



Avionics Systems Course: Aircraft Power, Data Buses, Radios and Fault Isolation



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Introduction:

Avionics systems, from aircraft power and data buses to radios and fault isolation, are the subject of this 10-day course for licensed and trainee maintenance engineers, avionics technicians and MRO engineering staff, which ends with an Avionics Fault Isolation Report and Maintenance Record Entry for a case defect. Operators lose dispatch reliability when avionics faults are cleared by swapping line replaceable units and wiring damage goes unseen. Nominees already carry out line or base maintenance and work through labs with bus analysers, test sets and fault data. CoreConcept Training Center delivers this avionics systems course.

Course Objectives:

- Trace aircraft electrical power from generators, transformer rectifier units, inverters and batteries through bus bars and protection to avionics loads
- Decode ARINC 429 words, ARINC 664 Part 7 virtual link traffic and MIL-STD-1553 messages with a bus analyser and judge their health
- Check air data, inertial reference, attitude and heading data feeding flight instruments, autopilot, flight director and flight management functions
- Test communication, navigation, transponder, TCAS and weather radar installations with ramp test sets and interpret their built-in test results
- Inspect EWIS wiring, connectors, bonding and shielding and apply ESD handling and wiring repair practices to avionics work
- Isolate an avionics defect from symptom to root cause and record the rectification, modification status and return-to-service entry

Target Audience:

- Licensed maintenance engineers responsible for certifying avionics and electrical work on line and base inputs
 - Trainee maintenance engineers building avionics type and system knowledge before taking on certifying duties
 - Avionics technicians responsible for testing, removing and installing line replaceable units and clearing system faults
 - Avionics workshop staff responsible for bench testing, repair and functional checks of avionics units
 - MRO engineering staff responsible for avionics troubleshooting support, modification embodiment and technical queries
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Course Outline:

Day 1: Aircraft Electrical Power Generation and Distribution

- AC Generator Drive and Frequency Control Arrangements
- Generator Control Unit Voltage Regulation and Protection Trips
- AC and DC Bus Bar Architecture and Load Transfer
- External Power and Auxiliary Power Unit Supply Priority Logic
- Circuit Breaker, Relay and Contactor Load Distribution Tracing

Day 2: Batteries, Power Conversion and Essential Avionics Supplies

- Nickel-Cadmium and Lithium-Ion Aircraft Battery Characteristics
- Battery Charger Control, Capacity Check and Thermal Monitoring
- Transformer Rectifier Unit Output Checks and Load Sharing
- Static Inverter Supply to Essential Avionics Instruments
- Emergency and Standby Bus Load Shedding Sequence Review

Day 3: Digital Fundamentals and the ARINC 429 Data Bus

- Binary, Octal, BCD and Two's Complement Data Encoding
- ARINC 429 Word Label, SDI, Data and SSM Fields
- ARINC 429 Parity, Bit Rate and Receiver Loading Limits
- Twisted Shielded Pair Termination and Differential Signal Checks
- Bus Analyser Capture of Live ARINC 429 Label Traffic

Day 4: AFDX Networks, MIL-STD-1553 and Data Bus Diagnostics

- ARINC 664 Part 7 End Systems, Switches and Virtual Links
- Bandwidth Allocation Gap and Redundant Network A and B Operation
- MIL-STD-1553 Bus Controller, Remote Terminal and Bus Monitor Roles
- Manchester Encoding, Transformer Coupling and Stub Fault Checks
- Network Fault Logs Compared Across Three Bus Families

Day 5: Flight Instruments, Air Data and Inertial Reference with Guided Case

- Pitot-Static Plumbing, Probe Heating and Leak Test Practice
 - Air Data Computer Outputs for Altitude, Airspeed and Temperature
 - Inertial Reference Unit Alignment, Drift and Attitude Outputs
 - Standby Attitude and Magnetic Heading Reference Cross-Checks
 - Guided Case on an Airspeed Disagree Bus Fault
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Day 6: Autopilot, Flight Director and Flight Management Systems

- Autopilot Servo Loops, Engagement Interlocks and Disconnect Logic
- Flight Director Command Bars and Mode Annunciation Checks
- Autothrottle Interface and Mode Control Panel Inputs
- Flight Management Computer Navigation Database Loading Procedure
- Autoflight Fault Messages Traced Through Sensor Validity Data

Day 7: Communication and Navigation Radio Systems

- VHF Communication Transceiver, Antenna and Audio Panel Checks
- HF Communication Coupler Tuning and Selective Calling Test
- VOR and DME Receiver Function and Ramp Test Set Use
- ILS Localiser, Glideslope and Marker Beacon Signal Checks
- GNSS Receiver Antenna, Satellite Status and Position Integrity

Day 8: Transponders, TCAS, Weather Radar, IMA and Display Systems

- Mode C and Mode S Transponder Reply and Altitude Checks
- TCAS Traffic and Resolution Advisory Functional Test
- Weather Radar Antenna Stabilisation and Radiation Safety Zone
- Integrated Modular Avionics Cabinets, Partitioning and Software Loading
- Display Unit, Symbol Generator and Display Source Switching

Day 9: Built-In Test, EWIS Inspection, ESD and Modification Records

- Built-In Test Equipment Fault History and Maintenance Messages
- EWIS Zonal Inspection for Chafing, Contamination and Heat Damage
- Wire Splice, Crimp Contact and Connector Repair Practice
- Bonding, Shield Termination and Electrostatic Discharge Handling Controls
- Avionics Modification Embodiment, Software Part Number and Configuration Records

Day 10: Lab Capstone on Avionics Fault Isolation and Record Entry

- Case Defect Brief with Crew Report and Fault History
 - Power Supply and Data Bus Checks on the Case System
 - Radio, Sensor and Display Path Isolation Using Test Sets
 - Rectification Action, Functional Test and Return-to-Service Criteria
 - Avionics Fault Isolation Report and Maintenance Record Entry Completion
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Skills You Will Gain:

- Aircraft Electrical Load Tracing
- Data Bus Signal Analysis
- Air Data and Inertial System Checks
- Autoflight System Troubleshooting
- Radio Navigation Ramp Testing
- Surveillance System Testing
- EWIS Damage Inspection
- Avionics Defect Recording

Why Attend This Course:

- Deliver an Avionics Fault Isolation Report and Maintenance Record Entry for a case defect to the shift supervisor and the maintenance control centre
- Decide whether a fault lies in a unit, its power supply, a data bus or the wiring before ordering a replacement part
- Cut no-fault-found removals, repeat defects and aircraft delays caused by unstructured avionics troubleshooting
- Pass on bus analyser capture methods, ramp test checklists and EWIS inspection criteria to hangar and workshop colleagues

Conclusion:

Back at work, the participant hands the Avionics Fault Isolation Report and Maintenance Record Entry to the shift supervisor and the maintenance control centre, who use it to accept the rectification and release the aircraft. Engineering staff use the same report to decide whether a repeat defect needs a wiring inspection, a unit shop finding or a technical query to the manufacturer. After the first recurring avionics defect handled this way, the unit should review time to isolate, parts removed and whether the fault returned.

Frequently Asked Questions FAQ:

What should participants know before an avionics systems course on data buses and fault isolation?

Participants should already hold or be working towards a maintenance licence or avionics role and understand basic electrical theory, units and test meters. Bringing an anonymised defect report from their own fleet helps them apply the fault isolation method during the labs.

How does an avionics systems course differ from an aircraft maintenance management course?

It teaches how avionics and electrical systems work and how to test and troubleshoot them on the aircraft. Maintenance management courses cover maintenance programmes, check planning, airworthiness directive control and contracts rather than system operation and fault finding.

Why do avionics systems faults so often trace back to wiring and data buses rather than the units themselves?

Many avionics units report a failure when their input data or power is missing or invalid. Chafed wires, poor connector contacts, broken shields and bus termination faults create those symptoms, so isolating supply and data paths first avoids replacing serviceable units.

What do participants take back from the avionics systems course?

Participants take back an Avionics Fault Isolation Report and Maintenance Record Entry for a case defect, plus bus decoding sheets, ramp test checklists, an EWIS inspection checklist and a fault isolation worksheet they can adapt to their own aircraft types.
