



WICHITA STATE
UNIVERSITY
*NATIONAL INSTITUTE
FOR AVIATION RESEARCH*

Environmental Test Labs

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Overview of Capabilities

- **Environmental Testing (DO-160/Mil-Std-810)**
 - We provide complete and consistent component level and system level environmental testing – Customize our support to meet Client needs.
- **Aircraft and System Level Testing**
 - Supporting complex aircraft integration
 - Aircraft level specialty tests, endurance, Fuel, EMC , HIRF
- **Design Assistance**
 - Experienced Staff of Engineers, Research Scientists & Technicians
 - Design Reviews
 - Development testing and screening – SoF Testing
- **Certification Support**
 - Certification Testing
 - Test Plans, Test Reports, Data Reduction, analysis
 - Design of tests, fixtures and operational setups
 - DER Services (Contracted services)



Common Test Standards

- RTCA DO-160
 - Temperature and Altitude
 - Temperature Variation
 - Humidity
 - Operational Shocks
 - Vibration
 - Explosion Proofness
 - Waterproofness
 - Fluids Susceptibility
 - Salt Spray
 - Magnetic Effect
 - Power Input
 - Voltage Spike
 - Audio Frequency Conducted Susceptibility
 - Induced Signal Susceptibility
 - Radio Frequency Susceptibility
 - Emissions of Radio Frequency
 - Lightning Induced Transient Energy
 - Electrostatic Discharge
 - Fire, Flammability
- Goal to provide complete and consistent component level and system level environmental testing



Specialized Equipment

Environmental Chambers

- **Tenny 27 cu.ft Temp/Humidity/Alt**
- Tenny 16 cu.ft Temp/Humidity
- Thermotron 37 cu.ft Temp/Humidity
- Cincinnati Sub Zero 8 cu.ft Temp/Humidity
- (2) Auto Technology 15 cu.ft Salt Fog,
- **Singleton 30 cu-ft Salt Fog**
- Grieve 36" x 48" x 36" (+1200F) Oven
- (2) Russels 8 cu.ft Temp Chambers
- **Large 12'W x 10'H x 48'L (-40F - +150F) Temp Chamber**

High Altitude and Explosive Decompression Chamber

- 3' x 3' x 3.5'h



Vibration

- **Shock and Vibration**

- Data Physics 12,000 lbf 3-axis - 24"x24" vibration table
- Ling 12,000 lbf 3 axis - 60"x 60" slip table

- **Sustained G**

- Rate Table 50 lbs
- Max Rate: 1000 deg/sec
- Mac Acceleration: 200 deg / sec
- Accelerometer Calibrations



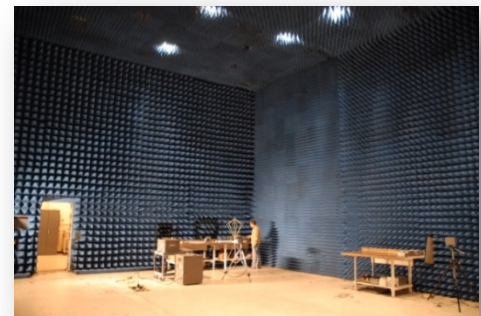
Power and RF Susceptibility

Power Input and Lightning Labs

- Power Input, Voltage Spike, Audio Frequency Susceptibility, Induced Signal Susceptibility
 - California Instruments AC/DC Programmable Power supply
 - Audio Susceptibility - DC to 50 kHz, 4,000 watts peak, 2850 watts RMS at rated power, DC to 150 kHz at reduced power.
 - Pulses in excess of 500 volts peak and 600 amps peak

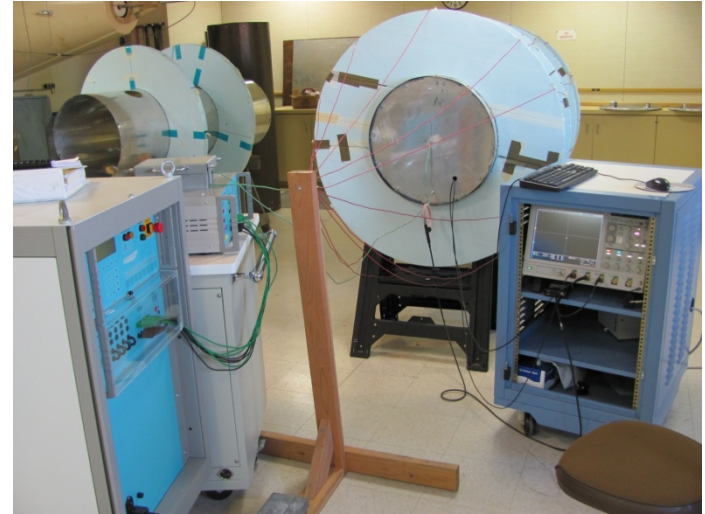
Radio Frequency Susceptibility/RF Emissions

- **17' x 20' x 12'** Semi-Anechoic Chamber
- **20' x 17' x 11'** Reverb (mode-stir) Chamber
- **25' x 20' x 15'** Reverb (mode-stir) Chamber
- **6' x 8' x 6'** Reverb (mode-stir) Chamber – Near future
 - For High field strength testing
- **30' x 50' x 25'H** Anechoic Chamber



Direct / Indirect Effects Lightning Test Labs

- Indirect Effects Lightning; Wave Forms 1-5A, Voltages and Currents to Level 5 (setup dependent)
- Fuel System Testing to SAE ARP-5416 Section 7.3, Section 7.7, Section 5.1.2 Swept Stroke – In Work
- DO-160 Lightning Direct Effects Sections 23.4.1.3, 23.4.3.1, 23.4.3.2.2 (Ignitable mixture and Photographic Test Method) – In Work
- Aircraft LTA testing -
- Direct Effects High Current Testing to 200KA – Under Construction



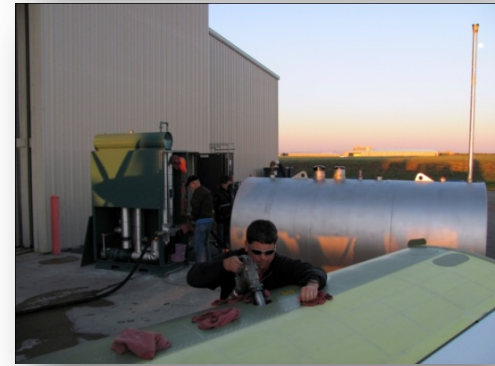
Direct / Indirect Effects Lightning Test Labs

- **DO-160 Explosion Proofness**
 - Explosion Proofness to DO-160, Section 9, All Categories
- **Fluid Susceptibility Testing**
 - Fluids Susceptibility to DO-160
- **Waterproofness Testing**
 - Waterproofness to DO-160 E,F,G, Section 10, All categories
- **Radome Transmissivity Testing**
 - Transmissivity Testing
 - DO-213 Standards
 - Certification and Production Acceptance



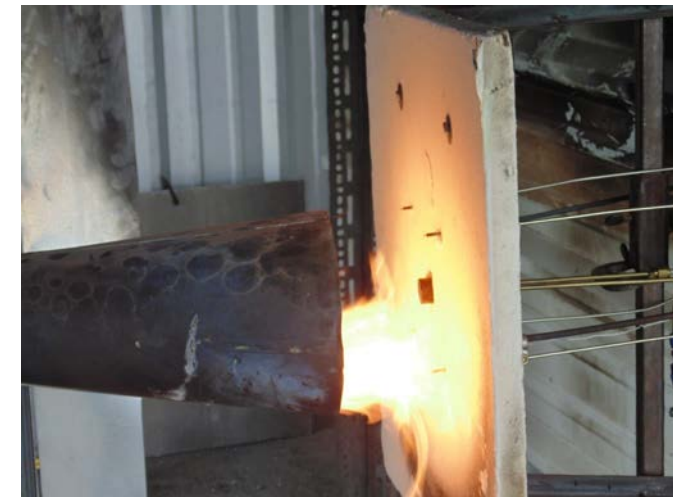
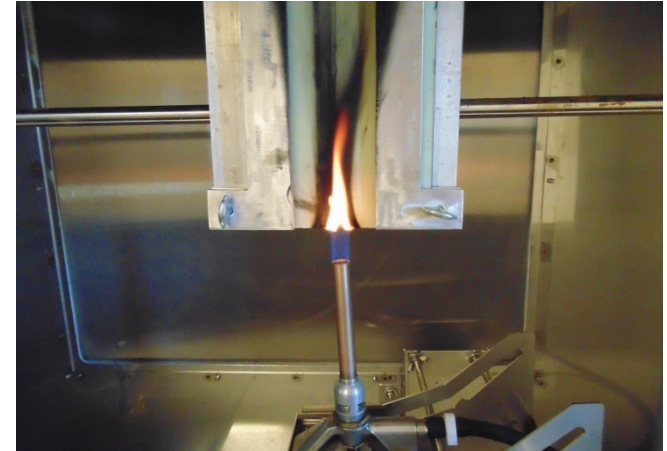
Aircraft And System Level Support

- 100' x 100' x 25' EMC Test Hangar w/integral foam/fire suppression system for fueled aircraft testing – Access to KBEC Runway 8,000ft x 100ft
- Precipitation Static Testing – 50kV and 120kV capability
- Hot Fuel - Wet/Saturated fuel
 - Fuel heated to lower flashpoint limit of fuel (Max 200°F)
- Firewall/Cowl/Pylon Burn Testing FAA 23/25 Fireproof 2000F Flame
 - FAA Interior Burn
 - Material burn
 - Fire Proof and Fire Resistance Testing (2000F flame)
- Full Aircraft HIRF Testing to SAE ARP-5483
- Aircraft Flight Instrumentation support



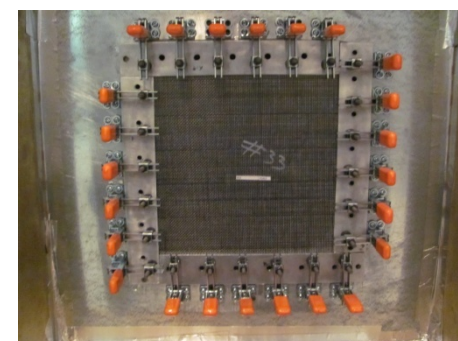
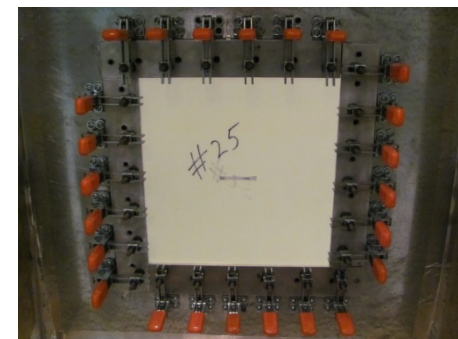
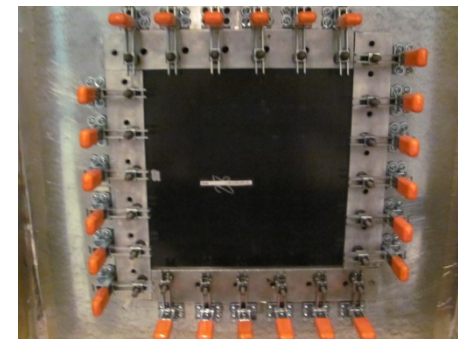
New Capabilities in Planning

- Fire and Burn Lab
 - Smoke Density and Toxicity
 - Seat Cushion Oil Burner Testing
 - Thermal/Acoustic Insulation Testing
 - Fire Proof and Fire Resistance Testing (2000F flame)
- Ballistic Testing – Q3 -2013
 - Pressure Bottles, accumulators, tanks...
 - Ballistic from 22cal to 50 cal
 - 35 ft ceiling for drop testing



Research - Carbon Composite Shielding Effectiveness Evaluation

- Carbon fiber panel shielding effectiveness testing was done using a reverberation method from 100MHz to 18GHz. This was accomplished using two separate metal chambers (a transmit side and a receive side) attached only by a 2'x2' access tunnel to allow for complete isolation between the chambers.
- The reverberation chamber produces an isotropic, uniform, randomly polarized field. The panels under test are exposed to this randomly polarized field which leads to a more robust test. I.e., plane wave measurement.
- Test results from each of the carbon fiber panels were compared to an aluminum panel.
- Results were on target, some of the proprietary materials and coatings were shown to be very comparable to an aluminum panel.



Summary

- Supporting the Needs of the Aviation Industry
 - ... by providing research, development, testing and certification services to manufacturers, government agencies and education entities.
- Consistent level of Component Qualification Testing
 - An Independent testing service filling the gap between suppliers and OEM's
- Constantly adapting and providing solutions to specialized and unique technologies and problems
 - OEM's and suppliers are responsible for our growth as we continue to address and fulfill their needs.