



NATIONAL CENTER FOR AEROSPACE & TRANSPORTATION TECHNOLOGIES

Aircraft Electronics Technician (AET) Standard

NCATT

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NCATT Aircraft Electronics Technician (AET) Standard Subject, Performance and Task Knowledge Requirements

- I. **Introductory and General Requirements**
- II. **Common Maintenance Practices**
- III. **Fundamentals of On Equipment Maintenance**
- IV. **Aircraft Fundamentals**

There are thirty-three basic fundamental *Subject Knowledge, Task Performance and Task Knowledge* activities and functions within the NCATT Standards for an Aircraft Electronics Technician (AET). The AET Standards were identified and defined by aerospace industry Subject-Matter-Experts (SMEs) through an NCATT facilitated, industry recognized, occupational analysis workshop. NCATT workshops focus on the “job” a technician performs in relation to an identified topic or career field.

The NCATT AET *Standards* can be used by Aerospace Industry education and training entities to develop lesson plans as part of a complete education and training program focused on Aircraft Electronics Technicians. They can also be used to develop specialized and/or targeted AET education and training needs.

Individuals can use this document in preparation to challenge the related endorsement exam(s) by using it as a guide to find relevant materials during the study process.

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NCATT Level Definitions

	Scale Value	Definition: The Individual
Task Performance Levels	1	IS EXTREMELY LIMITED. (Can do simple parts of the task. Needs to be told or shown how to do most of the task)
	2	IS PARTIALLY PROFICIENT. (Can do most parts of the task. Needs only help on hardest parts.)
	3	IS COMPETENT. (Can do all parts of the task. Needs only a spot check of completed work.)
	4	IS HIGHLY PROFICIENT. (Can do the complete task quickly and accurately. Can tell or show others how to do the task.)
Task Knowledge Levels	a	KNOWS NOMENCLATURE. (Can name parts, tools, and simple facts about the task.)
	b	KNOWS PROCEDURES. (Can determine step-by-step procedures for doing the task.)
	c	KNOWS OPERATING PRINCIPLES. (Can identify why and when the task must be done and why each step is needed.)
	d	KNOWS ADVANCED THEORY. (Can predict, isolate, and resolve problems about the task.)
*Subject Knowledge Levels	A	KNOWS FACTS. (Can identify basic facts and terms about the subject.)
	B	KNOWS PRINCIPLE. (Can identify relationship of basic facts and state general principles about the subject.)
	C	KNOWS ANALYSIS. (Can analyze facts and principles and draw conclusions about the subject.)
	D	KNOWS EVALUATION. (Can evaluate conditions and make proper decisions about the subject.)

Explanations

A task knowledge scale value may be used alone or with a task performance scale value to define a level of knowledge for a specific task. (Example: b and 1b)

*A subject knowledge scale value is used alone to define a level of knowledge for a subject not directly related to any specific task, or for a subject common to several tasks.

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REFERENCES

**The Reference listing is for suggested materials and does not encompass all available references for use. Inclusion in this reference list is not indicative of an NCATT endorsement of materials.*

1. United States, Federal Aviation Administration. (1998). AC43.13 1B (With Change 1) & 2A* (With Change 2): Acceptable Methods, Techniques, and Practices: Aircraft Inspection, Repair, and Alterations. Washington: GPO. Reprinted by Jeppesen Sanderson Training Products. *As of 03/03/2008, 2A, Alterations, is revised to 2B.
2. FAR Handbook for Aviation Maintenance Technicians
3. United States, Federal Aviation Administration. (1976). AC65-9A Airframe and Powerplant Mechanics General Handbook. Washington: GPO
4. United States, Federal Aviation Administration. (1976). AC65-15A Airframe and Powerplant Mechanics Airframe Handbook. Washington: GPO.
5. Electrical/Electronics Textbook
6. Manufacturer's Avionics Installation Instruction Service Manuals

NCATT Aircraft Electronics Technician (AET) Standard Subject, Performance and Task Knowledge Requirements

I. Introductory and General Requirements

1. Direct Current (DC) Basic Terms

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

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

2. Alternating Current (AC) Basic Terms

NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows and can identify the relationship of basic facts and state general principles* about “Alternating Current”. The following is a minimum list of terms associated with this subject.

- Alternating current
- Apparent power
- Capacitive reactance
- Delta wound
- Effective
- Frequency
- Impedance
- Inductive reactance
- Phase
- Polyphase
- Power factor
- Rectifier
- Resistance
- RMS
- Sine wave
- True power
- Wye wound

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3. Basic Circuit Theory of Operation

NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows and can identify the relationship of basic facts and state general principles* about “Basic Circuit Theory of Operation”. The following is a minimum list of terms associated with this subject.

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

4. Basic Circuit Troubleshooting

NCATT Level 2b

Outcome: A successful education or training outcome for this task/subject will produce an individual who is *partially proficient* in the performance task of “Basic Circuit Troubleshooting”. The individual *will be able to do most parts of the task and will need help only on the hardest parts*. In addition, he or she *will know the task procedures, and can determine the step-by-step procedures* for doing the task. The following is a minimum list of terms associated with this task.

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

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5. Basic Circuit Calculations

NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows and can identify the relationship of basic facts and state general principles* about “Basic Circuit Calculations”. The following is a minimum list of terms associated with this subject.

- AC
 - Apparent power
 - Capacitance
 - Capacitive reactance
 - Effective (working) voltage
 - Frequency
 - Impedance
 - Inductance
 - Inductive reactance
 - Peak voltage
 - Period
 - Phase angle
 - Power factor
 - Resonance
 - True power
- DC
 - Amps
 - Ohms
 - Volts
 - Watts

6. DC / AC Basic Circuit Measurements

NCATT Level 2b

Outcome: A successful education or training outcome for this task/subject will produce an individual who is *partially proficient* in the performance task of “DC / AC Basic Circuit Measurements”. The individual *will be able to do most parts of the task and will need help only on the hardest parts*. In addition, he or she *will know the task procedures, and can determine the step-by-step procedures* for doing the task. The following is a minimum list of terms associated with this task.

- Ammeters
- Ohmmeters
- Oscilloscopes
- Voltmeters

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7. Resistor / Color Codes

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

- The use of color codes to identify resistor / resistance values

8. Resistor / Fault Isolation

NCATT Level 2b

Outcome: A successful education or training outcome for this task/subject will produce an individual who is *partially proficient* in the performance task of “Resistor / Fault Isolation”. The individual *will be able to do most parts of the task and will need help only on the hardest parts*. In addition, he or she *will know the task procedures, and can determine the step-by-step procedures* for doing the task. The following is a minimum list of terms associated with this task.

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

9. Inductors

NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows and can identify the relationship of basic facts and state general principles* about “Inductors”. The following is a minimum list of terms associated with this subject.

- Theory of Operation
 - Calculation of inductive reactance
 - Correct operation of Inductors (coils)
 - Use of multiple Inductors
- Isolate Faulty Inductors
 - Improperly installed Inductors
 - Open Inductors
 - Shorted Inductors

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10. Capacitor / Theory of Operation

NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows and can identify the relationship of basic facts and state general principles* about “Capacitor Theory of Operation”. The following is a minimum list of terms associated with this subject.

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

11. Capacitor / Fault Isolation

NCATT Level 2b

Outcome: A successful education or training outcome for this task/subject will produce an individual who is *partially proficient* in the performance task of “Capacitor / Fault Isolation”. The individual *will be able to do most parts of the task and will need help only on the hardest parts*. In addition, he or she *will know the task procedures, and can determine the step-by-step procedures* for doing the task. The following is a minimum list of terms associated with this task.

- Improperly installed Capacitors
- Open Capacitors
- Shorted Capacitors

12. Transformer / Theory of Operation

NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows and can identify the relationship of basic facts and state general principles* about “Transformer Theory of Operation”. The following is a minimum list of terms associated with this subject.

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

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13. Transformer / Fault Isolation

NCATT Level 2b

Outcome: A successful education or training outcome for this task/subject will produce an individual who is *partially proficient* in the performance task of “Transformer / Fault Isolation”. The individual *will be able to do most parts of the task and will need help only on the hardest parts*. In addition, he or she *will know the task procedures, and can determine the step-by-step procedures* for doing the task. The following is a minimum list of terms associated with this task.

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

14. Analog Circuits, Devices & Switches

NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows and can identify the relationship of basic facts and state general principles* about “Analog Circuits, Devices and Switches”. The following is a minimum list of terms associated with this subject.

- Derating factors
- DPDT
- DPST
- Micro Switch
- Normally closed
- Normally open
- Proximity switches
- Push button Switch
- Relays
- Rocker
- Rotary
- Solenoids
- SPDT
- Switches
- Toggle

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15. Power Supply Circuit / Rectifiers

NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows and can identify the relationship of basic facts and state general principles* about “Power Supply Circuit / Rectifiers”. The following is a minimum list of terms associated with this subject.

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

16. Power Supply Circuit / Filters

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

- Active filters
- Passive filters

17. Frequency Sensitive Filter - Theory of Operation

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

- Band-pass
- Band-reject
- Cutoff frequency
- Demodulation
- Detection
- Filtering
- High-pass
- Tuning circuit
- Use of crystals

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18. Wave Generation Circuits

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

- Oscillators
 - Crystal-controlled Oscillator
 - Hartley Oscillator
 - LC tank
 - Oscillator
 - Regenerative feedback path
- Waveshaping Circuits
 - Astable Multivibrator
 - Bistable Multivibrator
 - Crystal-controlled Oscillator
 - LC tank
 - Monostable Multivibrator
 - Oscillator

19. Limiter Circuits

NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows and can identify the relationship of basic facts and state general principles* about “Limiter Circuits”. The following is a minimum list of terms associated with this subject.

- Diodes
 - Forward bias
 - Proper use and installation
 - Reverse bias
 - Schematic diagram symbol
- Zener Diodes
 - Proper use and installation
 - Schematic diagram symbol
- Transistors
 - Base current
 - Bipolar
 - Collector Base Junction
 - Collector current
 - Emitter Base Junction
 - Emitter current
 - NPN
 - PNP
 - Polarity of connections
 - Proper use and installation
 - Schematic diagram symbol

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20. Digital Numbering Systems

NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows and can identify the relationship of basic facts and state general principles* about “Digital Numbering Systems”. The following is a minimum list of terms associated with this subject.

- Binary
 - Conversion from/to digital and hexadecimal
 - Digital signal
 - One
 - Zero
- Octal
 - Conversion from/to binary and decimal
 - Octal notation
 - Triad
- Hexadecimal
 - Base 16
 - Decimal to hex conversion
 - Hex to decimal conversion

21. Digital Logic Functions

NCATT Level B

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows and can identify the relationship of basic facts and state general principles* about “Digital Logic Functions”. The following is a minimum list of terms associated with this subject.

- Main Logic Gates
 - AND
 - Display of digital data
 - Exclusive OR
 - INVERT
 - Logic gates
 - NAND
 - NOR
 - OR
 - Positive and negative logic
 - Proper use and installation
 - Truth tables
- Flip-Flops
 - Advantages of flip-flops
 - Asynchronous flip-flop
 - Clock pulse
 - Data-type latch
- JK flip-flop
- Latches
- RS latch
- Counters
 - Adder and subtractor circuits
 - Asynchronous
 - Counter triggering method
 - Frequency division characteristics
 - Full-adder
 - Half-adder
 - Subtractor
 - Synchronous
- Adders
 - Adder
 - Full-adder
 - Half-adder

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II. Common Maintenance Practices

22. Hazards / Safety Practices

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

- RF Energy
- Noise
- Electrical Power
 - Circuit protection devices
 - Elimination/termination of circuit power
- ESD Protection
- Microwave
- Hazardous Liquids
 - Acetone
 - Cleaners and caustic solutions used in electronics
 - How to obtain proper Material Safety Data Sheet (MSDS) information
 - MEK
 - Solvents
- First Aid for Electrical Shock
 - First Aid and CPR
 - How to rescue someone hurt by electrical shock
 - Proper steps to take in case of need for First Aid

23. Hazardous Materials Handling

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

- Handling Procedures
- Material Safety Data Sheet
- Proper Disposal
- Storage & Labeling
- Types of Hazardous Materials / Fluids

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24. FOD Prevention

NCATT Level 1a

Outcome: A successful education or training outcome for this task/subject will produce an individual who is *extremely limited* in the performance task of “FOD Prevention”. The individual *will be able to do simple parts of the task*. He or she will need to be told or shown how to do most of the task. In addition, he or she *can name parts, tools and simple facts* about the task.

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

25. Technical Publications

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

- Interpret Installation Manuals
- Interpret Technical Data
 - Block diagrams
 - Pictorial diagrams
 - Schematic diagrams
 - Wiring diagrams
- Locate & Interpret Avionics Installation Data
 - Aircraft equipment lists
 - Aircraft maintenance records
 - Aircraft weight and balance
 - Approved flight manual supplements
 - Supplemental Type Certificates (STC's)
- Interpret Wiring Diagrams
- Interpret Charts, Blueprints, Drawings & Sketches
- Interpret Aircraft Equipment List Information

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III. Fundamentals of On-Equipment Maintenance

26. Use Common Tools

NCATT Level 2b

Outcome: A successful education or training outcome for this task/subject will produce an individual who is *partially proficient* in the performance task of “Use of Common Tools”. The individual *will be able to do most parts of the task and will need help only on the hardest parts*. In addition, he or she *will know the task procedures, and can determine the step-by-step procedures* for doing the task. The following is a minimum list of common tools associated with this task.

- General-Purpose Tools (Examples)
 - Hammers / Mallets
 - Screwdrivers
 - Pliers / Plier Type Cutting Tools
 - Punches
 - Wrenches / Special Wrenches
- Metal Cutting Tools (Examples)
 - Hand Snips
 - Files
 - Drills
 - Twist Drills
 - Reamers
- Layout and Measuring Tools (Examples)
 - Scales
 - Tapes
 - Dividers
- Soldering Iron / Gun
- Crimping Tools
- Stripping Tools
- Magnifiers

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27. Handling Electrostatic Devices

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

- Recognizing and preventing damage to electronic components due to Electrostatic Discharge (ESD)

28. Identify & Perform Corrosion Control

NCATT Level a

Outcome: A successful education or training outcome for this task/subject will produce an individual who *knows the nomenclature* used in the performance task of “Identifying and Performing Corrosion Control”. In addition, he or she *can name parts, tools and simple facts* about the task. The following is a minimum list of terms associated with this task.

- Exfoliation
- Galvanic
- Intergranular
- Pitting

29. Use Safety Devices

NCATT Level 1a

Outcome: A successful education or training outcome for this task/subject will produce an individual who is *extremely limited* in the performance task of “Use of Safety Devices”. The individual *will be able to do simple parts of the task*. He or she will need to be told or shown how to do most of the task. In addition, he or she *can name parts, tools and simple facts* about the task. The following is a minimum list of devices associated with this task.

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

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30. Aircraft Wiring

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

- Coaxial Cable
- Databus (Multiplex) Cables
- Multiconductor
- Single Conductor
- Twisted Pair

31. Perform Wire Maintenance

NCATT Level 3c

Outcome: A successful education or training outcome for this task/subject will produce an individual who is *competent* in the performance task of “Performance of Wire Maintenance”. The individual *will be able to do all parts of the task and will need only a spot check of completed work*. In addition, he or she *will know the operating principles* used with this standard, and *can identify why and when the task must be done and why each step is needed*. The following is a minimum list of performance items associated with this task.

- Lacing / Tying Wire Bundles
- Cutting Wire / Cables
- Splicing
- Connecting Terminals
- Connecting Terminals to Terminal Blocks
- Bonding and Grounding
- Conduit
- Continuity Checks
- Wiring Inspections

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32. Use Test Equipment / Special Tools

NCATT Level 2b

Outcome: A successful education or training outcome for this task/subject will produce an individual who is *partially proficient* in the performance task of “Use of Test Equipment / Special Tools”. The individual *will be able to do most parts of the task and will need help only on the hardest parts*. In addition, he or she *will know the task procedures, and can determine the step-by-step procedures* for doing the task.

- Analog Multimeter
- Continuity Tester
- Digital Multimeter
- Oscilloscope
-

IV. Aircraft Fundamentals

33. Aircraft Structures

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

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

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34. Aircraft Handling and Safety

NCATT Level A

Outcome: A successful education or training outcome for this task/subject will produce an individual who *can identify basic facts and terminology* related to:

- Ground Operations and Safety
 - Aircraft pre- and post-flight inspection
 - Ground movement of aircraft
 - Storage of aircraft (e.g. preparation for and removal from storage)
- Operations Risk Management/Fall Protection
 - EPA
 - OSHA