<https://www.allaboutcircuits.com/>

- Electrical4U (power systems voltage generation basics)
<https://www.electrical4u.com/>
- Electronics Tutorials Power (electric power calculations systems)
<https://www.electronics-tutorials.ws/>

10. Troubleshooting and Fault Isolation

- Fluke Education (troubleshooting testing electrical systems)
<https://www.fluke.com/en-us/learn>
- Electronics Tutorials Fault Finding (troubleshooting circuits diagnostics)
<https://www.electronics-tutorials.ws/>
- iFixit (diagnostics repair troubleshooting process)
<https://www.ifixit.com/>
- Khan Academy Circuits (problem solving circuits troubleshooting)
<https://www.khanacademy.org/science/electrical-engineering>

11. Technical Diagrams Documentation and Communication

- All About Circuits Schematics (electrical diagrams symbols)
<https://www.allaboutcircuits.com/>
- Lucidchart (diagram creation technical documentation)
<https://www.lucidchart.com/>
- Purdue OWL Technical Writing (technical communication documentation)
<https://owl.purdue.edu/>
- Autodesk Design Academy (technical drawing documentation CAD)
<https://academy.autodesk.com/>

12. Standards Quality and Workmanship

- NASA Workmanship Standards (quality wiring workmanship inspection)
<https://workmanship.nasa.gov/>
- ISO Standards (quality management technical standards)
<https://www.iso.org/>
- FAA Regulations (aviation standards compliance safety)
https://www.faa.gov/regulations_policies/
- IPC Standards (electronics quality soldering standards)
<https://www.ipc.org/>

13. Final Assessment Project

- Instructables Engineering (project design fabrication ideas)
<https://www.instructables.com/>
- Maker Education Initiative (design thinking project based learning)
<https://makered.org/>
- Autodesk Student Projects (engineering design examples CAD)
<https://www.autodesk.com/education>
- Engineering com Projects (engineering case studies design)
<https://www.engineering.com/>

14. Leadership

- National Coordinating Council for Career and Technical Student Organizations (CTSO leadership employability skills student leadership)
<https://www.ctsos.org/>
- U.S. Department of Labor Teamwork (teamwork collaboration workplace success communication)
<https://www.dol.gov/sites/dolgov/files/odep/topics/youth/softskills/teamwork.pdf>
- Overcoming Obstacles (leadership communication decision making life skills)
<https://www.overcomingobstacles.org/>
- University of Washington Student Leadership Competencies (student leadership competencies reflection community engagement)
https://cele.uw.edu/site/assets/files/1211/guide_to_building_student_leadership_competencies_for_community_based_engagement.pdf

15. Work-Based Learning

- Colorado Workforce Development Council Work-Based Learning (Colorado work-based learning continuum employer partnerships career pathways)
<https://cwdc.colorado.gov/strategies/work-based-learning>
- U.S. Department of Labor Career Preparation and Work-Based Learning Experiences (career readiness job shadow internships employability skills)
<https://www.dol.gov/agencies/odep/program-areas/individuals/youth/career-preparation>
- Youth.gov Career Exploration and Skill Development (career exploration mentoring internships job search skills)
<https://youth.gov/youth-topics/youth-employment/career-exploration-and-skill-development>
- U.S. Bureau of Labor Statistics Student Career Resources (career exploration occupational outlook job training pathways)
<https://www.bls.gov/k12/students/careers/how-can-bls-help-me-explore-careers.htm>



Technology Student Association – National Competitive Events

System Control Technology

Objective: *Students will design, construct, troubleshoot, document, and demonstrate a working control-system solution that responds to a TSA-provided problem.*

- Interpret the TSA-provided control-system problem and identify the required functions, constraints, and performance goals.
- Design a system that uses inputs, outputs, circuits, sensors, motors, controls, or programmable components.
- Construct and test the system using approved materials, tools, electronics, and safety procedures.
- Troubleshoot electrical, mechanical, sensor, programming, or reliability issues to improve system performance.
- Maintain an inventor's log documenting design decisions, testing, revisions, and final system operation.
- Demonstrate the completed system for judges and explain how the design meets the problem criteria.
- Evaluate the system using TSA criteria for functionality, design quality, problem interpretation, documentation, and communication.

Resources

- Technology Student Association – System Control Technology competition guidelines
<https://tsaweb.org/competitions-programs/tsa/themes-problems>
- FAA – Aviation Maintenance Technician Handbook: Airframe
<https://www.faa.gov/regulationspolicies/handbooksmanuals/aviation>
- Arduino Education – Electronics and control systems
<https://www.arduino.cc/education>
- Tinkercad Circuits – Circuit simulation and prototyping
<https://www.tinkercad.com/circuits>



Technology Student Association – National Competitive Events

Technology Problem Solving

Objective: *Students will work as a team to solve an on-site TSA technology challenge by designing, constructing, testing, and evaluating a solution using limited materials, tools, and time.*

- Analyze an on-site TSA problem and identify the required task, constraints, materials, and scoring criteria.
- Collaborate with a partner to plan and construct a working solution within the competition time limit.
- Use approved materials, tools, adhesives, measuring devices, and safety procedures during construction.
- Apply engineering, electronics, and technology concepts to improve the performance of the solution.
- Test the solution using the required objective measure, such as strength, distance, time, accuracy, or task completion.
- Revise the solution based on observed performance and available time.
- Evaluate the final product using TSA criteria for problem solving, construction quality, teamwork, and measurable performance.

Resources

- Technology Student Association – Technology Problem Solving competition guidelines <https://tsaweb.org/competitions-programs/tsa/themes-problems>
- TeachEngineering – Hands-on engineering design challenges <https://www.teachengineering.org/>
- Science Buddies – Engineering Design Process <https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-process-steps>
- OSHA – Young Worker Safety and Health <https://www.osha.gov/young-workers>



Technology Student Association – National Competitive Events

Manufacturing Prototype

Objective: *Students will design, document, fabricate, and present a manufactured prototype that meets TSA Manufacturing Prototype requirements for production quality, technical documentation, materials, and product communication.*

- Research the annual TSA Manufacturing Prototype challenge and identify the product requirements, constraints, and intended audience.
- Develop a prototype concept using sketches, technical drawings, CAD models, schematics, or other design-planning tools.
- Create working drawings, detail drawings, a parts list, and documentation needed to communicate the design.
- Fabricate a prototype using appropriate materials, tools, components, and manufacturing processes.
- Document construction, testing, revisions, strengths, weaknesses, materials, and production decisions in a portfolio.
- Prepare a bill of materials and work log that communicate the manufacturing process.
- Present a sales pitch explaining the product, design decisions, production process, cost considerations, and final prototype.

Resources

- Technology Student Association – Manufacturing Prototype competition guidelines
<https://tsaweb.org/competitions-programs/tsa/themes-problems>
- Autodesk Fusion – CAD/CAM design and manufacturing tools
<https://www.autodesk.com/products/fusion-360/education>
- Onshape Education – Browser-based CAD and product design tools
<https://www.onshape.com/en/education/>
- FAA – Aviation Maintenance Technician Handbook: General
<https://www.faa.gov/regulationspolicies/handbooksmanuals/aviation>