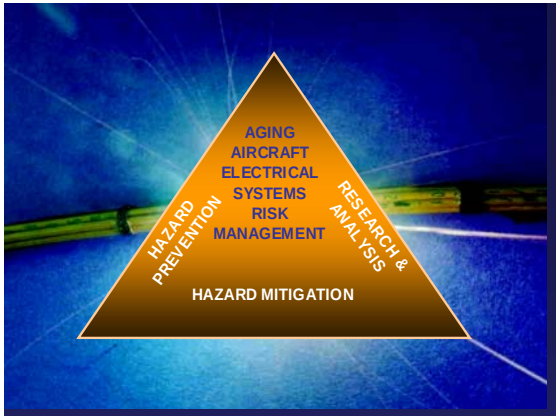
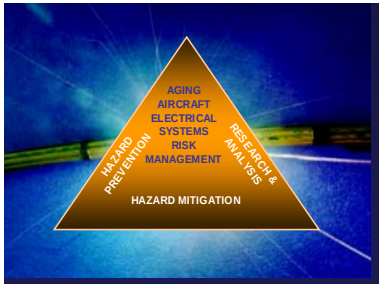


FAA Technical Center

Electrical Wire Interconnect Systems (EWIS)

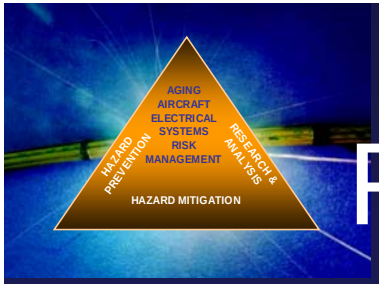
Hazard Prevention



Research Overview

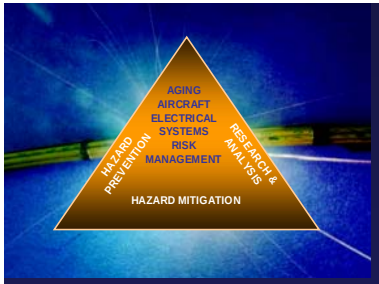
The Aging Aircraft Electrical Systems research programs are broken down into 3 Areas

- **Research and Analysis**
  - Perform Proof of Concept Studies to support emerging Technology
  - Generate reports to support ATSRAC and other rule making Committees
- **Hazard Mitigation**
  - Develop technology to reduce damage effects
- **Hazard Prevention**
  - Develop NDI and NDT technology



FAA Hazard Prevention

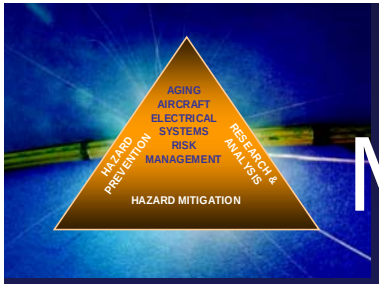
- The FAA has sponsored 11 programs to develop new test equipment to identify and locate compromised areas of the EWIS system
- The FAA has been working with other government agencies (Nav Air, NASA, AFRL) to maximize resources
- Broad Agency Announcement (BAA) TCBAA-04-000C
  - Development of Electrical Wiring Interconnect System Test and Inspection Systems CLOSED June 04



FAA EWIS NDI and NDT

Programs

- Micro Energy High Voltage
- Fiber Optic Chafe Detection
- Excited Dielectric Test
- Broadband
- Indenter II
- Pseudo Random
- Pulse Arrested Spark Discharge
- Tera Hertz
- Wide Frequency TDR
- COTS
- Wire Test Bed



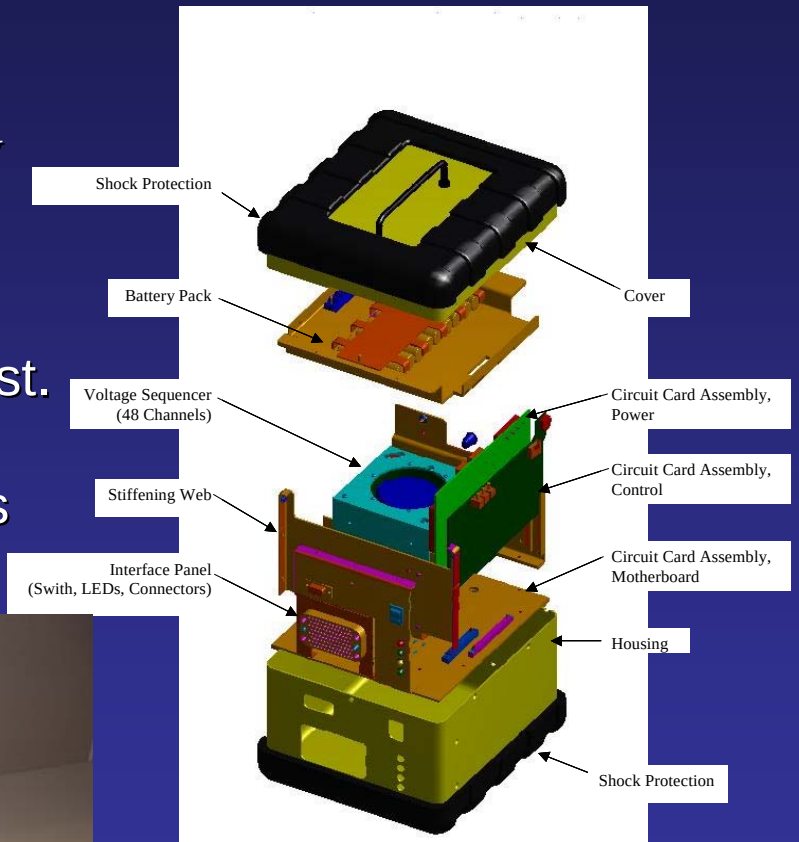
Micro Energy High Voltage

General Dynamics

Micro Energy High Voltage Technology

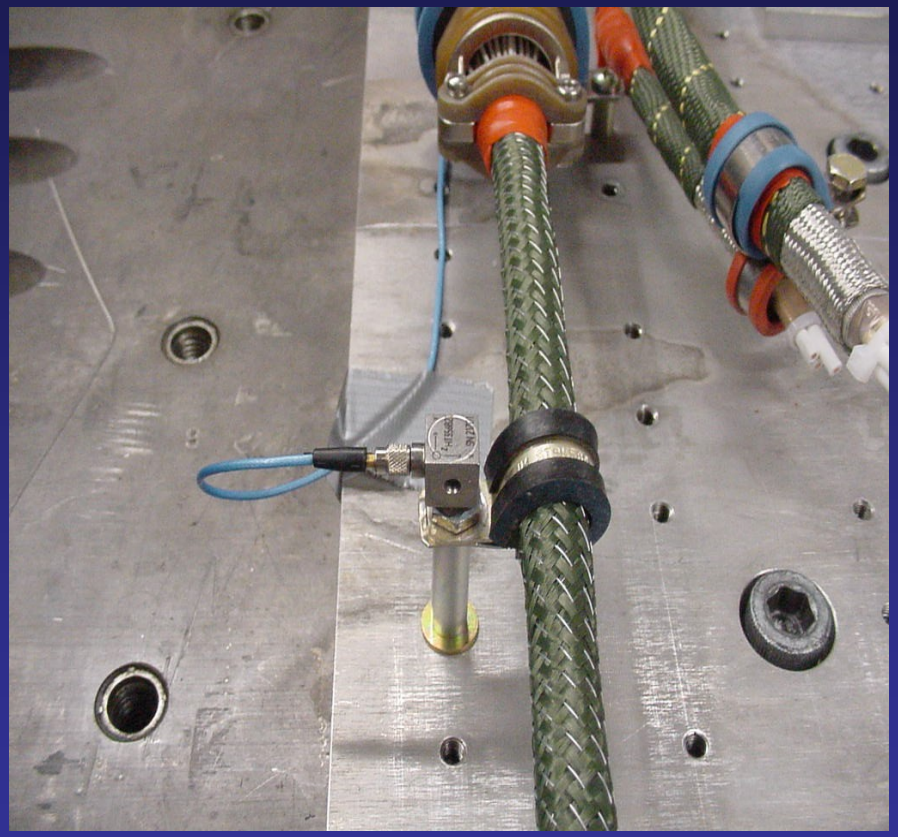
The MET will successfully identify a breach that results in a dielectric breakdown of less than 5000V with respect to the wire under test. Distance to breach reporting accuracy is subjective to the configuration of the harness under test

Status Complete



Fiber Optic Chafe Detector

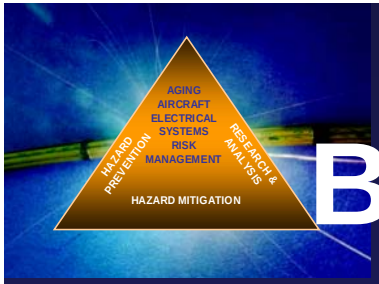
- Phase I (Proof of Concept Demonstration) - Complete
  - FAA and Navy performed initial flight evaluation of the technology on a 707 type aircraft (Omega Air N707AR).
  - Provided an initial assessment of the technology in terms of fabrication and installation, environmental compliance, interface requirements, and chafe detection.



Fiber Optic Sensors Embedded in Aircraft Wire Harness Killdeer Mountain Manufacturing

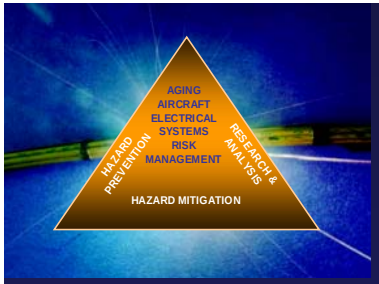
Excited Dielectric Tester

- CM Technologies Develop and Field Wiring Diagnostic Tool
- Time Domain Reflectometry/Excited Dielectric Test
- 128 point switching
- Status Transferred to Nav Air



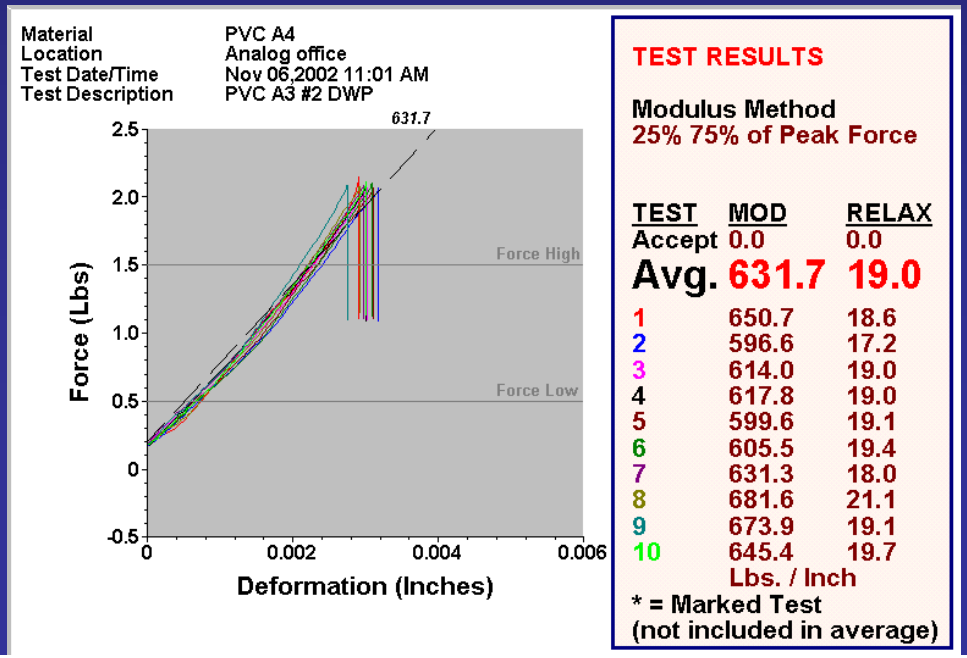
Broad Band Impedance

- Boeing Phantom Works Approach- Development on an impedance-monitoring prototype device equipped with failure databases and appropriate rules based software that can be used as an inexpensive and convenient tool for electrical wiring maintenance in commercial aircraft. The prototype device will also include a Standing Wave Reflectometer (SWR) device that detects and locates shorts and pre-shorts in wire harnesses.
- To be completed Sept 2004



Indenter

- Aircraft Wire Indenter can measure hardness on wires of the type and gauge typically used in aircraft.Hardness, or loss of flexibility of the insulation,is a key indicator of aging.
- Analog Interfaces Completion Sept. 2004

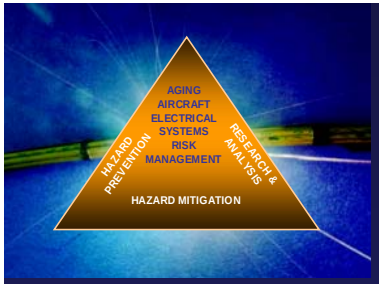


TEST RESULTS

Modulus Method
25% 75% of Peak Force

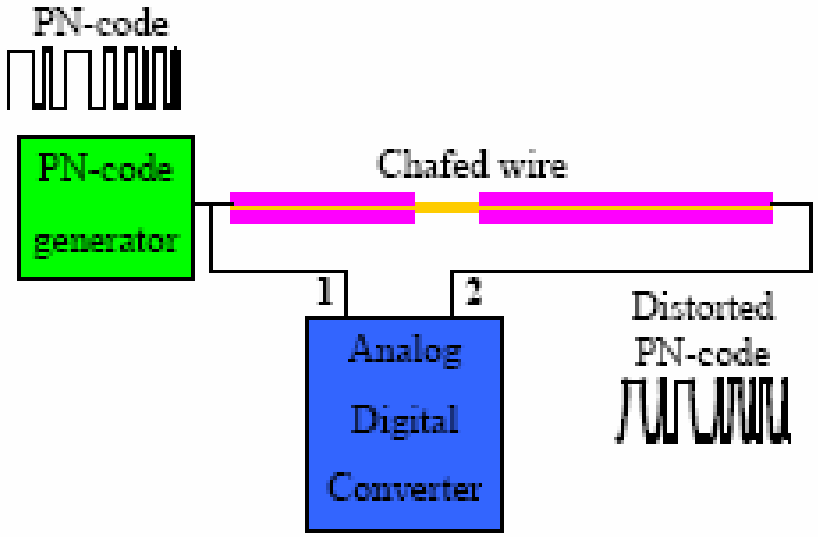
TEST	MOD	RELAX
Accept	0.0	0.0
Avg.	**631.7**	**19.0**
1	650.7	18.6
2	596.6	17.2
3	614.0	19.0
4	617.8	19.0
5	599.6	19.1
6	605.5	19.4
7	631.3	18.0
8	681.6	21.1
9	673.9	19.1
10	645.4	19.7
	Lbs. / Inch	

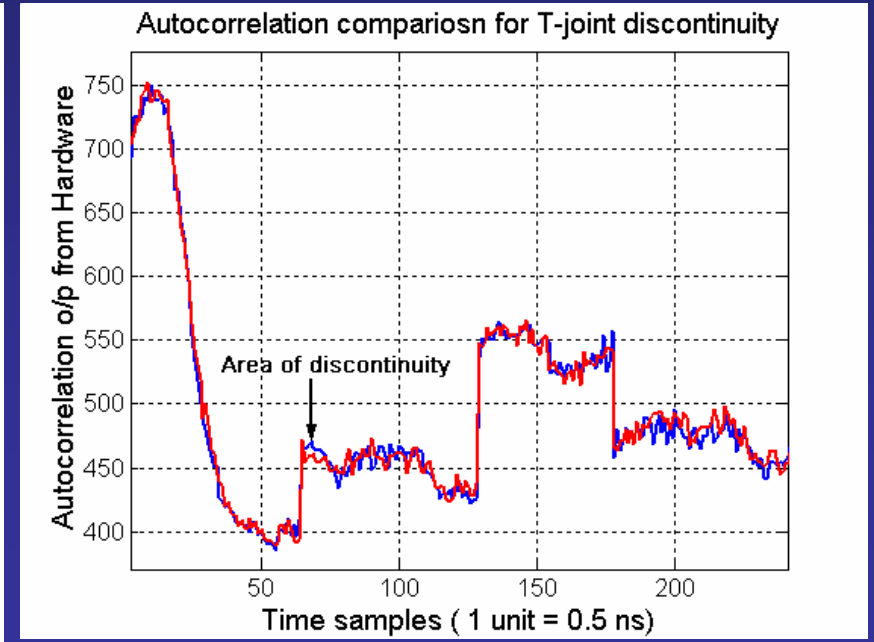
* = Marked Test
(not included in average)



Pseudo Random

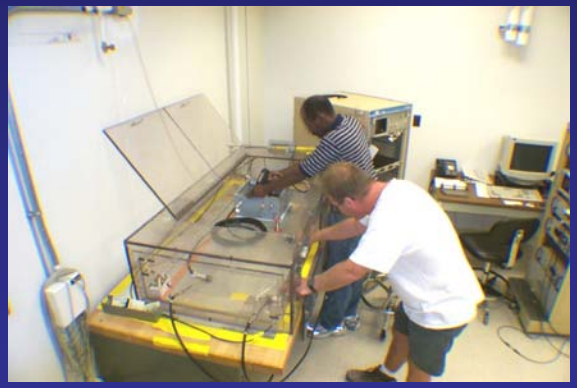
- Aircraft Wiring Integrity Verification Using Pseudo-Random Binary Sequence
- Intelligent Automation Inc. Status Ongoing completion 2005



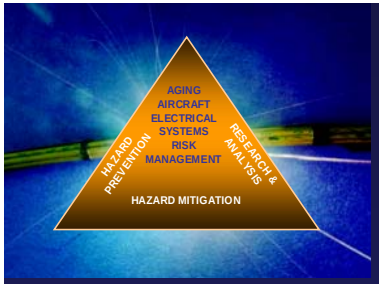


Pulse Arrested Spark Discharge

The PASD method uses a high-voltage (up to 20KV), low-energy (approximately 1mJ), short pulse (few ns) to induce an electrical spark discharge at a cable defect site. The arc discharge signal can be used to accurately locate the defect in the wiring system.

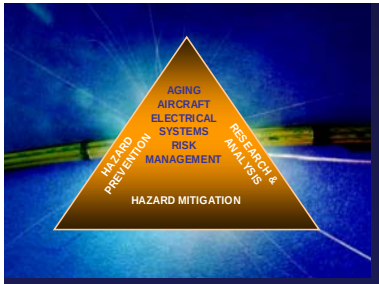


PASD Lab showing original pulser (left) and additional of second pulser test bed on right wall (right). Sandia National Labs Completion 2005



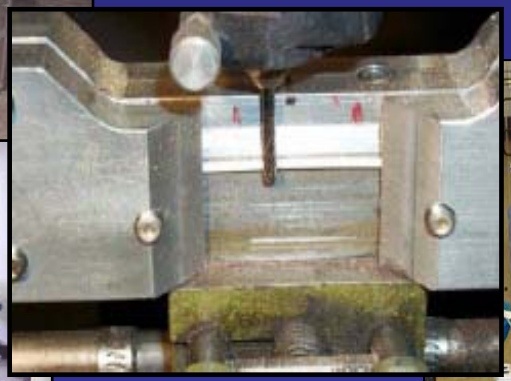
Tera Hertz

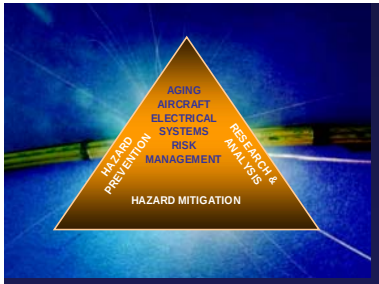
- At frequencies that correspond to wavelengths that are comparable to the diameter of the insulation,
  - the coaxial system of the insulation shell and conducting core acts as an "inside-out" waveguide.
- Brookhaven National Labs Completion Sept. 2004



Wire Test Bed

- Development Test Bed and Blind test bed
- Standard Wiring Validation Testbed Available to test new wire inspection technology





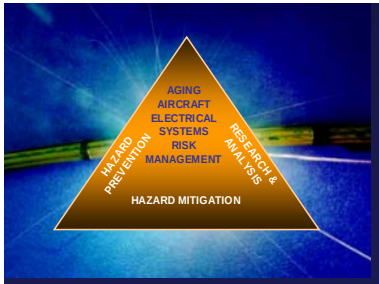
COTS

- There is presently a need to perform an independent evaluation of commercial-off-the-shelve (COTS) wire system diagnostics. The objective of this evaluation will be to provide the FAA with data to assess the current ability of the avionics and electrical test equipment community to detect (and possibly predict) wire system anomalies.

  Equipment scheduled for testing

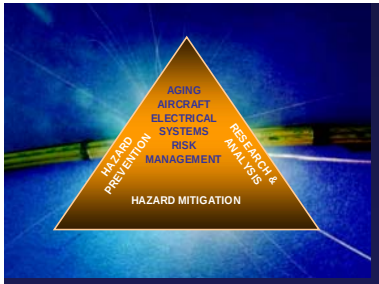
  Eclypse ESP 3M DitMco

  CK Technologies Grumman AMWIT



New Awards

- Goodrich
  - Wide Frequency TDR Aug. 2004
- BAA TCBAA-04-000C
  - Evaluations of Two page summary completed



Summary

- No Silver bullet found
  - Varying ground planes
  - Harness Geometry
  - EWIS Interface
- FAA is committed to the development of new technology for EWIS NDI and NDT
- FAA will continue to work with partners in industry and the government to maximize efforts and transfer the technology to the end user.