WIRE PERFORMANCE SPECIFICATION
FOR
AIRCRAFT ELECTRICAL SYSTEMS

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This work is being performed under contract to the FAA Technical Center (Contract No. GS-23F-0263K)
Goal

• Develop the performance requirements for electrical interconnect wire necessary to assist the FAA to update to current standards the regulations related to insulated electrical wire used in commercial aircraft.

• WHY?

To improve safety of aircraft by creating up-to-date requirements for electrical wire used in aircraft.
Wire Issues

Topcoat flaking

Chaffed wire
Wire Issues

Notch propagation at hot stamp

Notch propagation (not to conductor)
Wire Issues

Arcing Damage / Flammability
Background

- Indianapolis facility
  - Formerly part of NAVAIR
    - Performed the qualification of wiring components to military specifications
    - Technical lead for wiring standards
    - The center of excellence for wiring in NAVAIR
  - Raytheon Technical Services Co., Engineering and Production Support (RTSC EPS)
    - Privatized in 1997 (BRAC)
    - Contracted to NAVAIR for wiring support
    - Continued to provide qualification and standardization support
    - Other wiring contracts with AF, FAA, NTSB, OEMs, etc.
    - Wiring design, installation, repair, modifications, etc.
    - Wiring and wiring component test facilities
Tasks

• Identify the current requirements for electrical wire in aerospace applications
• Collect Field Data
• Evaluate the data
  • Identify deficiencies in the wiring requirements related to incidents and accidents
  • Review current wire specifications for inadequacies
• Develop the requirements for a performance based specification for electrical wiring in commercial aircraft
Task 1: Current Wire Specifications

- Identify all current wire performance and component specifications for general-purpose aircraft wire
- Collect current wire specifications
  - Major Original Aircraft Manufacturers (OAMs)
  - Military Specifications (Mil-Spec, Def-Stan)
  - Wire Manufacturer’s Specifications
  - Industry Standard’s Bodies (SAE, NEMA, UL, ASTM, AECMA)
  - Governing Bodies
Task 2: Collect Field Data

• Collect field data related to electrical wiring
  • Incident and accident data (NTSB AAIDS and ASRS)
  • Maintenance and inspection data (ATSRAC data)
  • Airworthiness Directives (AD)
  • Service difficulty reports (SDR)
  • Other related sources (Navy Safety Info, NALDA Cable & Connector/Electric Shop)
• Field data collected utilizing key word searches on public available data.
  • Wire, wiring, short, arc, smoke, cable, and derivatives
• Identify field data potentially related to wire deficiencies.
Task 3: Evaluation of Data (cont.)

- Analyze the field data
  - Identify data which may indicate wire deficiencies.
- Categorize the causes of failure. Filter data.
  - Wire Deficiency
  - Design Deficiency
  - Maintenance
  - Installation
  - Modifications
  - Use / Misuse
  - Source Non Wire Related
  - Non Wire Related
  - Not Enough Data
- Very little specific data to perform good analysis.
Task 3: Evaluation of Data (cont.)

• Analyze the wire specifications
  • Review and analyze the requirements of electrical wire
  • Determine the adequacy of the specifications
  • Identify areas where the specifications may lack sufficient requirements. Some examples that have been identified include:
    • Arc track resistance
    • Smoke
    • Toxicity
    • Mechanical strength at temperature
• Identify areas where the specifications are not pertinent
  • Purchasing data
Task 4: Develop Wire Performance Specification

Requirements

• Draft a Performance Specification for general purpose aircraft electrical wire
  • Minimum requirements for electrical wire used on aircraft
  • Not to be a design guide and not to tell designer how to do his job
• Recommendations to the FAA Technical Center
  • Possible inclusion in a technical standards order (TSO)

• Status: About to begin this phase