

# Cessna 421 Series Training Course

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*Focused Single Pilot Training Program*

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Make & Model Specialists LLC  
Cessna 421 Curriculum

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## Introduction

Pilots desiring to obtain a Cessna 421 PIC Authorization must comply with the following:

Before the practical evaluation, complete the Make & Model Specialists LLC Cessna 421 PIC Training program in a Cessna 421 aircraft and pass an oral and practical test by an FAA Inspector, FAA Designated Pilot Examiner or, an instructor who is qualified and current to act as PIC in the aircraft used for training. Each pilot must: 1) Hold a valid US unrestricted Private Pilot certificate, or higher, with a valid Instrument Airplane rating; and 2) Hold a valid Third Class, or higher US Medical Certificate.

## Summary

**General:** Make & Model Specialists LLC's Cessna 421 PIC Training Program specifically trains pilots to operate the Cessna 421 series aircraft safely and efficiently as a single pilot. The program consists of ground and airplane instruction. The completion standards for initial and recurrent pilots are the same. Times indicated are typical. At the discretion of the instructor and based on the experience level and capabilities of the pilot, actual academic training and flight time may be more or less as appropriate. Specific equipment will be addressed as applicable to the subject aircraft used for training. At the discretion of the instructor or at request of the pilot, specific equipment not installed in the training aircraft may be reviewed as differences training. Completion of Ground Instruction areas of aeronautical knowledge shall be proven by the pilot's ability to correctly answer questions during written or verbal examinations.

**Course Objective:** Train and certify a pilot for proficient single pilot operation of the Cessna 421 airplane. On completion of the ground and flight instruction, the pilot will be prepared for a practical test administered in accordance with 14 CFR Part 61 and the Commercial Pilot Airmen Certification Standards, as a single pilot.

**Training Requirements:** The entire Cessna 421 PIC Training Program must be completed in a Cessna 421 series airplane no more than 30 days preceding the evaluation.

The "Ground Instruction" consists of 20 program hours of academic instruction covering the following aeronautical knowledge areas:

- 1) Safe and efficient operation of all aircraft systems;
- 2) Weight and balance computations;
- 3) Use of performance charts;
- 4) Significance and effects of exceeding aircraft performance limitations;
- 5) Principles and functions of aircraft systems;
- 6) Maneuvers, procedures, and emergency Operations appropriate to the aircraft; and
- 7) Night and high-altitude Operations.

Pilots may select either personal platform instruction, or self-study via on-line computer-based training. Upon completion of the CBT portion, pilots must pass the end of course test(s) before scheduling the airplane instruction. To ensure adequate understanding of the academic subjects, pilots must also pass a comprehensive written test in the presence of Make & Model's instructor prior to advancing to the airplane instruction.

The "Airplane Instruction" consists of 9 hours of program instruction time. The flight instruction required for the Practical Test includes the following areas:

- 1) Preflight preparation;
- 2) Preflight procedures;
- 3) Takeoff and departure phase;
- 4) In-flight maneuvers;
- 5) Instrument procedures;
- 6) Landings and approaches to landing;
- 7) Normal and abnormal procedures;
- 8) Emergency procedures; and
- 9) Post flight procedures.

**Testing Requirements:** Pilots seeking their initial Airline Transport Pilot examination must have passed the FAA ATP Aeronautical Knowledge Test and satisfactorily completed the Cessna 421 PIC Training Program. Then, within 10 days of the training completion, successfully accomplish the final practical test in a Cessna 421 series airplane, administered by a pilot examiner or FAA inspector who is authorized to conduct Airline Transport Pilot examinations. The test will be conducted in accordance with 14 CFR Part 61 and the Airline Transport Pilot Airmen Certification Standards.

## Record Keeping

Make & Model Specialists LLC will maintain all training records as directed by 14 CFR Part 61.

## GROUND INSTRUCTION

### GENERAL OPERATIONAL SUBJECTS

**Objective:** The pilot will clearly understand the specific Cessna 421 operational requirements.

**Completion Standards:** The pilot will demonstrate, by written or verbal testing, Airline Transport Pilot level knowledge of the subject matter.

#### Lesson #1 – Introduction (1 hour)

**A. Objective:** The pilot will understand the training syllabus, training materials, and required level of preparation for each training session.

**B. Content:**

1) Introduction and course overview.

**C. Completion Standards:** The pilot must be able to demonstrate, by verbal testing and discussion, an understanding of the lesson content.

#### Lesson #2 – Regulations (0.5 hour)

**A. Objective:** The pilot will understand the regulations regarding initial turboprop training and certification, recurrent training, differences training requirements; and Commercial / Airline Transport Pilot privileges and limitations.

**B. Content:**

1) 14 CFR Part 61

2) 14 CFR Part 91

3) FAA Order 8000.95

4) FAA Minimum Equipment List

5) Privileges and Limitations of the Private, Commercial or Airline Transport Pilot certificate

**C. Completion Standards:** The pilot must be able to demonstrate, by verbal testing and discussion, an understanding of the lesson content.

#### Lesson #3 – Cessna 421 Aircraft Publications and General Information (1 hour)

**A. Objective:** The pilot will understand the aircraft's certification basis and general characteristics.

**B. Content:**

1) Cessna 421 Airplane Flight Manual (AFM) and Operations Manual general layout, content and use

2) Aircraft General information

3) Operating Limitations

**C. Completion Standards:** The pilot must be able to demonstrate, by verbal testing and discussion, an understanding of the lesson content.

#### Lesson #4 – Fuel (1 hour)

**A. Objective:** The pilot will become familiar with the fuel system including AFM and Operations Manual normal and abnormal operating procedures.

**B. Content:**

1) Fuel system – Tank location(s) and venting systems; capacity; drains; pumps; distribution; fuel controls; indicators; cross-feeding; fuel grade, color, and additives; fueling and defueling procedures; emergency substitutions.

2) AFM and Operations Manual normal procedures, limitations, and operational considerations.

**C. Completion Standards:** The pilot must be able to demonstrate knowledge and understanding of the aircraft's fuel system.

#### Lesson #5 – Powerplants (1.5 hour)

**A. Objective:** The pilot will become familiar with the components and operation of the engines, including AFM and Operations Manual normal, abnormal and emergency operating procedures.

**B. Content:**

1) Engine – Type and specifications; controls and indicators; fuel control; mounting points; turbine wheels; and compressors.

2) Propellers – Type and specification, governors, synchronizers, auto-feather, reversing operation.

3) Ignition system.

4) Oil system – Capacity; grade; quantities; indicators.

5) AFM and Operations Manual normal procedures, limitations, and operational considerations.

**C. Completion Standards:** The pilot must be able to demonstrate understanding of the aircraft's powerplants.

**Lesson #6 – Fire Detection and Protection System (1 hour)**

**A. Objective:** The pilot will become familiar with the components and operation of the fire detection system, including AFM and Operations Manual normal, abnormal and emergency operating procedures.

**B. Content:**

- 1) Fire detection.
- 2) Fire suppression.
- 3) Smoke and Fume Elimination.
- 4) AFM and Operations Manual normal procedures, limitations, and operational considerations.

**C. Completion Standards:** The pilot must be able to demonstrate knowledge and understanding of the aircraft's fire detection and protection system.

**Lesson #7 – Electrical System (1 hour)**

**A. Objective:** The pilot will become familiar with the electrical systems and their operation.

**B. Content:**

- 1) AC/DC power; battery; feed bus; emergency bus; alternators; generators; circuit breakers and current limiters; controls; indicators; external ground power.
- 2) Normal AFM and Operations Manual operation and limitations of electrical power system units.

**C. Completion Standards:** The pilot must be able to demonstrate understanding of the electrical power system operation and limitations.

**Lesson #8 – Landing Gear and Brakes (0.5 hour)**

**A. Objective:** The pilot will become familiar with the landing gear and brake system, its operation and limitations.

**B. Content:**

- 1) Landing gear system – indicators; tires; nose wheel steering; and shock struts, and normal and abnormal operations.
- 2) Brakes – components; operation.

**C. Completion Standards:** The pilot must be able to demonstrate knowledge, understanding and the operation of landing gear, brake systems and their limitations.

**Lesson #9 – Flight Controls (0.5 hour)**

**A. Objective:** The pilot will become familiar with and be able to operate the flight control systems.

**B. Content:**

- 1) Primary flight controls (yaw, pitch, and roll devices).
- 2) Secondary flight controls (flaps and trim).
- 3) AOA, stall, and speed warning devices.
- 4) AFM and Operations Manual normal and abnormal operating procedures and limitations.

**C. Completion Standards:** The pilot will be able to operate, demonstrate knowledge, and understand the flight control systems and their limitations.

**Lesson #10 – Environmental Systems (1 hour)**

**A. Objective:** The pilot will become familiar with the environmental systems and their operation.

**B. Content:**

- 1) Air conditioning – heating; cooling; ventilation.
- 2) Pressurization – components; controls; indicators; regulating devices; system operation; emergency pressurization.
- 3) AFM and Operations Manual normal operating procedures and limitations.

**C. Completion Standards:** The pilot must be able to demonstrate understanding of the environmental and pneumatic systems.



### **Lesson #11 – Ice and Rain Protection (0.5 hour)**

**A. Objective:** The pilot will become familiar with and be able to operate the airplane's ice protection systems.

**B. Content:**

- 1) Ice detection.
- 2) Anti-ice and deice systems – pitot-static, wing and stabilizer leading edge, engine, and windshield.
- 3) AFM and Operations Manual normal operating procedures and limitations.

**C. Completion Standards:** The pilot will be able to demonstrate knowledge and understanding of the airplane's ice protection systems and their limitations.

### **Lesson #12 – Avionic and Auto-flight Safe and Efficient Operation (1 hour)**

**A. Objective:** The pilot will be able to operate the airplane's flight instrument and auto-flight system.

**B. Content:**

- 1) Panel arrangement.
- 2) Pitot-static system and instruments – Operation of the system, including drains, and alternate static sources; indicator bug settings, including markings; altimeter; vertical speed indicator.
- 3) Service Air and instruments – Operation of the system, including gauges and malfunction indications; attitude indicator; heading indicator; turn and slip indicator.
- 4) Electrically operated instruments – Turn and bank coordinator; attitude indicator; radio altimeter.
- 5) Magnetic compass – Errors in and use of magnetic compass system.
- 6) Air data computer (as applicable).
- 7) Stall avoidance and warning systems.
- 8) Flight director (FD).
- 9) Weather detection systems – Stormscope, radar (as applicable).
- 10) Traffic collision and avoidance system or Traffic Avoidance System (TCAS, TAS, as applicable).
- 11) Flight management system (FMS, as applicable).
- 12) Autopilot– Interface with aircraft flight director and navigation systems, including automatic approach tracking and altitude pre-select settings.

**C. Completion Standards:** The pilot must be able to demonstrate knowledge and understanding of the avionic and auto-flight systems.

### **Lesson #13 – Communication and Navigation Equipment (1 hour)**

**A. Objective:** The pilot will become familiar with and be able to operate the airplane's communications equipment.

**B. Content:**

- 1) VHF/HF radios; audio panels; interphone and passenger address systems; voice recorder.
- 2) Aircraft transponders, radio altimeters, electronic flight instrumentation system (EFIS), or computer-generated displays of aircraft position and navigation information.
- 3) Navigation receivers – VOR, NDB, RNAV, GPS, DME, and marker beacon.
- 4) Terrain Avoidance and Awareness Systems (TAWS, GPWS, Radar Altimeter, as applicable).

**C. Completion Standards:** The pilot must be able to demonstrate knowledge and understanding of the airplane's communication and navigation systems and equipment.

### **Lesson #14 – Weight and Balance (0.5 hour)**

**A. Objective:** The pilot will become familiar with the weight and balance limitations of the aircraft and be able to ensure the aircraft is properly loaded.

**B. Content:**

- 1) Determining the current aircraft empty weight, center of gravity, and Zero Fuel Weight.
- 2) Computation of the weight and center of gravity for specified load conditions to include adding, removing, or shifting weight.
- 3) Determining if the center of gravity will be within limits for takeoff, flight, and landing.
- 4) Understanding the effect of fuel burn on the center of gravity.

**C. Completion Standards:** The pilot will be able to demonstrate proficiency using the applicable charts to solve loading problems.

### **Lesson #15 – Adverse Weather Practices (0.5 hour)**

**A. Objective:** The pilot will understand the Manufacturer's recommended practices for operating in adverse weather conditions.

**B. Content:**

- 1) Operation in heavy precipitation.
- 2) Operation in snow, slush, and ice.
- 3) Operation in turbulence.
- 4) Low level wind-shear encounter.
  - a) Takeoff and departure
  - b) Approach and landing
- 5) Thunderstorm avoidance.
- 6) Cold weather precautions.
- 7) Low visibility Operations.
- 8) High, Hot & Heavy Operations.
- 9) Operation at towered and non-towered airports with missing or incomplete weather information.

**C. Completion Standards:** The pilot will be able to demonstrate, by verbal testing and discussion, the Manufacturer's recommended adverse weather practices.

### **Lesson #16 – Performance Charts, Significance and Effects of Exceeding Aircraft Limitations (1 hour)**

**A. Objective:** The pilot will become familiar with the performance characteristics, limitations, and MEL for the aircraft.

**B. Content:**

- 1) Review of aerodynamic fundamentals.
- 2) Airflow – Airfoils; aerodynamic effect of flaps and other configurations.
- 3) Low/high-speed aerodynamics and stability.
- 4) Recommended airspeeds during specific phases of flight.
- 5) Stall/spin characteristics and limitations.
- 6) Performance charts, tables, tabulated data, and other related AFM and Operations Manual information – Accelerate-stop/accelerate-go distance; takeoff performance, with all engines and with one engine inoperative; climb performance, with all engines and with one engine inoperative; cruise performance; fuel consumption, range, and endurance; descent performance; and other performance data.
- 7) Normal, abnormal, and emergency performance characteristics.
- 8) Meteorological and weight-limiting performance factors (temperature, pressure, contaminated runways, precipitation, climb/runway limits)
- 9) Special operational conditions (e.g., unpaved runways and high-altitude airports).
- 10) Other information found in the approved AFM and Operations Manual on the aircraft's aerodynamics, performance, and limitations.

**C. Completion Standards:** The pilot must be able to demonstrate use of the aircraft's performance charts to determine aircraft performance and limitations during all flight regimes.

### **Lesson #17 – Night and High-Altitude Operations (1 Hour)**

**A. Objective:** The pilot will become familiar with the procedures for night and high altitude Operations.

**B. Content:**

- 1) Night Operations
- 2) High Altitude Operations

**C. Completion Standards:** The pilot must be able to demonstrate knowledge of night and high-altitude Operations.

### **Lesson #18 – Maneuvers (1 Hour)**

**A. Objective:** The pilot will become familiar with the techniques to correctly perform the flight maneuver profiles.

**B. Content:**

- 1) Steep Turns, Stalls – takeoff, cruise, and departure, Unusual Attitudes
- 2) Engine shutdown and restart
- 3) Visual Approach and Landing
- 4) Instrument Approach and Landing
- 5) Circling Approach

**C. Completion Standards:** The pilot must be able to demonstrate knowledge of the airplane maneuvers and instrument approach procedures.



### **Lesson #19 – Human Factors and Risk Management (2.0 hours)**

**A. Objective:** The pilot will become familiar with Human Factors (HF) issues and Risk Management techniques.

**B. Content:**

- 1) Human physiology.
  - a) Rest, naps, and sleep.
  - b) Effects of drugs and alcohol.
  - c) Smoking.
  - d) Other stresses; e.g., divorce, finance.
  - e) Eating habits.
  - f) Stress management.
- 2) Hazardous attitudes.
- 3) Aeronautical decision making.
  - a) Risk assessment.
  - b) Risk management.
  - c) How to develop decision making skills.
  - d) First flight of the day.

**C. Completion Standards:** The pilot must be able to demonstrate knowledge of HF and risk management.

### **Lesson #20 – Single Pilot Resource and Cockpit Resource Management (2.0 hours)**

**A. Objective:** The pilot will become familiar with Single Pilot and Cockpit Resource Management (CRM) techniques and be able to facilitate the smooth flow of information and application of skills between flight and ground crewmembers and ATC, and shall be capable of utilizing all available resources and installed equipment resulting in a safe, organized flight.

**B. Content:**

- 1) Getting along with others.
- 2) Communications skills.
- 3) How to develop decision-making skills.
- 4) Standard Operating Procedures (SOPs).
  - a) Use of checklists.
  - b) “Do List” vs. “Done List”.
  - c) Pilot flying and monitoring roles.
- 5) Critical situations.
- 6) Deviations from Standard Operating Procedures.

**C. Completion Standards:** This lesson is complete when the pilot is able to demonstrate satisfactory knowledge on a written or oral examination on the lesson subject matter.

### **Lesson #21 – Review (3 hours)**

**A. Objective:** The pilot will become familiar with the systems and components covered.

**B. Content (as applicable):**

- 1) Review any problem areas in preparation for the written or verbal examination.

**C. Completion Standards:** The pilot must be able to demonstrate understanding of all material covered.

### **Lesson #22 – Examination**

The pilot must be able to pass the written or oral examination on material covered during the ground instruction segment. All questions will refer to the Cessna 421 AFM, checklist or the accepted Make & Model Specialists Cessna 421 PIC Abbreviated Checklist. The minimum passing score for the written or oral examination is 80%.

## FLIGHT INSTRUCTION

Time allocations are suggested and should be adjusted according to the pilot's ability, the type of airplane, and equipment. Portions of this may be accomplished in Cockpit Procedures Trainers (CPT), Flight Training Devices (FTD), or FAA Approved Simulators as available and appropriate to the task or maneuver being trained.

**Objective:** The pilot shall apply the knowledge and skill acquired during ground training to the flying airplane.

**Completion Standards:** The pilot shall demonstrate proficiency in handling and operating the airplane by passing the flight portion of the practical test to levels consistent with the PTS.

### Lesson #23 – Introduction to the Airplane; Instructional Preflight (2 hours)

**A. Objective:** The pilot shall become familiar with the airplane and will be able to apply the knowledge gained from ground training to the inspection of the airplane.

**B. Content:**

- 1) Preflight discussion.
- 2) Introduction.
  - (a) Airplane documentation – Registration; airworthiness certificate; maintenance logs; MEL.
  - (b) Preflight inspection – Complete visual inspection of interior and exterior, using appropriate checklist.
- 3) Ground Operations.
  - (a) Prestart checklist.
  - (b) Control system checks.
  - (c) Normal starting procedures.
  - (d) Radio and electronic equipment checks.
  - (e) Systems Operations familiarization and additional checks described in the approved AFM and Operations Manual, checklists, or other approved material appropriate to the airplane type and type of flight.

**C. Completion Standards:** At the completion of this lesson, the pilot shall demonstrate basic airmanship qualities and understanding of flight characteristics of the aircraft.

### Lesson #24 – Basic Maneuvers and Instrument Procedures (2 hours)

**A. Objective:** The pilot shall become familiar the local training environment, and will be able to apply the knowledge gained from ground training to the operation of the airplane.

**B. Content:**

- 1) Systems Operations familiarization and additional checks described in the approved AFM and Operations Manual, checklists, or other approved material appropriate to the airplane type and type of flight.
- 2) Taxiing.
- 3) Pre-takeoff checks, crew briefing as appropriate to the airplane type.
- 4) Normal or crosswind takeoffs.
- 5) Airspeed/V-speed control.
- 6) Straight and level cruise flight.
- 7) Climbs.
- 8) Descents.
- 9) Level, climbing, and descending turns.
- 10) Steep turns.
- 11) Approach to stalls.
  - (a) Takeoff configuration.
  - (b) Cruise configuration.
  - (c) Landing configuration.
- 12) Approach to landing and landings.
- 13) Normal and crosswind landings.
- 14) Engine shutdown procedures.
- 15) Post-flight critique and preview of the next lesson.

**C. Completion Standards:** At the completion of this lesson, the pilot shall demonstrate basic airmanship qualities and understanding of flight characteristics of the aircraft.

## **Lesson #25 – Advanced Maneuvers and Back-up Instrument Procedures (2 hours)**

**A. Objective:** The pilot shall practice advanced maneuvers. A minimum of one instrument approach will be flown using back-up or fail-down display systems.

**B. Content:**

- 1) Rejected and simulated single engine takeoffs.
- 2) V-speed control.
- 3) Steep turns.
- 4) Approach to stalls.
  - (a) Takeoff configuration.
  - (b) Cruise configuration.
  - (c) Landing configuration.
- 5) VMC Demonstration.
- 6) In-flight Precautionary Engine Shutdown and Restart.
- 7) Approach to landing and landings with a simulated engine failure.
- 8) Rejected landing and missed approach with a simulated engine failure.
- 9) Approach to landing and landings with a simulated flap failure.
- 10) Circling approaches and landings.
- 11) Post-flight critique and preview of the next lesson.

**C. Completion Standards:** At the completion of this lesson, the pilot shall demonstrate basic airmanship qualities and understanding of flight characteristics of the aircraft.

## **Lesson #26 – Proficiency Training (3 hours)**

**A. Objective:** The pilot shall develop proficiency in single-pilot takeoffs, landings, VFR patterns, and instrument work.

**B. Content.**

- 1) Preflight discussion, single-pilot considerations.
- 2) Flight.
  - (a) Review of previous lesson.
  - (b) Practice takeoffs and landings to become proficient with power settings, airspeeds, and attitudes for flying a VFR pattern.
  - (c) Takeoff with simulated IMC at or before reaching an altitude of 100 feet above the airport elevation.
  - (d) ILS to missed approach.
  - (e) ILS approach and landing.
  - (f) Non-precision approach to the circling minimum descent altitude (MDA), followed by a change in heading and the necessary visual maneuvering to maintain a flight path that permits a normal landing on a runway at least 90° from the final approach course of the simulated instrument portion of the approach.
- 3) Comply with the practical test requirements and standards appropriate to the grade and class of pilot certificate the pilot holds, and demonstrate proficiency in circling approaches; and satisfactorily perform all maneuvers and procedures throughout the entire practical test as a single pilot.

**C. Completion Standards:** At the completion of this lesson, the pilot must be able to perform the maneuvers contained in this lesson to the Commercial or Airline Transport Pilot – Type Rating Airmen Certification Standards and takeoff and land without assistance from the instructor.

## **PRACTICAL TEST**

**A. Objective:** The practical test shall be conducted in a Cessna 421 series aircraft or FAA Approved Flight Simulator. The pilot shall be able to demonstrate knowledge of, and operational proficiency in the Cessna 421 series aircraft and its systems during the practical test and meet the standards in the current Commercial or Airline Transport Pilot Airplane Airmen Certification Standards.

**B. Content:**

- 1) Oral examination.
- 2) Flight test.
- 3) Evaluation and critique.

**C. Completion Standards:** The pilot shall demonstrate the proficiency required to pass the practical test within the criteria specified in the current Commercial or Airline Transport Pilot Airmen Certification Standards.