



# ***Aircraft Electronics Technician AET***

## ***Study Guide***

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# NCATT Aircraft Electronics Technician (AET)

## Study Guide

### Description

This **AET Study Guide** is designed to be used in preparing for the NCATT AET Certification examination. The study guide addresses each NCATT AET knowledge “Standard” and the required level of understanding for passing the AET examination. The AET examination will ask one or more questions from each of the standards areas. Use of this study guide coupled with a serious review of the references and study materials that are provided on the NCATT website ([www.ncatt.org](http://www.ncatt.org)) will ensure the technician is adequately prepared to join the ranks of “Certified Aircraft Electronics Technicians”.

### References

- Applicable Textbooks
- FAA Advisory Circulars
- Manufacturer Technical Data
- NCATT Web Resources [www.ncatt.org](http://www.ncatt.org)

## **Introductory and General Requirements**

### **1. Basic Terms and Definitions**

#### **(a) Direct Current (DC) Terms**

Identify basic facts about and define direct current (DC) terms to include:

- Direct current
- Electron
- Proton
- Neutron
- Conductor
- Insulator
- Static electricity
- Current
- Coulomb
- Ampere
- EMF
- Volt
- Resistance
- Ohm
- Watts
- Capacitor
- Inductor
- Battery
- Left-hand Rule
- Magnetism
- Magnetic permeability
- Scientific notation
- Metric prefixes
- Henry
- Farad

### **1. Basic Terms and Definitions**

#### **(b) Alternating Current (AC) Terms**

Identify the relationship of basic facts and state general principles about alternating current (AC) terms to include:

- Alternating current
- Frequency
- Impedance
- Capacitive reactance
- Inductive reactance
- Sine wave
- RMS
- Effective

- Phase
- Resistance
- Power factor
- True power
- Apparent power
- Wye wound
- Delta wound
- Polyphase
- Rectifier

## **2. Basic Circuits**

### **(a) Theory of Operations**

Identify the relationship of basic facts and state general principles about basic circuit theory of operation to include:

- Volts
- Amps
- Resistance
- Ohm's Law
- Power
- Watts
- Joules
- Series circuits
- Parallel circuits
- Complex circuits
- Voltage drop
- Resistors in series circuits
- Resistors in parallel circuits
- Kirchoff's Law
- Bridge circuits

## **2. Basic Circuits**

### **(b) Troubleshoot Circuits**

Determine procedures for troubleshooting basic electrical circuits to include:

- Series circuit
- Parallel circuit
- Complex circuit voltage drop
- Resistors in series circuit
- Resistors in parallel circuit
- Kirchoff's Law
- Bridge circuits

## **3. Basic Circuit Calculations**

**(a) DC**

Identify the relationship of basic facts and state general principles for DC circuit calculations to include:

- Volts
- Amps
- Ohms
- Watts

**3. Basic Circuit Calculations**

**(b) AC**

Identify the relationship of basic facts and state general principles for AC circuit calculations to include:

- Phase angle
- Frequency
- Capacitive reactance
- Inductive reactance
- Power factor
- Period
- Peak voltage
- Effective (working) voltage
- Inductance
- Resonance
- Capacitance
- Impedance
- True power
- Apparent power

**3. Basic Circuit Calculations**

**(c) DC/AC Measurements**

Determine procedures for calculating basic DC and AC measurements using:

- Voltmeters
- Ohmmeters
- Oscilloscopes
- Ammeters

**4. Resistors**

**(a) Color Codes**

Identify basic facts and terms about resistor identification (values) using color codes.

#### **4. Resistors**

##### **(b) Isolate Faulty Resistors**

Determine procedures for isolating faulty resistors within a circuit to include:

- Open Resistors
- Shorted Resistors
- Resistors of incorrect value
- Improperly installed Resistors

#### **5. Inductors**

##### **(a) Theory of Operation**

Identify the relationship of basic facts and state general principles about inductor theory of operations to include:

- Correct operation of Inductors (coils)
- Use of multiple Inductors
- Calculation of inductive reactance

#### **5. Inductors**

##### **(b) Isolate Faulty Inductors**

Identify the relationship of basic facts and state general principles for isolating faulty inductors to include:

- Open Inductors
- Shorted Inductors
- Improperly installed Inductors

#### **6. Capacitors**

##### **(a) Theory of Operation**

Identify the relationship of basic facts and state general principles about capacitor theory of operation to include:

- Correct operation of Capacitors
- Use of multiple Capacitors
- Calculation of capacitive reactance
- Time constants
- Fixed Capacitors
- Variable Capacitors
- Dielectric
- Farad
- Electrolytic

## **6. Capacitors**

### **(b) Isolate Faulty Capacitors**

Determine procedures for isolating faulty capacitors in a circuit to include:

- Open Capacitors
- Shorted Capacitors
- Improperly installed Capacitors

## **7. Transformers**

### **(a) Theory of Operation**

Identify the relationship of basic facts and state general principles about transformer theory of operation to include:

- Primary winding
- Secondary winding
- Eddy currents
- Counter EMF
- Step-up
- Step-down
- Hysteresis

## **7. Transformers**

### **(b) Isolate Faulty Transformers**

Determine procedures for isolating faulty transformers within a circuit to include:

- Open or shorted Primary Coil
- Secondary Coil
- Improperly installed Transformers
- Primary and secondary resistance testing

## **8. Analog Circuits, Devices and Switches**

Identify the relationship of basic facts and state general principles about use and operation of analog circuits, analog devices and analog switches to include:

- Switches
- Relays
- Solenoids
- Derating factors
- Normally open
- Normally closed
- DPST
- SPDT

- DPDT
- Rocker
- Toggle
- Rotary
- Micro Switch
- Push button Switch
- Proximity switches

## **9. Power Supply Circuits**

### **(a) Rectifiers**

Identify the relationship of basic facts and state general principles for power supply circuit rectifiers to include:

- Use of power supply circuits
- Types of components used
- Solid-state
- Silicon
- Germanium
- Forward bias
- Reverse bias
- Diode
- Full-wave Rectifier
- Half-wave Rectifier
- Three phase Rectifier
- Ripple amplitude

## **9. Power Supply Circuits**

### **(b) Filters**

Identify basic facts and terms about power supply circuit filters to include:

- Active filters
- Passive filters

## **10. Frequency Sensitive Filters**

### **Theory of Operation**

Identify basic facts and terms about the theory of operation for frequency sensitive filters to include:

- Filtering
- High-pass
- Band-pass
- Band-reject
- Tuning circuit

- Detection
- Demodulation
- Use of crystals
- Cutoff frequency

## **11. Wave Generation Circuits**

### **(a) Oscillators**

Identify basic facts and terms about the theory of operation for wave generation circuit oscillators to include:

- Oscillator
- LC tank
- Crystal-controlled Oscillator
- Hartley Oscillator
- Regenerative feedback path

## **11. Wave Generation Circuits**

### **(b) Wave shaping Circuits**

Identify basic facts and terms about the theory of operation for wave shaping circuits to include:

- Oscillator
- LC tank
- Crystal-controlled Oscillator
- Monostable Multivibrator
- Astable Multivibrator
- Bistable Multivibrator

## **12. Limiter Circuits**

### **(a) Diodes**

Identify the relationship of basic facts and state general principles about operation of limiter circuit diodes to include:

- Schematic diagram symbol
- Proper use and installation
- Forward bias
- Reverse bias

## **12. Limiter Circuits**

### **(b) Zener Diodes**

Identify the relationship of basic facts and state general principles about operation of limiter circuit zener diodes to include:

- Schematic diagram symbol
- Proper use and installation

## **12. Limiter Circuits**

### **(c) Transistors**

Identify the relationship of basic facts and state general principles about operation of limiter circuit transistors to include:

- Schematic diagram symbol
- Proper use and installation
- PNP
- NPN
- Polarity of connections
- Bipolar
- Collector current
- Base current
- Emitter current
- Emitter Base Junction
- Collector Base Junction

## **13. Digital Numbering Systems**

### **(a) Binary**

Identify the relationship of basic facts and state general principles about binary digital numbering systems to include:

- Digital signal
- One
- Zero
- Conversion from/to digital and hexadecimal

## **13. Digital Numbering Systems**

### **(b) Octal**

Identify the relationship of basic facts and state general principles about octal digital numbering systems to include:

- Octal notation
- Triad
- Conversion from/to binary and decimal

## **13. Digital Numbering Systems**

### **(c) Hexadecimal**

Identify the relationship of basic facts and state general principles about hexadecimal digital numbering systems to include:

- Base 16
- Hex to decimal conversion
- Decimal to hex conversion

#### **14. Digital Logic Functions**

##### **(a) Main Logic Gates**

Identify the relationship of basic facts and state general principles about digital logic functions utilizing main logic gates to include:

- Positive and negative logic
- Display of digital data
- Truth tables
- Logic gates
- AND
- OR
- INVERT
- NOR
- NAND
- Exclusive OR
- Proper use and installation

#### **14. Digital Logic Functions**

##### **(b) Flip-flops**

Identify the relationship of basic facts and state general principles about digital logic functions utilizing flip-flops to include:

- Latches
- RS latch
- Data-type latch
- Clock pulse
- JK flip-flop
- Asynchronous flip-flop
- Advantages of flip-flops

#### **14. Digital Logic Functions**

##### **(c) Counters**

Identify the relationship of basic facts and state general principles about digital logic functions utilizing counters to include:

- Adder and subtractor circuits

- Half-adder
- Full-adder
- Subtractor
- Asynchronous
- Synchronous
- Frequency division characteristics
- Counter triggering method

#### **14. Digital Logic Functions**

##### **(d) Adders**

Identify the relationship of basic facts and state general principles about digital logic functions utilizing adders to include:

- Adder
- Half-adder
- Full-adder

#### **Common Maintenance Practices**

#### **15. Hazards/Safety Practices**

##### **(a) RF Energy**

Identify basic facts and terms about hazards and safety practices concerning RF energy.

#### **15. Hazards/Safety Practices**

##### **(b) Noise**

Identify basic facts and terms about hazards and safety practices concerning noise.

#### **15. Hazards/Safety Practices**

##### **(c) Electrical Power**

Identify basic facts and terms about hazards and safety practices concerning electrical power to include:

- Circuit protection devices
- Elimination/termination of circuit power

#### **15. Hazards/Safety Practices**

##### **(d) ESD Protection**

Identify basic facts and terms about hazards and safety practices concerning ESD protection.

#### **15. Hazards/Safety Practices**

##### **(e) Microwave**

Identify basic facts and terms about hazards and safety practices concerning microwave energy.

## **15. Hazards/Safety Practices**

### **(f) Hazardous Liquids**

Identify basic facts and terms about hazards and safety practices concerning hazardous liquids to include:

- MEK
- Acetone
- Solvents
- Cleaners and caustic solutions used in electronics
- How to obtain proper Material Safety Data Sheet (MSDS) information

## **15. Hazards/Safety Practices**

### **(g) Practice FOD Prevention**

Determine simple facts about practicing Foreign Object Damage (FOD) prevention to include:

- Foreign Object Elimination (FOE)
- Tool Control and management
- Housekeeping

## **15. Hazards/Safety Practices**

### **(h) First Aid for Electrical Shock**

Identify basic facts and terms about First Aid for electrical shock to include:

- Proper steps to take in case of need for First Aid
- How to rescue someone hurt by electrical shock
- First Aid and CPR

## **16. Hazardous Materials Handling**

### **(a) Types of Hazardous Materials/Fluids**

Identify basic facts and terms about hazardous materials and fluids to include:

- OSHA standard 29 CFR 1910.1200
- Use of MSDS (See 16e.)
- Handling of chemicals
- Physical health hazards
- Explosive health hazards
- Workplace communication programs

**16. Hazardous Materials Handling**  
**(b) Handling Procedures**

Identify basic facts and terms about handling hazardous materials.

**16. Hazardous Materials Handling**  
**(c) Storage and Labeling**

Identify basic facts and terms about storage and labeling of hazardous materials.

**16. Hazardous Materials Handling**  
**(d) Proper Disposal**

Identify basic facts and terms about proper disposal of hazardous materials.

**16. Hazardous Materials Handling**  
**(e) Material Safety Data Sheet (MSDS)**

Identify basic facts and terms about use of Material Safety Data Sheets.

**17. Technical Publications**

**(a) Interpret Installation Manuals**

Identify basic facts and terms about interpreting installation manuals.

**17. Technical Publications**

**(b) Interpret Technical Data**

Identify basic facts and terms about interpreting technical data to include:

- Schematic diagrams
- Wiring diagrams
- Block diagrams
- Pictorial diagrams

**17. Technical Publications**

**(c) Locate and interpret avionics installation data**

Identify basic facts and terms about locating and interpreting avionics installation data to include:

- Approved flight manual supplements
- Aircraft maintenance records
- Aircraft equipment lists
- Aircraft weight and balance
- Supplemental Type Certificates (STC's)

**17. Technical Publications**

**(d) Interpret wiring diagrams**

Identify basic facts and terms about interpreting wiring diagrams.

**17. Technical Publications**

**(e) Interpret charts/blueprints/drawings/sketches**

Identify basic facts and terms about interpreting charts, blueprints, drawings and sketches.

## **17. Technical Publications**

### **(f) Interpret Aircraft Equipment List Information**

Identify basic facts and terms about interpreting aircraft equipment list information.

## **Fundamentals of On-Equipment Maintenance**

### **18. Use Common Tools**

Determine procedures for using common tools.

### **19. Handling of Electrostatic Devices**

Identify basic facts and terms about handling of electrostatic devices.

### **20. Identify and Perform Corrosion Control**

Identify simple facts about identification of corrosion and performance corrosion control to include:

- Galvanic
- Pitting
- Exfoliation
- Intergranular

### **21. Use Safelying Devices**

#### **(a) Safety Wire**

Identify simple facts about use of safety wire to include:

- All types of safety devices
- Types and sizes of safety wire
- Acceptable safety wire practices

### **21. Use of Safelying Devices**

#### **(b) Shear Wire**

Identify simple facts about use of shear wire.

## **22. Aircraft Wiring**

### **(a) Multiconductor**

Identify basic facts and terms about use of multiconductor aircraft wire.

**22. Aircraft Wiring**  
**(b) Coaxial**

Identify basic facts and terms about use of coaxial aircraft wire.

**22. Aircraft Wiring**  
**(c) Twisted Pair**

Identify basic facts and terms about use of twisted pair aircraft wire.

**22. Aircraft Wiring**  
**(d) Single Conductor**

Identify basic facts and terms about use of single conductor aircraft wire.

**23. Perform Wire Maintenance**  
**Continuity Checks**

Use multimeter or appropriate tooling to perform continuity checks on wiring or electrical equipment.

**24. Use Test Equipment/Special Tools**  
**(a) Analog Multimeters**  
**(b) Digital Multimeters**  
**(c) Oscilloscope**

Determine procedures for using test equipment and special tools.

**Aircraft Fundamentals**

**25. Aviation Terminology**

Identify basic facts and terms about aircraft design and construction techniques to include:

- Fuselage
- Wings
- Empennage components
- Internal and external bracing for structural integrity
- Streamlining and drag reduction for airframes and structures
- Aircraft axis and controls
- Aerodynamic forces

## **26. Basic Aviation/Aircraft Fundamentals and Safety**

Identify basic facts and terms about aviation/aircraft fundamentals and safe ground operations to include:

- Ground movement of aircraft
- Storage of aircraft (e.g. preparation for and removal from storage)
- Aircraft pre- and post-flight inspection

## **27. Basic Troubleshooting Theory**

Identify basic facts and terms about troubleshooting theory to include:

- Use of basic troubleshooting tools (e.g. multimeter, continuity testers, oscilloscope)
- Steps in troubleshooting process

## **28. Identify Flight Controls**

Identify basic facts and terms about identification of flight controls to include:

- Theory of flight (e.g. Bernoulli's Principal, Newton's Laws of Motion, airfoils, forces that act on the aircraft in flight)
- Flight controls (e.g. primary, secondary, auxiliary)

## **29. Safety (Operational Risk Management/Fall Protection)**

Identify basic facts and terms about operation risk management/fall protection to include:

- Causes of accidents (as related to the human element)
- Proper techniques for lifting or moving objects