Unmanned Aircraft Systems

8910 36 weeks

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The components of this instructional framework were developed by the following curriculum development panelists:

- Peter J. Bale, Chief Executive Officer, Sentinel Robotics Solutions, Wallops Island
- Mark Blanks, Director, Mid-Atlantic Aviation Partnership, Virginia Tech, Blacksburg
- Chris Carter, Deputy Director, Virginia Space Grant Consortium, Hampton
- Dustin Carter, Instructor, Galax High School, Galax City Public Schools
Correlations to the Virginia Standards of Learning were reviewed and updated by the following:

- Leslie R. Bowers, English Teacher (ret.), Newport News Public Schools
- Vickie L. Inge, Mathematics Committee Member, Virginia Mathematics and Science Coalition
- Anne F. Markwith, New Teacher Mentor (Science), Gloucester County Public Schools
- Michael L. Nagy, Social Studies Department Chair, Rustburg High School, Campbell County Public Schools

The framework was edited and produced by the CTE Resource Center:

- Nathan K. Pope, Writer/Editor
- Kevin P. Reilly, Administrative Coordinator

Virginia Department of Education Staff

Dr. Lynn Basham, Specialist, Technology Education and Related Clusters
Dr. J. Anthony Williams, Curriculum and Instruction Coordinator
Dr. David S. Eshelman, Director, Workforce Development and Initiatives
George R. Willcox, Director, Operations and Accountability

Office of Career, Technical, and Adult Education
Virginia Department of Education

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Course Description

Suggested Grade Level: 10, 11, or 12

Course Description:
Unmanned Aircraft Systems prepares students to fly drones under the Federal Aviation Administration’s (FAA) Part 107 guidelines. Students get an overview of the national airspace system, FAA regulations, and the design and operation of small drones. Students monitor weather, address loading and performance of drones, and coordinate flight operation logistics. They perform administrative tasks, train to fly, and, finally, fly small unmanned aircraft systems (sUAS).

Note: In order to teach the Unmanned Aircraft Systems course and supervise student flying experiences, the teacher must have the FAA Part 107 Remote Pilot Certificate. Students must be 16 to take the certification test and receive the FAA Part 107 Remote Pilot Certificate.

Task Essentials Table

- Tasks/competencies designated by plus icons (+) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (○) are optional
- Tasks/competencies designated by minus icons (●) are omitted
- Tasks marked with an asterisk (*) are sensitive.

<table>
<thead>
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<th>Task/Competency</th>
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<tbody>
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<td><strong>Introducing Unmanned Aircraft Systems</strong></td>
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<td><strong>Defining the National Airspace System</strong></td>
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<tr>
<td>Task/Competency</td>
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<td>-----------------</td>
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<tr>
<td>Secure mission supplies.</td>
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<tr>
<td>Appraise UAS batteries.</td>
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<tr>
<td>Plan to secure operations area.</td>
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</tbody>
</table>

**Flying the sUAS**

<table>
<thead>
<tr>
<th>Task/Competency</th>
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</thead>
<tbody>
<tr>
<td>Define operation objective.</td>
</tr>
<tr>
<td>Assess area of operations.</td>
</tr>
<tr>
<td>Set up flight control area.</td>
</tr>
<tr>
<td>Upload flight plan to aircraft.</td>
</tr>
<tr>
<td>Conduct safety briefing.</td>
</tr>
<tr>
<td>Conduct mission briefing.</td>
</tr>
<tr>
<td>Check for foreign objects and debris (FOD).</td>
</tr>
<tr>
<td>Verify use of personal protective equipment (PPE).</td>
</tr>
<tr>
<td>Communicate with crew and Air Traffic Control (ATC).</td>
</tr>
<tr>
<td>Secure launch and recovery area.</td>
</tr>
<tr>
<td>Launch aircraft.</td>
</tr>
<tr>
<td>Fly the sUAS.</td>
</tr>
<tr>
<td>Maintain visual contact with aircraft.</td>
</tr>
<tr>
<td>Monitor site communications.</td>
</tr>
<tr>
<td>Recover aircraft.</td>
</tr>
<tr>
<td>Conduct a post-flight inspection.</td>
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<tr>
<td>Conduct a post-flight debrief.</td>
</tr>
<tr>
<td>Task/Competency</td>
</tr>
<tr>
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<tr>
<td>103</td>
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</table>

**Coordinating Flight Operations Logistics**

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>104</td>
<td>Develop a schedule for the day of the flight.</td>
</tr>
<tr>
<td>105</td>
<td>Communicate flight schedule.</td>
</tr>
<tr>
<td>106</td>
<td>Coordinate mission-dependent resources.</td>
</tr>
<tr>
<td>107</td>
<td>Schedule mission personnel.</td>
</tr>
</tbody>
</table>

**Maintaining Proficiency in Professional Knowledge and Skills**

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>108</td>
<td>Practice flying sUAS.</td>
</tr>
<tr>
<td>109</td>
<td>Train on flight simulator.</td>
</tr>
</tbody>
</table>

**Performing Administrative Tasks**

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>110</td>
<td>Create proposals and presentations.</td>
</tr>
<tr>
<td>111</td>
<td>File flight reports.</td>
</tr>
<tr>
<td>112</td>
<td>Maintain flight logs.</td>
</tr>
</tbody>
</table>

Legend: ✤Essential ○Non-essential ❌Omitted

**Curriculum Framework**

**Introducing Unmanned Aircraft Systems**
Task Number 39

Describe applications of unmanned aircraft systems (UAS).

Definition
Description should include the following:

• Commercial (e.g., delivery, surveying, photography)
• Research (e.g., environmental monitoring, wildlife tracking)
• Public safety (e.g. search and rescue, fire operations, law enforcement)
• Agriculture (e.g., crop health monitoring, spraying, seeding, surveying)
• Recreation (hobbyists)
• Sporting events (first-person view [FPV])

Process/Skill Questions
• How might a UAS be used by a commercial photographer?
• What is a first-person-view UAS?
• How can a UAS be used by electrical linemen in the course of their work?

Task Number 40

Explain the design of UAS.

Definition
Explanation should include motor configurations such as

• fixed-wing
• multirotor
• vertical takeoff and landing (VTOL).

Process/Skill Questions
• What flight-control systems are used in UAS?
• What are the uses of each of the three UAS motor configurations?
• What is load factor, and how does it affect the wings or rotors?
Task Number 41

Identify elements of UAS.

Definition
Identification should include

- propulsion system (prop, motor, electronic speed control [ESC])
- flight control system (global positioning system [GPS], real-time kinematic positioning [RTK], electronic gyroscope inertial sensing, avoidance sensors, radio for controller, controller, or telemetry system)
- power system (batteries or fuel with control system)
- payload
- unmanned aerial vehicle (air frame).

Process/Skill Questions
- What are the major subsystems of a UAS?
- Which considerations are most relevant to a remote pilot in command (PIC) when evaluating unmanned aircraft performance?
- How often is the PIC expected to inspect the condition and airworthiness of a UAS?
- Which preflight action is specifically required of the pilot for each flight?

Task Number 42

Research careers related to UAS.

Definition
Research should include

- education and training
- available career opportunities.

Process/Skill Questions
- How can a college utilize UAS in the study of coastal erosion?
- How can UAS be used to collect data and to research weather conditions and patterns?
- How many jobs will be available for UAS operators next year?
Task Number 43

Identify milestones in the history of UAS.

Definition
Identification should include

- evolution from government development to commercial enterprise
- evolution of technology.

Process/Skill Questions
- How has smartphone technology been applied to drones?
- Who is credited with developing the first multirotor UAS?
- When did the Federal Aviation Administration (FAA) institute 14 CFR Part 107?
- What government agency was the first to use UAS?

Defining the National Airspace System

Task Number 44

Describe the national airspace system (NAS).

Definition
Description should include

- what agency is responsible for the NAS
- categories of airspace
- regulated and unregulated airspace
- air navigation charts
- airport operations.

Process/Skill Questions
- What is the purpose of a Common Traffic Advisory Frequency (CTAF)?
- Under what conditions, if any, may remote pilots fly through a restricted area?
- What airspace can be flown in without permission or notification?
- What is the height limit above ground level for flying a UAS?
Task Number 45

Use Low Altitude Authorization and Notification Capability (LAANC) to identify controlled airspace.

Definition
LAANC provides pilots with an awareness of where they are allowed to fly and applies to
- drone pilots with access to controlled airspace at or below 400 feet
- air traffic professionals with visibility into where and when drones are operating.

Process/Skill Questions
- On what are the lateral dimensions of Class D airspace based?
- What are the steps to operate a small UAS (sUAS) within a zero grid of a LAANC facility?
- What is the process for obtaining permission to operate an sUAS within a LAANC-enabled airspace?

Task Number 46

Describe waivers.

Definition
Description should include
- when waivers are required
- safety cases
- how to apply for waivers.

Process/Skill Questions
- Why is it important to check FAA information on a regular basis?
- When requesting a waiver, how many days prior to the planned operation must the required documents be presented to the FAA?
- According to 14 CFR Part 107, how may a remote pilot operate an unmanned aircraft within the boundaries of Class C airspace?
- What waiver is required when operating an sUAS at an altitude of 600 feet above ground level (AGL), not within close proximity of a tower or structure?
Exploring Regulations

Task Number 47

Explain the role of the FAA.

Definition
Explanation should include methods used by the FAA to regulate the airspace.

Process/Skill Questions
• Why was the FAA founded?
• Who is responsible for regulating the airspace over the United States and its territories?

Task Number 48

Define a UAS, according to the FAA.

Definition
Definition should include researching current FAA regulations defining UAS.

Process/Skill Questions
• According to 14 CFR Part 107, what is the most a drone can weigh to qualify as an sUAS? What is the minimum weight?
• Under what condition would an sUAS not have to be registered before it is operated in the United States?

Task Number 49

Explain the requirements and process for registering sUAS vehicles with the FAA.

Definition
Explanation should include the following:

• All drones must be registered, except those that weigh .55 pounds or less.
• Registration must be done on the FAA website.
• One must be 13 years old or older and a US citizen to register a drone.

Teacher resource: FAA Drone Zone
Process/Skill Questions
• According to 14 CFR Part 48, what sUAS must be registered with the FAA? Which sUAS do not have to be registered?
• What is the age requirement to register a UAS with the FAA in the United States?
• Where must the FAA registration be posted on or within the UAS?

Task Number 50

Identify penalties for failure to adhere to Part 107 regulations.

Definition
Identification should include
  • fines
  • suspension of license.

The FAA, not local jurisdictions, is responsible for enforcement.

Process/Skill Questions
• Within how many days must an sUAS accident be reported to the FAA?
• What is maximum penalty for being found using drugs or alcohol under Part 107?

Task Number 51

Follow regulations for sUAS.

Definition
Following regulations should include understanding restrictions set by the instructor, school, division, or locality, in addition to FAA requirements.

Process/Skill Questions
• Under what circumstances may an operator fly an sUAS from a moving vehicle?
• May an sUAS be flown indoors? Explain.
Task Number 52

Identify requirements for earning an FAA Part 107 sUAS pilot license.

Definition
Identification should include an understanding of the following:

- History of the FFA
- FFA training opportunities
- FAA licensing and certification requirement
- Methods used by the FFA to regulate airspace

Process/Skill Questions
- After receiving a remote pilot certificate under Part 107, how often is a person required to complete recurrent training?
- Which individuals may process an application for a Part 107 remote pilot certificate with an sUAS rating?
- What requirements are there for a Part 107 license?

Task Number 53

Identify the three classifications of flying in airspace.

Definition
Identification should include

- hobbyist
- Part 107 certification
- certificate of authorization (COA).

Teacher resource: Operating within a CBO, Academy of Model Aeronautics

Process/Skill Questions
- Which types of operations are excluded from the requirements in 14 CFR Part 107?
- May a person without a Part 107 Remote Pilot certificate operate an sUAS for commercial endeavors? Explain.
- In what situations is a COA required?
Task Number 54

Research flight regulations.

Definition
Research should include local, state, and federal regulations that cover flight, including

- privacy laws
- frequency usage and Federal Communications Commission (FCC) compliance
- ethical considerations.

Process/Skill Questions
- What agency regulates all the national airspace?
- How do local privacy laws affect UAS missions?
- What regulations govern the usage of UAS frequencies?

Understanding the Importance of Monitoring Weather

Task Number 55

Check advisory information.

Definition
Checking should include

- reading Notices to Airmen (NOTAMs) and Temporary Flight Restrictions (TFRs)
- interpreting abbreviations
- accessing online information.

Process/Skill Questions
- Where can one find updated weather advisories?
- What is a NOTAM, and where can one find them?
- What is a TFR, and how would it affect mission planning?
Task Number 56

Read weather reports, forecasts, and charts.

Definition
Reading requires obtaining the following weather briefings from official sources:

- Meteorological Aerodrome Reports (METARs)
- Terminal Aerodrome Forecasts (TAFs)
- Significant Meteorological Information AIM 7-1-6 (SIGMETs)
- surface observations
- aviation forecasts
- apps for checking weather conditions.

Process/Skill Questions
- Where can one find the best source of weather reports and forecasts to inform planning?
- Why are visibility, pressure, and wind speed important to determine from a METAR?
- What surface observations should one look for in the field before starting a mission?

Task Number 57

Explain weather’s effect on performance.

Definition
Explanation should include the effects on sUAS performance of

- wind
- air masses and fronts
- atmospheric stability
- visibility and clouds
- thunderstorms
- icing
- fog
- density altitude.

Process/Skill Questions
- How do wind and temperature affect a sUAS mission?
- Why is it important to know what air masses and fronts are in the area where you are flying?
- What types of cloud cover are good for flying? What cloud cover is the worst for flying?
Examining Loading and Performance Concerns

Task Number 58

Select an sUAS to meet objectives.

Definition
Selection should include

- interview with customer to determine objectives
- type of aircraft best suited for a given mission
- payload or sensor
- mission planning software.

Process/Skill Questions
- For what types of missions is a fixed-wing UAS best suited? A multirotor UAS?
- What types of missions are best flown manually? What types of missions are best flown autonomously?
- What features of mission planning software should be considered when planning a manual mission? An autonomous mission?

Task Number 59

Define aircraft configuration.

Definition
Definition should include

- selecting payloads (sensors, cameras, accessory systems)
- required lighting (for night flight).

Process/Skill Questions
- What is a multispectral sensor, and when should one be used?
- What types of lighting are needed when flying missions at night?
- What factors need to be considered when selecting sensors and data collection instruments to fly missions?
Task Number 60

Determine airworthiness.

Definition
Determination should include a pre-flight inspection to check

- weight
- balance
- center of gravity
- fatigue.

Process/Skill Questions
- What could happen if a sensor is added to a UAS without consideration for center of gravity?
- Why is it important to know how much payload the UAS can lift?
- How are UAS propellers tested and balanced?

Performing Operations

Task Number 61

Assign sUAS personnel.

Definition
Assigning should include

- stating the role of the remote pilot in command (PIC)
- training visual observers and flight team
- reviewing mission responsibilities and communications methods.

Process/Skill Questions
- What factors affect planning and assigning personnel for a mission?
- What requirements does a visual observer need to fulfill?
- What requirements need to be met to daisy-chain visual observers to increase visual line of sight?
Task Number 62

Rehearse flight operation.

Definition
Rehearsal should include

- communication with personnel
- aeronautical decision-making
- risk management.

Process/Skill Questions
- Why is it important to rehearse a flight operation?
- How different should the conditions of the rehearsal be from the actual flight operation in terms of sUAS, sensors, and personnel?

Task Number 63

Assemble the aircraft’s supporting equipment.

Definition
Assembly should include

- installing batteries
- attaching propellers
- installing sensors.

Process/Skill Questions
- What parts of an off-the-shelf sUAS typically need to be assembled in the field before flight?
- How do all the equipment and parts work together to create a full sUAS?

Task Number 64

Create a preflight checklist.

Definition
Creation should include

- conducting flight checks of the sUAS
- establishing ground control points (GCPs)
- recording flight data.
Process/Skill Questions

- Why is a preflight checklist important?
- What are the key elements of a good preflight checklist?
- If the manufacturer does not provide a checklist, what guidance should be used to create one?

---

**Task Number 65**

**Troubleshoot electrical system.**

**Definition**

Troubleshooting should include

- voltmeter use
- smart battery application use
- soldering
- coverage of plug-in wire harnesses
- calibration of compass and inertia devices
- battery requirements.

**Process/Skill Questions**

- How does one know when the system is not working properly?
- What are the physical signs of a bad battery?
- How should batteries be stored and transported?

---

**Task Number 66**

**Troubleshoot mechanical systems.**

**Definition**

Troubleshooting should include calibration of engine power balance.

**Process/Skill Questions**

- How does one know when mechanical systems are not working properly?
Task Number 67

Troubleshoot airframe.

Definition
Troubleshooting should include

- replacement of parts preferred
- use of adhesives (e.g., LockTite) on structural parts
- manufacturer’s suggested preventive maintenance.

Process/Skill Questions
- What might indicate that an airframe is unfit to fly?
- How is a fatigue crack identified?

Task Number 68

Perform scheduled maintenance on fuel system.

Definition
Performance should include

- using safety equipment
- following safety procedures
- checking for leaks.

Process/Skill Questions
- What are some indications that the system is not working properly?
- What are the dangers of fuel systems that propel sUAS?
- How should fuel be stored during transport?
- What is the proper method of fueling a combustion-powered UAV?

Task Number 69

Troubleshoot propulsion/power plant.

Definition
Troubleshooting should include

- checking battery power cable connections
- assessing equipment or system damage
• examining the glow or spark plug.

Process/Skill Questions
• What should be checked about the UAS battery?
• What should one troubleshoot if the power system is not working?

Task Number 70

Troubleshoot software.

Definition
Troubleshooting should include
• determining appropriate software
• testing compatibility with hardware.

Process/Skill Questions
• What might one need to do to ensure software is working properly?
• How can a hardware or software simulator test potential fixes?

Task Number 71

Update software.

Definition
Update should include
• installing latest software
• installing latest firmware.

Process/Skill Questions
• How would one find out about the latest software revision and updates?
• Why should a ground-based functional test be performed after a software update?
• How does one find out about potential unintended consequences?

Task Number 72

Inspect the sUAS for maintenance issues.

Definition
Inspection should include
• cleaning lenses and sensors
• ensuring batteries are free of damage, leaks, or bulges.

Process/Skill Questions
• What documentation should be kept on system maintenance?
• What is the life cycle for vehicle parts, and are they specified by the manufacturer?

Task Number 73

Inspect the aircraft for airworthiness.

Definition
Inspection should include

• propellers (undamaged, spin freely, properly installed)
• frame (structurally sound)
• wiring connections
• battery condition.

Process/Skill Questions
• How does a logbook help you prepare for a flight?
• What might the logbook include about the last flight?
• Why would one look for configuration changes?

Task Number 74

Integrate payloads.

Definition
Integration should include

• type (e.g., camera, sensor, actuator)
• weight
• effect on flight.

Process/Skill Questions
• What are some integrations, that should be documented in the vehicle logbook?
• What process would one use to verify payload via telemetry?
• Why should payload integration be checked for communication?
• Why is it important to ship the sUAS and related electronic equipment, sensors, and cameras in original packaging when possible?
• What are some of the issues to look for when receiving an sUAS and/or sUAS sensors and payloads that has been shipped to you prior to use?
• What are the dangers related to shipping lithium batteries?

Task Number 75
Implement configuration changes to hardware and software.

Definition
Implementation should include
• program, file, or script
• battery, frame, and flight controller
• camera, sensor, actuator, and transponder.

Process/Skill Questions
• What should be included in plans for a checkout flight?
• Why should configuration changes be documented by the technician and communicated to the operations team?

Task Number 76
Document configuration changes.

Definition
Documentation should include
• changes to software files
• modifications to platform
• payload settings.

Process/Skill Questions
• Why check the logbook for when it was last updated?
• When should changes to an existing block diagram/schematic be done?
• Why should one archive outdated configuration documents?
Task Number 77

Keep maintenance logs.

Definition
Maintenance logs should include

- repairs
- modifications
- battery state of health.

Process/Skill Questions
- Why review the logbook prior to the first flight of the day?
- What are examples of maintenance information that should be in the logbook?
- Why should maintenance items be inspected and/or undergo quality assurance?

Task Number 78

Establish operation communications plan.

Definition
Establishing should include

- interference-free radio signals
- frequencies
- data links
- range test
- air-traffic communications monitor.

Process/Skill Questions
- Why should frequencies be checked prior to flight?
- What operational distances and/or obstructions should be considered?
- Why must approvals to operate on desired frequencies be submitted/approved for each operational area?
Task Number 79

Conduct maintenance test flight.

Definition
Conducting should include testing

- flight controls
- battery
- camera
- software updates.

Process/Skill Questions
- What is a shakeout flight?
- Why must limits for speed, altitude, and attitude be established?
- What modes of operation need to be engaged to test maintenance actions?

Task Number 80

Assess operational risk.

Definition
Assessment should include

- risk identification
- risk analysis
- mitigation.

Process/Skill Questions
- How can wind affect the operational ability of an sUAS?
- What are the consequences of flying an sUAS in violation of FAA rules?
- What is the purpose of conducting an operational risk assessment?
- Where can the sUAS pilot get up-to-date weather information relating to aircraft operations for his/her area of operation?
- What is Crew Resource Management, and how does it assist with overall safety and mitigation of risk?
Task Number 81

Determine fuel or battery requirements.

Definition
Determination should include
- platform energy needs
- duration of mission
- atmospheric conditions.

Process/Skill Questions
- How does wind and flight distance affect battery life?
- How does high or low battery temperature affect sUAS operation?
- How would one determine the number of batteries needed and the charging requirements for a given mission?

Task Number 82

Address personnel needs in the field.

Definition
Addressing needs should include
- safety
- environmental requirements
- limiting fatigue and exposure.

Process/Skill Questions
- What logistical items are needed for short-term (less than four hours) sUAS operations?
- What logistical items are needed for long-term (four to twelve hours) sUAS operations?
- What items should sUAS personnel have with them for use on a mission?

Task Number 83

Secure mission supplies.

Definition
Securing should include
- platform sources
payload sources
protecting customer data.

Process/Skill Questions
• What items would be beneficial for sUAS pilots when operating in bright sunlight?
• Why is it important to have an inverter generator instead of a standard generator when powering electronics?
• What spare parts and supplies should be readily available during sUAS missions?

Task Number 84

Appraise UAS batteries.

Definition
Appraisal should include

• proper storage
• inspection for defects
• full charge.

Process/Skill Questions
• Where might one look to find instructions on charging sUAS batteries?
• What are the differences between a smart and non-smart lithium battery?
• When should one not charge an sUAS battery?
• What battery information should be documented and retained?

Task Number 85

Plan to secure operations area.

Definition
Plan should include

• identifying necessary boundaries
• identifying the flight line
• contacting additional agencies
• staffing
• setting up physical barriers.

Process/Skill Questions
• Why is it important to secure the operations area?
• What resources can be used to secure the operations area?
• What are some things one should consider in securing an operations area?
• When can a TFR be established?

Flying the sUAS

Task Number 86

Define operation objective.

Definition
Definition should include

• sUAS capabilities
• required equipment
• required personnel and roles
• operation boundaries
• submittal method and format.

Process/Skill Questions
• What is an example of an operational objective?
• How does sUAS capability affect the operation objective?
• Who has the final authority to fly a mission?
• What are some typical operational objectives an sUAS pilot may be assigned?

Task Number 87

Assess area of operations.

Definition
Assessment should include

• NOTAMs
• TFRs
• weather briefings
• site survey.

Process/Skill Questions
• How might one find current NOTAMs and TFRs?
• What is considered a reputable weather briefing?
• What are the consequences of not completing a site survey prior to an sUAS operation?
Task Number 88

Set up flight control area.

Definition
Setup should include the workspace for all equipment and materials necessary for flight and communications.

Process/Skill Questions
• How can one create a safe area to launch and recover the UAV?
• What types of devices are available to control pedestrian and vehicle traffic?
• How can one clear the flight path during the mission?

Task Number 89

Upload flight plan to aircraft.

Definition
Uploading should include the following, if applicable for software:

• Flight path
• Home points
• Ground control points
• Altitude
• Camera settings (if used)
• Aircraft speed
• Boundaries and fly-away procedures

Process/Skill Questions
• How can one verify that the flight plan has been successfully sent to the autopilot?
• How might the flight plan be transferred?
• What are common types of flight plans?

Task Number 90

Conduct safety briefing.

Definition
Briefing should include
• identification of potential hazards
• location of safety and first-aid equipment.

**Process/Skill Questions**
• What are the major elements of a safety briefing?
• Who should conduct the briefing?
• Who should be involved in the briefing?

---

**Task Number 91**

**Conduct mission briefing.**

**Definition**
Briefing should include

• assigning roles to all personnel involved in the operation
• describing the roles assigned to each crew member.

**Process/Skill Questions**
• What are the major elements of a mission briefing?
• Who should conduct the briefing?
• Who should be involved in the briefing?

---

**Task Number 92**

**Check for foreign objects and debris (FOD).**

**Definition**
Checking should include

• visual inspection of the aircraft
• visual inspection of the landing/home points
• visual inspection of the operation area.

**Process/Skill Questions**
• What are common types of FOD?
• What is the best way to prevent FOD damage?
• What should be done if FOD damage is found on the aircraft?
Task Number 93

Verify use of personal protective equipment (PPE).

Definition
Verification should include

- the use of PPE by all crewmembers at all times during the operation
- safety equipment required by the UAS owner/operator as well as by the client/operation area.

Process/Skill Questions
- What are the hazards to one’s body during a flight?
- What types of PPE should we be wearing?
- Who should be wearing PPE?

Task Number 94

Communicate with crew and Air Traffic Control (ATC).

Definition
Communication is necessary for successful completion of the mission and should include all crew members, including but not limited to

- visual observers (VO)
- person manipulating the controls.

ATC communications should also be monitored.

Process/Skill Questions
- What are some best practices for crew communication?
- When is one required to communicate with ATC?
- What method should one use to communicate with ATC?
Task Number 95

Secure launch and recovery area.

Definition
Securing should ensure that the launch and recovery areas are free of debris and obstacles and that no unauthorized persons are in the area.

Process/Skill Questions
- What are the best methods to secure the local area before, during, and after a flight?
- What hazards do UAVs pose to bystanders?
- What equipment should be on hand in the event of a mishap?

Task Number 96

Launch aircraft.

Definition
Launching should occur only after the operations area has been secured and should follow the manufacturer’s instructions.

Process/Skill Questions
- How does one ensure that the vehicle is safe for flight?
- How does one ensure that the crew know their responsibilities and roles?
- How does one arm the motors and launch the aircraft?

Task Number 97

Fly the sUAS.

Definition
Flying should include having all crew members follow all procedures discussed and implemented.

Process/Skill Questions
- What are the most important items to monitor while flying an sUAS?
- What conditions should trigger an immediate return to the landing location?
- Which Part 107 regulations need to be followed while flying the mission?
Task Number 98

Maintain visual contact with aircraft.

Definition
Maintaining visual contact should occur at all times, following regulations for visual contact as defined by the FAA or in the waiver, if one has been obtained.

Process/Skill Questions
• What is the definition of visual line of sight, according to 14 CFR Part 107?
• What devices can be used to maintain visual line of sight?

Task Number 99

Monitor site communications.

Definition
Monitoring should include communications from and with all crew members during the completion of the sUAS mission.

Process/Skill Questions
• How might communications among crew members be done during the mission?

Task Number 100

Recover aircraft.

Definition
Recovering should include

• identifying reason for recovery
• determining whether the landing was planned or unplanned.

Process/Skill Questions
• How does one determine whether the landing area is safe?
• What are the responsibilities of each member of the flight team when the flight is complete?
Task Number 101

Conduct a post-flight inspection.

Definition
Inspection should include

- a visual and physical survey of the equipment
- determination of the equipment’s condition
- recommendations for equipment replacement or adjustments.

Process/Skill Questions
- What parts need to be inspected after flight?
- How is the inspection documented?

Task Number 102

Conduct a post-flight debrief.

Definition
Debrief should include

- reviewing the flight plan
- determining with team members whether the flight was conducted according to the filed flight plan
- reviewing the roles of the team members and discussing issues
- reviewing the condition of the sUAS and any other equipment associated with the flight.

Process/Skill Questions
- What is the purpose of the flight debriefing?
- Who leads the debrief?

Task Number 103

Pack sUAS for transport.

Definition
Packing should include

- ensuring all items are accounted for
- storing the sUAS for transportation
• following safety guidelines for transporting a sUAS.

Process/Skill Questions
• What items should be packed for transport for a sUAS mission?
• What are safety guidelines for transporting an sUAS?

Coordinating Flight Operations Logistics

Task Number 104

Develop a schedule for the day of the flight.

Definition
Development schedule should include

• location
• team members’ roles
• current weather NOTAMs
• safety requirements
• required documentation.

Process/Skill Questions
• What should a schedule for the day of the flight include?

Task Number 105

Communicate flight schedule.

Definition
Communication should include

• conducting a meeting
• sharing all information with the team, including the daily schedule, weather, and flight documentation
• determining the roles of each member of the flight team.

Process/Skill Questions
• What should be included when communicating the flight schedule?
• How are the roles of the flight team determined?
Task Number 106

Coordinate mission-dependent resources.

**Definition**
Coordination should include

- working with the team to identify resources needed for the flight
- determining how to acquire resources.

**Process/Skill Questions**
- What is needed to make the flight successful?
- How can one ensure the team has access to the resources it needs?

Task Number 107

Schedule mission personnel.

**Definition**
Scheduling should include

- identifying roles needed for the mission
- assigning roles to each person on the flight team.

**Process/Skill Questions**
- How are roles assigned to personnel?

Maintaining Proficiency in Professional Knowledge and Skills

Task Number 108

Practice flying sUAS.

**Definition**
Practicing should include

- preparing and implementing a flight plan
• identifying weather conditions during flight time
• documenting personal flight time (i.e., keeping a log).

Process/Skill Questions
• What tools can be used when preparing a flight plan?
• What resources can help one identify weather conditions?

Task Number 109
Train on flight simulator.

Definition
Training should include

• developing flying skills
• completing five hours of training before attempting an actual flight.

Process/Skill Questions
• Why use a flight simulator?
• How can a flight simulator assist in preparing you for sUAS flight?

Performing Administrative Tasks

Task Number 110
Create proposals and presentations.

Definition
Creation should include

• a service proposal showcasing how a UAS could benefit a customer
• a sample flight plan.

Process/Skill Questions
• What services could an sUAS operator provide?
• How can data and other information benefit the customer?
• What should be included in the presentation?
Task Number 111

File flight reports.

Definition
Filing should include

- completing the documentation of a flight
- creating a flight report
- following FAA guidelines for flight reports.

Process/Skill Questions
- What types of reports are required?
- How long should documentation be kept?

Task Number 112

Maintain flight logs.

Definition
Maintaining should include

- keeping accurate flight logs
- having an up-to-date system of storing logs.

Process/Skill Questions
- What information does one need to fill out the logs properly?
- Why is one required to keep up-to-date logs?
- How long should flight logs be kept?

SOL Correlation by Task

<table>
<thead>
<tr>
<th>Introducing Unmanned Aircraft Systems</th>
<th>English: 10.5, 10.8, 11.5, 11.8, 12.5, 12.8</th>
<th>History and Social Science: WHII 14; VUS 14; GOVT 7, 8, 9</th>
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</thead>
<tbody>
<tr>
<td>Describe applications of unmanned aircraft systems (UAS).</td>
<td></td>
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<tr>
<td>Explain the design of UAS.</td>
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<td>English: 10.5, 11.5, 12.5</td>
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<tr>
<td>Identify elements of UAS.</td>
<td>English: 10.5, 11.5, 12.5</td>
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<tr>
<td>Research careers related to UAS.</td>
<td>English: 10.5, 10.8, 11.5, 11.8, 12.5, 12.8</td>
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<tr>
<td>Identify milestones in the history of UAS.</td>
<td>English: 10.5, 11.5, 12.5 History and Social Science: WHII 14; VUS 14; GOVT 7, 8, 9</td>
<td></td>
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<tr>
<td><strong>Defining the National Airspace System</strong></td>
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<tr>
<td>Describe the national airspace system (NAS).</td>
<td>English: 10.5, 11.5, 12.5 History and Social Science: GOVT 7, 8, 9</td>
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<tr>
<td>Use Low Altitude Authorization and Notification Capability (LAANC) to identify controlled airspace.</td>
<td>History and Social Science: GOVT 7, 8, 9</td>
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<tr>
<td>Describe waivers.</td>
<td>English: 10.5, 11.5, 12.5 History and Social Science: GOVT 7, 8, 9</td>
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<tr>
<td><strong>Exploring Regulations</strong></td>
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<tr>
<td>Explain the role of the FAA.</td>
<td>English: 10.5, 11.5, 12.5 History and Social Science: GOVT 7, 8, 9</td>
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<tr>
<td>Define a UAS, according to the FAA.</td>
<td>English: 10.3, 10.5, 11.3, 11.5, 12.3, 12.5 History and Social Science: GOVT 7, 8, 9</td>
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<td>Explain the requirements and process for registering sUAS vehicles with the FAA.</td>
<td>English: 10.5, 11.5, 12.5 History and Social Science: GOVT 7, 8, 9</td>
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<tr>
<td>Identify penalties for failure to adhere to Part 107 regulations.</td>
<td>English: 10.5, 11.5, 12.5 History and Social Science: GOVT 7, 8, 9</td>
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<tr>
<td>Follow regulations for sUAS.</td>
<td>English: 10.5, 11.5, 12.5 History and Social Science: GOVT 7, 8, 9</td>
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<tr>
<td>Identify requirements for earning an FAA Part 107 sUAS pilot license.</td>
<td>English: 10.5, 11.5, 12.5 History and Social Science: GOVT 7, 8, 9</td>
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<tr>
<td>Task</td>
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<tr>
<td>Identify the three classifications of flying in airspace.</td>
<td>7, 8, 9</td>
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</tbody>
</table>
| Research flight regulations.                                         | English: 10.5, 11.5, 12.5  
History and Social Science: GOVT 7, 8, 9 |
| Understanding the Importance of Monitoring Weather                  |              |
| Check advisory information.                                          | English: 10.2, 10.5, 11.2, 11.5, 12.2, 12.5  
History and Social Science: GOVT 7, 8, 9 |
| Read weather reports, forecasts, and charts.                        | English: 10.5, 11.5, 12.5  
Science: ES.11 |
| Explain weather’s effect on performance.                             | English: 10.5, 11.5, 12.5  
Science: ES.11 |
| Examining Loading and Performance Concerns                          |              |
| Select an sUAS to meet objectives.                                   | English: 10.1, 11.1, 12.1 |
| Define aircraft configuration.                                       | English: 10.3, 10.5, 11.3, 11.5, 12.3, 12.5 |
| Determine airworthiness.                                             |              |
| Performing Operations                                                |              |
| Assign sUAS personnel.                                               | English: 10.5, 11.5, 12.5 |
| Rehearse flight operation.                                           | English: 10.1, 11.1, 12.1 |
| Assemble the aircraft’s supporting equipment.                        |              |
| Create a preflight checklist.                                       | English: 10.5, 10.6, 10.7, 11.5, 11.6, 11.7, 12.5, 12.6, 12.7 |
| Troubleshoot electrical system.                                     |              |
| Troubleshoot mechanical systems.                                     |              |

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<tr>
<th>Task</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Troubleshoot airframe.</td>
<td>English: 10.5, 11.5, 12.5</td>
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<tr>
<td>Perform scheduled maintenance on fuel system.</td>
<td>English: 10.5, 11.5, 12.5</td>
</tr>
<tr>
<td>Troubleshoot propulsion/power plant.</td>
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<tr>
<td>Troubleshoot software.</td>
<td>English: 10.5, 11.5, 12.5</td>
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<tr>
<td>Update software.</td>
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<tr>
<td>Inspect the sUAS for maintenance issues.</td>
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<tr>
<td>Inspect the aircraft for airworthiness.</td>
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<tr>
<td>Integrate payloads.</td>
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<tr>
<td>Implement configuration changes to hardware and software.</td>
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<tr>
<td>Document configuration changes.</td>
<td>English: 10.5, 10.6, 10.7, 11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
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<tr>
<td>Keep maintenance logs.</td>
<td>English: 10.5, 10.6, 10.7, 11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
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<tr>
<td>Establish operation communications plan.</td>
<td>English: 10.5, 11.5, 12.5</td>
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<tr>
<td>Conduct maintenance test flight.</td>
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<tr>
<td>Assess operational risk.</td>
<td>English: 10.5, 11.5, 12.5</td>
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<tr>
<td>Determine fuel or battery requirements.</td>
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<tr>
<td>Address personnel needs in the field.</td>
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<td>Secure mission supplies.</td>
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<tr>
<td>Appraise UAS batteries.</td>
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<tr>
<td>Plan to secure operations area.</td>
<td>English: 10.5, 11.5, 12.5</td>
</tr>
<tr>
<td><strong>Flying the sUAS</strong></td>
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<tr>
<td>Define operation objective.</td>
<td>English: 10.3, 10.5, 11.3, 11.5, 12.3, 12.5</td>
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<tr>
<td>Assess area of operations.</td>
<td>English: 10.5, 11.5, 12.5</td>
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<td>Task</td>
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<td>----------------------------------------------------------------------</td>
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<tr>
<td>Set up flight control area.</td>
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<tr>
<td>Upload flight plan to aircraft.</td>
<td>10.2, 11.2, 12.2</td>
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<tr>
<td>Conduct safety briefing.</td>
<td>10.5, 11.5, 12.5</td>
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<tr>
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<td>Check for foreign objects and debris (FOD).</td>
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<tr>
<td>Verify use of personal protective equipment (PPE).</td>
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<td>Communicate with crew and Air Traffic Control (ATC).</td>
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<tr>
<td>Secure launch and recovery area.</td>
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<tr>
<td>Launch aircraft.</td>
<td>10.1, 11.1, 12.1</td>
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<tr>
<td>Fly the sUAS.</td>
<td>10.1, 11.1, 12.1</td>
</tr>
<tr>
<td>Maintain visual contact with aircraft.</td>
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<td>Monitor site communications.</td>
<td>10.1, 11.1, 12.1</td>
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<tr>
<td>Recover aircraft.</td>
<td>10.1, 11.1, 12.1</td>
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<td>Conduct a post-flight inspection.</td>
<td>10.1, 10.5, 11.1, 11.5, 12.1, 12.5</td>
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<tr>
<td>Conduct a post-flight debrief.</td>
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<td>Pack sUAS for transport.</td>
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</table>

**Coordinating Flight Operations Logistics**

<table>
<thead>
<tr>
<th>Task</th>
<th>English:</th>
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<tbody>
<tr>
<td>Develop a schedule for the day of the flight.</td>
<td>10.1, 10.5, 11.1, 11.5, 12.1, 12.5</td>
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<tr>
<td>Communicate flight schedule.</td>
<td>10.5, 11.1, 11.5, 12.1, 12.5</td>
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<tr>
<td>Coordinate mission-dependent resources.</td>
<td>10.1, 10.5, 11.5, 12.5</td>
</tr>
<tr>
<td>Schedule mission personnel.</td>
<td>10.5, 11.5, 12.5</td>
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</table>

**Maintaining Proficiency in Professional Knowledge and Skills**
<table>
<thead>
<tr>
<th>Practice flying sUAS.</th>
<th>English: 10.6, 10.7, 11.6, 11.7, 12.6, 12.7</th>
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<tbody>
<tr>
<td>Train on flight simulator.</td>
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**Performing Administrative Tasks**

<table>
<thead>
<tr>
<th>Create proposals and presentations.</th>
<th>English: 10.1, 10.5, 11.1, 11.5, 12.1, 12.5</th>
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<tr>
<td>File flight reports.</td>
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</tr>
<tr>
<td>Maintain flight logs.</td>
<td>English: 10.5, 10.6, 10.7, 11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
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</tbody>
</table>
Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials (Only apply to 36-week courses)

- College and Work Readiness Assessment (CWRA+)
- FAA Remote Pilot Small Unmanned Aircraft Systems Certification Examination
- National Career Readiness Certificate Assessment
- Small Unmanned Aircraft System (UAS) Safety Certification Examination
- Workplace Readiness Skills for the Commonwealth Examination

Concentration sequences: A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.

- Aerospace Technology I (8487/36 weeks)
- Aerospace Engineering (8428/36 weeks)
- Air Traffic Controller (8734/36 weeks)
- Aircraft Pilot I (8731/36 weeks)
- Aviation Maintenance Technology I (8728/36 weeks)

Career Cluster: Agriculture, Food and Natural Resources

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
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<tr>
<td>Agribusiness Systems</td>
<td>Farm, Ranch Manager</td>
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<tr>
<td></td>
<td>Farmer/Rancher</td>
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<tr>
<td>Environmental Service Systems</td>
<td>Environmental Compliance Inspector</td>
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<tr>
<td></td>
<td>Turf Farmer</td>
</tr>
<tr>
<td>Natural Resources</td>
<td>Ecologist</td>
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</table>
### Career Cluster: Agriculture, Food and Natural Resources

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<tr>
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<tbody>
<tr>
<td><strong>Systems</strong></td>
<td>Fish and Game Officer</td>
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<td>Forest Manager, Forester</td>
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<td>Geological Technician</td>
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<td>Park Manager</td>
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<td>Range Technician</td>
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<td>Wildlife Manager</td>
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<td><strong>Plant Systems</strong></td>
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<td>Turf Farmer</td>
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### Career Cluster: Architecture and Construction

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### Career Cluster: Arts, Audio/Video Technology and Communications

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<td>Videographer</td>
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<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performing Arts</td>
<td>Cinematographer</td>
</tr>
<tr>
<td>Visual Arts</td>
<td>Commercial Photographer</td>
</tr>
</tbody>
</table>

### Career Cluster: Energy

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Efficiency</td>
<td>Environmental Engineer</td>
</tr>
<tr>
<td></td>
<td>Environmental Engineering Technician</td>
</tr>
<tr>
<td></td>
<td>Environmental Science and Protection Technician</td>
</tr>
<tr>
<td></td>
<td>Environmental Scientist</td>
</tr>
<tr>
<td></td>
<td>Forest and Conservation Technician</td>
</tr>
<tr>
<td></td>
<td>Geoscientist</td>
</tr>
<tr>
<td>Fuels Production</td>
<td>Petroleum Technician</td>
</tr>
<tr>
<td>Power Generation</td>
<td>Engineering Manager</td>
</tr>
<tr>
<td>Transmission and Distribution</td>
<td>Electrical Power Line Installer/Repairer</td>
</tr>
<tr>
<td></td>
<td>Wind Turbine Service Technician</td>
</tr>
</tbody>
</table>

### Career Cluster: Government and Public Administration

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Security</td>
<td>Combat Specialty Officer</td>
</tr>
<tr>
<td></td>
<td>Military Enlisted Personnel</td>
</tr>
<tr>
<td></td>
<td>Military Intelligence Specialist</td>
</tr>
<tr>
<td>Planning</td>
<td>Urban and Regional Planner</td>
</tr>
<tr>
<td>Regulation</td>
<td>Environmental Compliance Inspector</td>
</tr>
<tr>
<td>Revenue and Taxation</td>
<td>Real Estate Appraiser</td>
</tr>
<tr>
<td></td>
<td>Revenue Agent</td>
</tr>
</tbody>
</table>
### Career Cluster: Information Technology

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Support and Services</td>
<td>Geographic Information Systems (GIS) Technician</td>
</tr>
<tr>
<td>Network Systems</td>
<td>Telecommunications Specialist</td>
</tr>
</tbody>
</table>

### Career Cluster: Science, Technology, Engineering and Mathematics

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering and Technology</td>
<td>Aerospace Engineering Technician</td>
</tr>
<tr>
<td></td>
<td>Agricultural Engineer</td>
</tr>
<tr>
<td></td>
<td>Civil Engineer</td>
</tr>
<tr>
<td></td>
<td>Civil Engineering Technician</td>
</tr>
<tr>
<td></td>
<td>Electrical Engineering Technician</td>
</tr>
<tr>
<td></td>
<td>Engineering Manager</td>
</tr>
<tr>
<td></td>
<td>Engineering Technician</td>
</tr>
<tr>
<td></td>
<td>Environmental Engineer</td>
</tr>
<tr>
<td></td>
<td>Marine Engineer</td>
</tr>
<tr>
<td></td>
<td>Nuclear Engineer</td>
</tr>
<tr>
<td></td>
<td>Petroleum Engineer</td>
</tr>
<tr>
<td></td>
<td>Power Systems Engineer</td>
</tr>
<tr>
<td>Science and Mathematics</td>
<td>Atmospheric Scientist</td>
</tr>
<tr>
<td></td>
<td>Ecologist</td>
</tr>
<tr>
<td></td>
<td>Environmental Scientist</td>
</tr>
<tr>
<td></td>
<td>Geodetic Surveyor</td>
</tr>
</tbody>
</table>

### Career Cluster: Transportation, Distribution and Logistics

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health, Safety and Environmental</td>
<td>Health, Safety, and Environment Manager</td>
</tr>
<tr>
<td>Pathway</td>
<td>Occupations</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Management</td>
<td></td>
</tr>
<tr>
<td>Transportation Operations</td>
<td>Flight Engineer</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
</tr>
<tr>
<td>Transportation Systems/Infrastructure</td>
<td>Civil Engineer</td>
</tr>
<tr>
<td>Planning, Management and Regulation</td>
<td>Civil Engineering Technician</td>
</tr>
<tr>
<td></td>
<td>Pilot</td>
</tr>
<tr>
<td></td>
<td>Traffic Engineer</td>
</tr>
<tr>
<td></td>
<td>Traffic Technician</td>
</tr>
<tr>
<td></td>
<td>Urban, Regional Planner</td>
</tr>
</tbody>
</table>