



**Ingenuity
in Flight.**



Aviation Maintenance Technician Training and Digital Systems

AAB International 2016
Doug Caldwell
Lead – In Service Engineering
21 July 2016

BOMBARDIER
the evolution of mobility

With the advances in technology aircraft design has reached a stage in its evolution where virtually all systems on all commercial aircraft are using digital data systems.

In addition to the traditional avionics systems, we now see digital electronics being used throughout aircraft design. Thrust management and engine controls, flight controls, environmental control systems, landing gear indication and control, fuel systems, hydraulic systems.

Some of the benefits of digital systems include:

- Reducing flight crew workload.
- Increased system health monitoring.
- Weight reduction.
- Maintenance cost savings

With digital systems comes a need to understand, maintain, troubleshoot and repair.

In the progression of digital systems design has gone from Hydro mechanical control systems to digital over sight systems with hydro mechanical back up to full authority digital control.

Full authority digital control requires a minimum dual channel redundancy.

- Doubling the potential to have a component fault.
- Increasing the number of sensors, inputs and outputs.
- Increasing cross system monitoring and interfacing.

Digital troubleshooting is limited by

- The technological ability of the system to self diagnose.
- The ability of the interfacing technician to interpret available diagnostic information.
- The technicians understanding of the effect of other interfacing systems.
- The technicians understanding of how a digital system communicates.

Basic Training Needs:

Digital terminology

Airplane digital systems overview

Basic computer structure

Logic symbols and gates

Digital data bus types and structure

Digital data word structure and data word reading

Electrostatic discharge sensitive devices.

Wiring diagrams.

Wire inspection and connector care.

- Ground studs, connector corrosion, connector cleaning and protection, analog transmission wires, digital data transmission wires, wire shields.
- Multi meter use.
- Insulation / resistance testing.

Fault codes – Time Limited Dispatch – fault filtering.

System fault tolerance - Message priorities - WARNING, CAUTION, ADVISORY, STATUS

As technology advances we find that digital data systems are using smaller voltages to transmit more and more data.

Visual wiring inspection techniques of old were effective in identifying certain conditions (heat damaged/burnt wire and vibration damage or chafing)

Cannot be relied upon to find other conditions: cracked insulation, arcing, corrosion, insulation delamination, contaminant ingress and degraded repairs or splices

An example of seldom understood digital system complexity:

Types of Grounding

AC returns

DC returns

Others

Mixing return currents from various sources should be avoided because noise will be coupled from one source to another and can be a major problem for digital systems

Additional maintenance training touch point possibilities:

Periodic visual inspections

Periodic signal path resistance checks

Reducing moisture and contaminant intrusion (drip shields, wire and connector protection (boots, potting, CRC's etc))

Clean-as-you-go philosophy

Repair of splices and/or replacement of wire on digital systems.



Q&A

BOMBARDIER

the evolution of mobility