

FAA 2nd Annual EAPAS Conference

**Certification and
Implementation of Airborne
Arc Fault Circuit Breakers**

Presented by

Stephen Slotte

FAA Transport Standards Staff



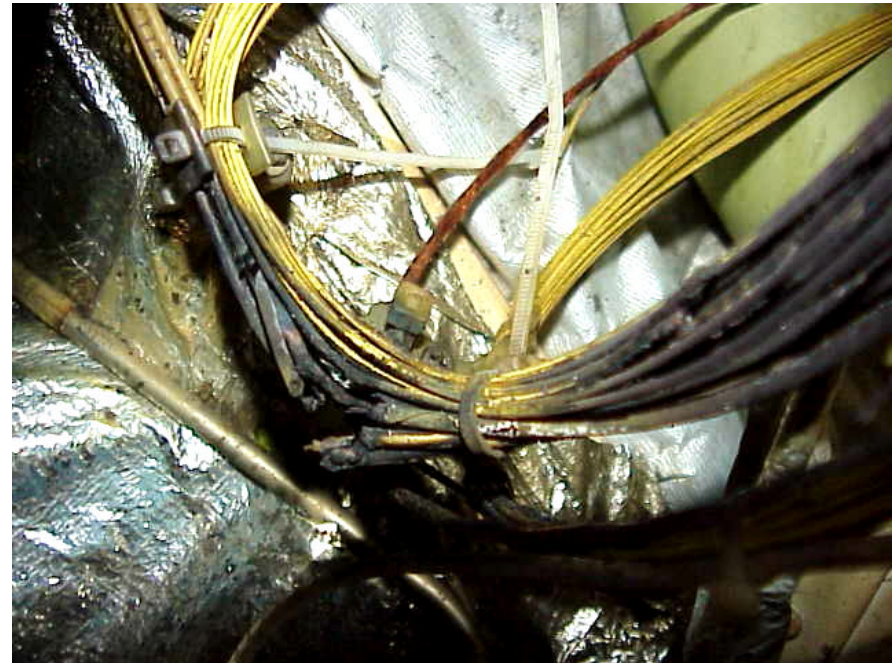
Background

- Aging Systems R,E & D
 - FAA R,E,&D
 - Intrusive Inspections
 - Arc Fault Circuit Breaker Development
 - Interconnect System Testing and Assessment
 - Inspection and Testing Technology Development



Background: Arc Faults

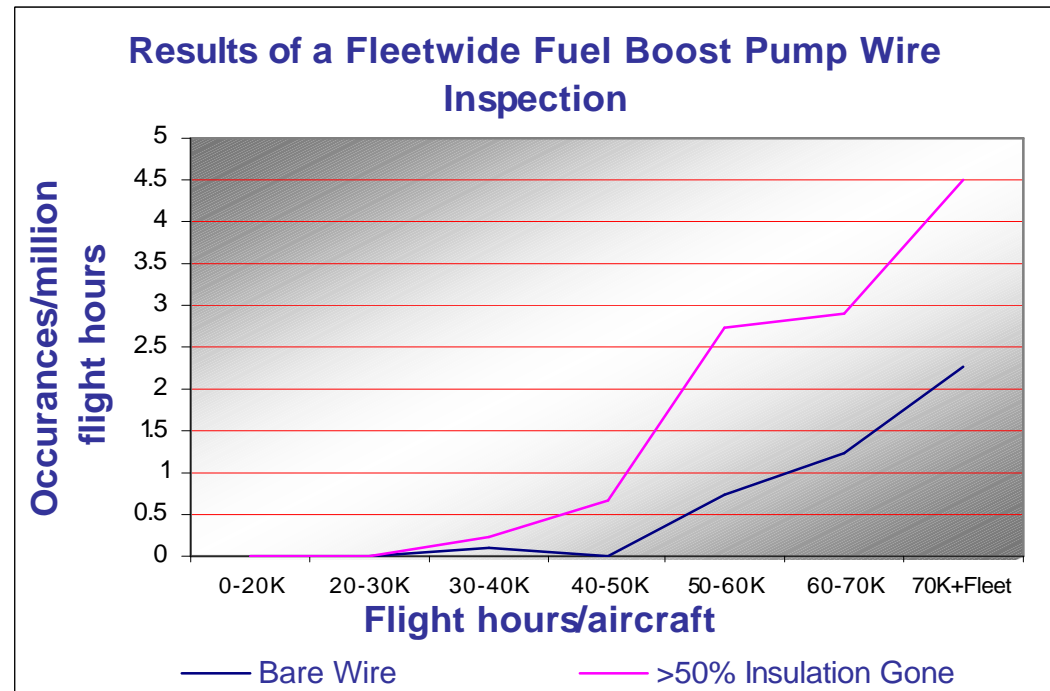
- Present aircraft circuit breakers are designed to protect against overloads and short circuits.
- Arcing faults draw less current than hard faults and are intermittent in duration.
- Arcing faults can cause systems failures and fires.





Background: Wire Degradation

- Wiring insulation degradation increases with time due to a variety of reasons such as:
 - Chaffing
 - Environmental stresses
 - Maintenance.
- Degradation varies due to design, maintenance, and operational differences

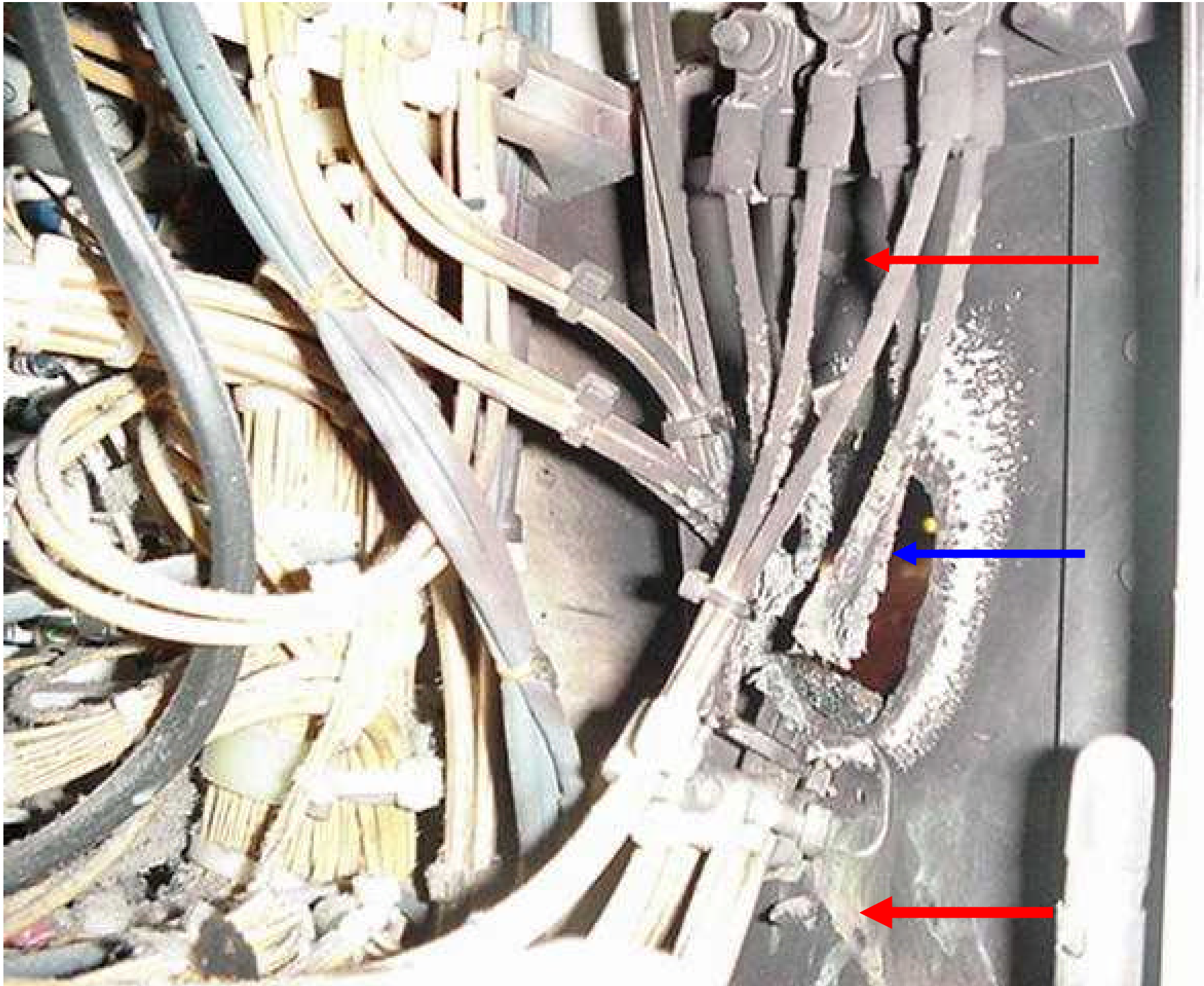




During flight the crew had to cut into this ceiling area to put fire out.

BAGGAGE BINS ABOVE ROW 6 & 7

AAL N3507A
DC9-82 11/30/00





Background: Current Inspection Technology

- Current inspection and surveillance methods for aircraft wiring are limited in effectiveness and periodic in frequency.
- Arc Fault Circuit Breakers provide continuous protection.





FAA Approach

- Develop certification criteria compatible and in parallel with SAE activity
 - TSO, based on SAE developed AFCEB Specification
 - Installation Advisory Circular
- Be ready to issue TSO and AC at the completion of initial SAE activity scheduled for January, 2003



Realities of New Technologies

- The FAA is committed to expedite airborne AFCB technology. However...
 - Learning curve associated with certification of new technology
 - Expect initial projects to be scrutinized more than a standard STC
- Initial AFCB projects by Issue Paper process

Major Installation Issues

- Common Causes of Nuisance Trips
 - Load Characteristics
 - Crosstalk (e.g.EMI, Lightning, adjacent wiring)
 - Feedback (parallel circuits)
- Fault Masking
 - Algorithm Dependent
- Post Trip Maintenance
 - May need NDT in addition to visual



Current Status

- Current FAA certification of AFCBs for non-essential circuits
- SAE AFCB specification nearing completion
- TSO and AC in development
- Issue Papers
 - Project Specific
 - Document means of compliance until TSO and AC published



AFCB Issue Paper

- Underlying Certification Philosophy
 - Provide a path for manufacturers to install AFCBs on a non-interference basis for purposes of gathering data
 - Limit AFCB installation to non-essential systems until adequate service history data can demonstrate proper function and reliability
 - Limit AFCB installation on critical circuits such that continued safe flight and landing can be achieved given an assumed common-mode nuisance trip



AFCBs- Summary

- Potential benefits
 - Protection against internal wire bundle arc fault damage
 - Minimize wiring related smoke and fire incidents
 - Minimize common mode wire bundle failures
- Possible risks
 - Nuisance trips
 - Post trip diagnosis issues



Point of Contact

- Brett Portwood
 - Los Angeles ACO
 - 3960 Paramount Boulevard
ANM-130L
Lakewood, CA 90712
 - 562.627.5350
 - brett.portwood@faa.gov