

The Lifecycle of U.S. Navy Aircraft Electrical Wiring Systems: Challenges for the Future

DOD Maintenance Symposium: Great Idea Competition

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Wire System Components

- Electrical Wire
- Connectors, Pins, Sockets, Termini
- Circuit Breakers
- Switches, Relays, Contactors



Electrical Power and Signals from Point A to B



Safety

- Navy Safety Center Data on Mishaps (1995 to 2002) – Wiring System Related
 - 6 Class A, 3 Class B, 22 Class C - 31 total
 - Ranks third highest among all Propulsion and Power Systems on aircraft
 - Highest 130 mishaps, Lowest 4 mishaps

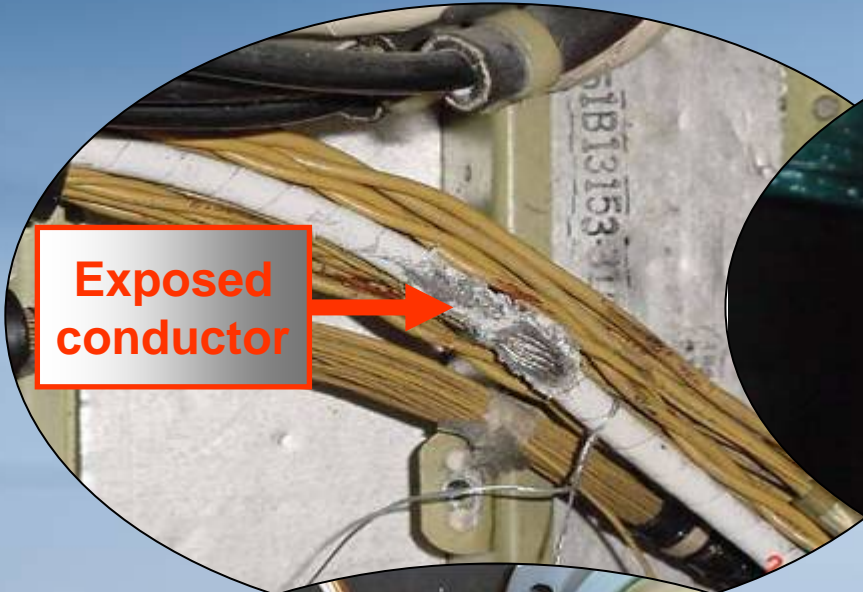


Metrics

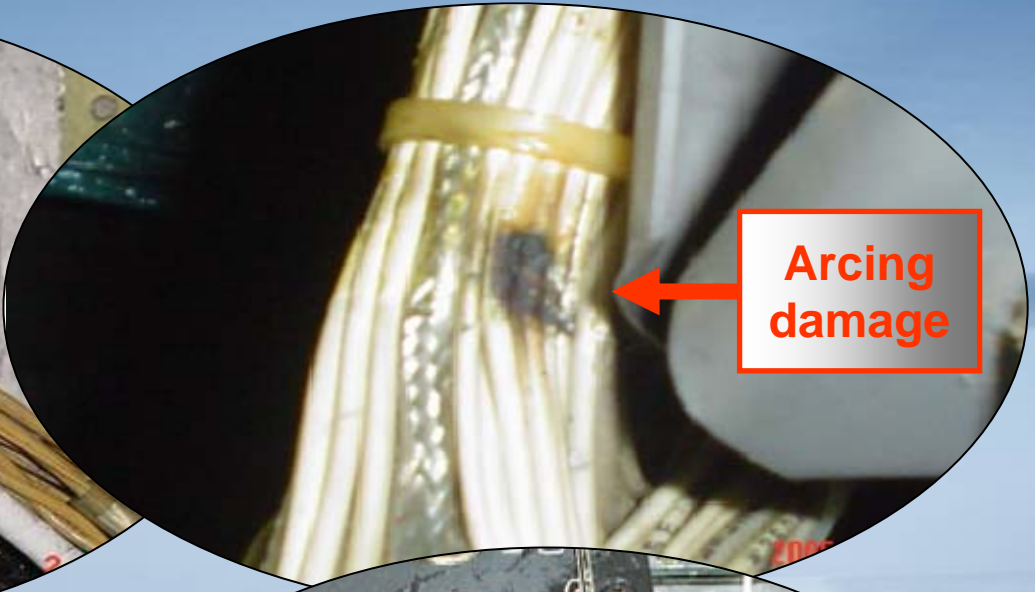
- **Naval Aviation Highlights (FY05Q3)**
 - 3,045 aircraft (Fixed Wing and Rotary Wing)
 - 921,658 Flight Hours per year
 - ~20 years old average age of all aircraft
- **Wiring System Highlights**
 - Wiring currently treated as commodity on the aircraft
 - For instance, 94,583 feet of wiring in one MH-53 aircraft
 - 1,101 mission aborts/year (401 in-flight aborts/year)
 - 2.42 flight hours / 1 hour spent repairing wiring systems
 - During 10 year period, lost six aircraft due to electrical problems
 - Effectively average 78 non-mission capable aircraft per year due to wiring
 - This information is known to be underreported



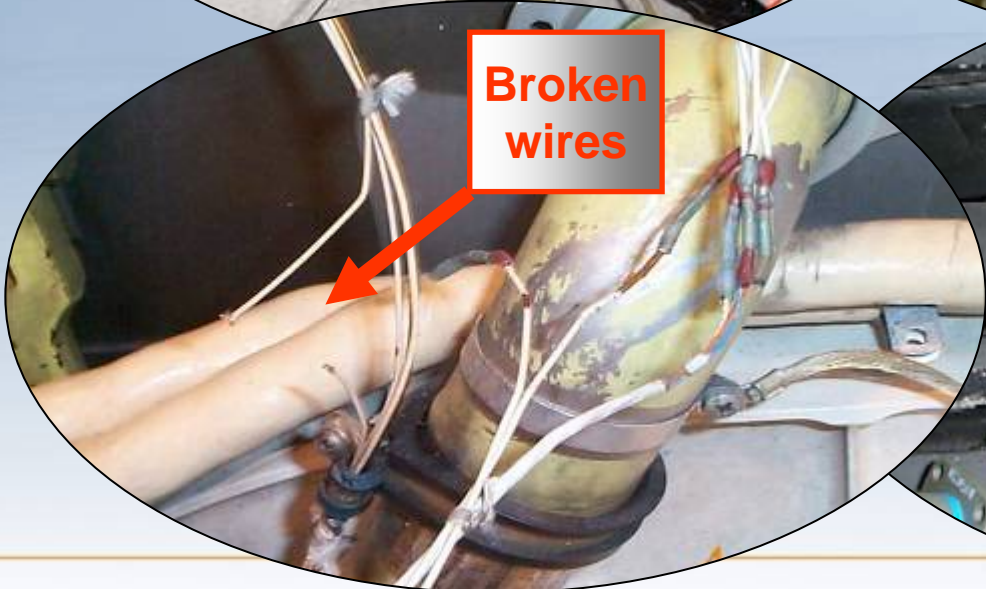
Material Condition Assessments



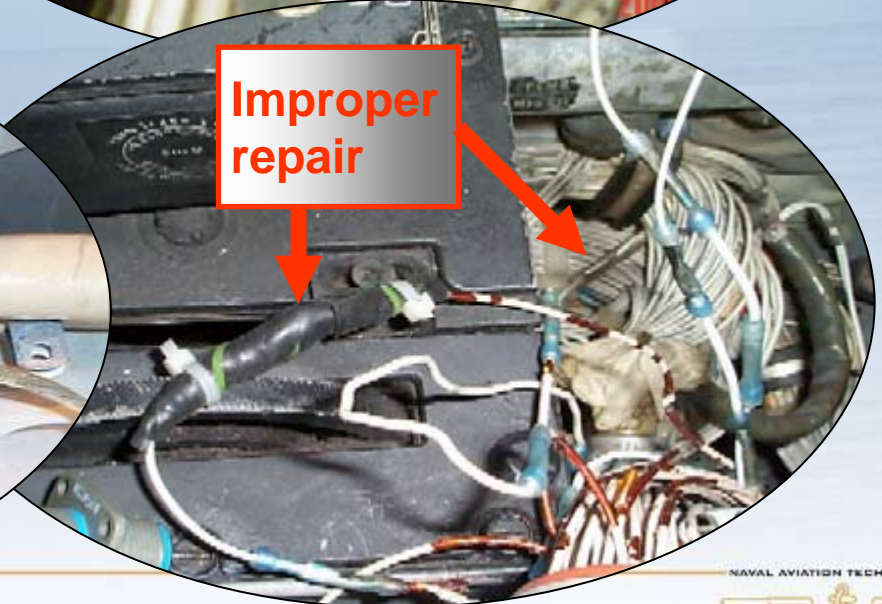
Exposed conductor



Arcing damage



Broken wires



Improper repair

Challenge for the Future



Wire System Integrity

Wiring Components

Designs and Installation

Maintenance & Training



Wiring Components

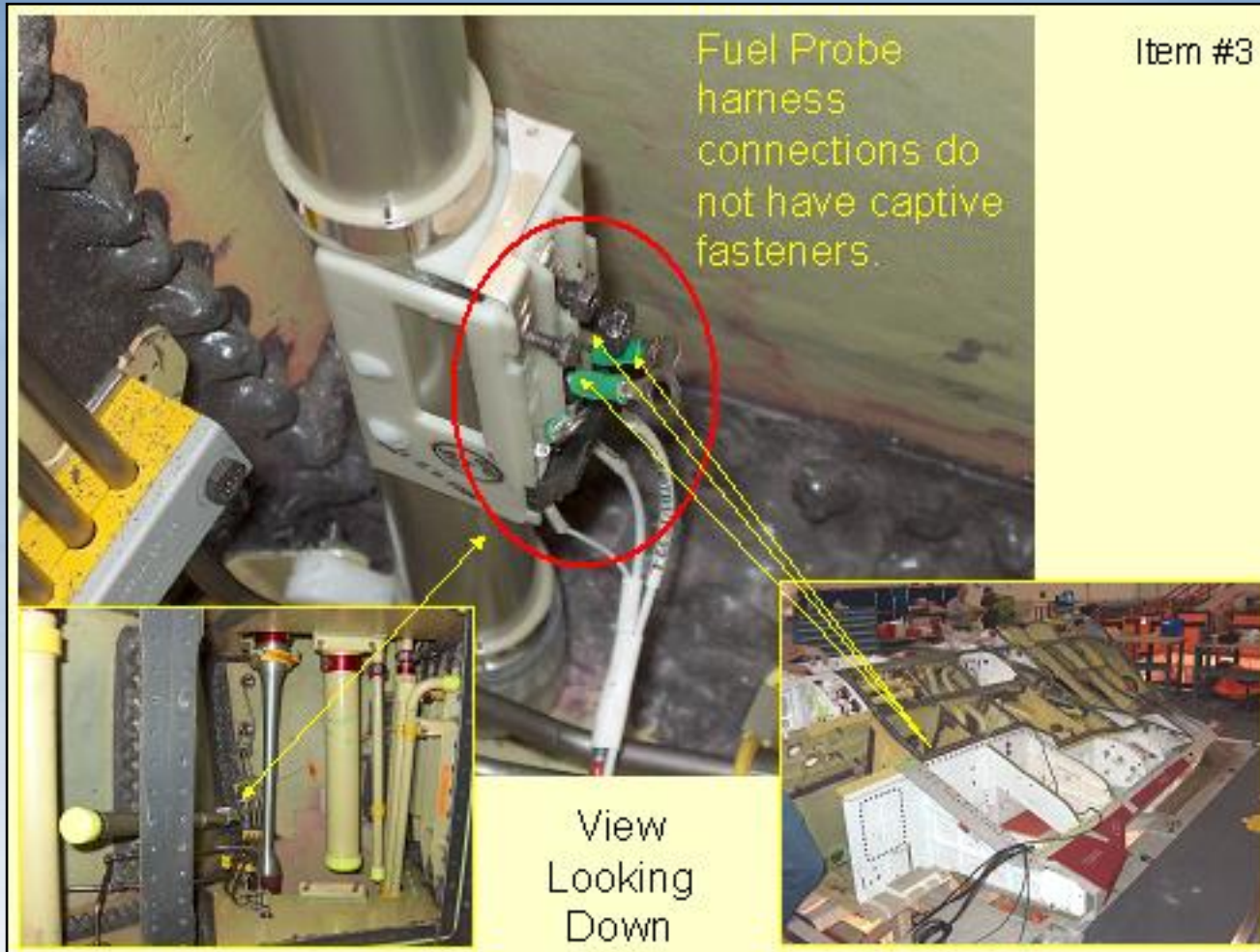
- Active and important qualification program for wiring components
- NAVAIR maintains 31 Wiring QPLs covering contacts, connectors, wires, terminals, tools, circuit breakers
 - Qualification
 - Retention/Removal
 - Verification
- Active participation in SAE AE-8 for specification maintenance and development
- Quality deficiencies taken for action

Design and Installation

- Wiring experts engaged in the design of new wiring systems
- Government and Industry accepted practices
 - Applied to wiring system designs (e.g. SAE AS50881B)
- 30-60-90% build inspections performed
 - Build is not always to design



Design vs. Build



Maintenance and Training

- Training
 - Schoolhouse
 - OJT (Material Condition Assessments and Training)
- Processes
 - 01-1A-14 (USAF)/01-1A-505-1 (Navy)/1-1500-323-24-1 (Army) Wiring Maintenance Manual
- Tools
 - Automatic Wire Analyzer Program for Diagnostic and Prognostic Tools
 - Work Package in 505 manual for handheld tool

Lessons Learned

- Not one “Great Idea”, but several “Good Ideas” – Whole Greater than Sum of the Parts
- Cultural change takes time
- Solution should be Warfighter focused
- Collaborate with others (i.e. Joint Service, Industry)
- Leverage off good people



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