



Abstract for the Consortium for Kansas Unmanned Systems' 2013 Conference

Recent Testing Activities at the National Institute for Aviation Research, Wichita State University

Since 2010, the Environmental Test Laboratory (ETL) at Wichita State University's National Institute for Aviation Research has provided significant electrical testing services in support of Carbon Fiber Composite (CFC) development programs. These carbon fiber composite materials have proven extremely useful for the construction of unmanned aerial systems (UAS) due to their excellent strength to weight ratios. Most of the tests are protected with tightly sealed nondisclosure agreements, but several programs have permitted public presentation with regards to the general nature of the tests conducted at the ETL.

Analysis capabilities:

WSU/NIAR has the capability to perform/provide in-depth analysis of the shielding effectiveness (SE) properties of different composite material compositions. This capability has been established to provide research data in order to enhance the understanding of electromagnetic effects on CFC aircraft. The current test method has been developed by WSU/NIAR and has provided an industry standard for current SE testing.

WSU/NIAR also has the capability to perform/provide in-depth analysis of the Indirect Effect of Lightning on aircraft; both manned and unmanned. This capability was established and validated in support of three years of research into the Indirect Effects of Lightning on CFC aircraft. This gives WSU/NIAR the capability of fully evaluating lightning protection schemes analytically.

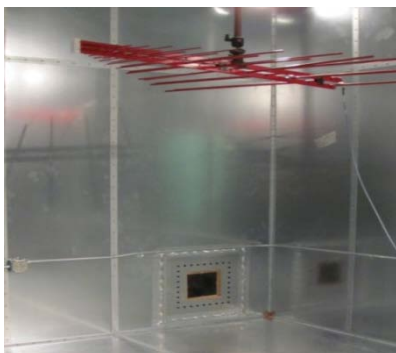
WSU/NIAR is not limited in these areas alone. Other ETL capabilities include support for material, component and full scale electrical, electromagnetic compatibility (EMC), lighting, and High Intensity Radiated Fields (HIRF) testing. The ETL has a large anechoic chamber capable of supporting most unmanned vehicles as well as a large environmental chamber that can accommodate large systems testing. The ETL is capable of full system functional testing in their large aircraft hangar. Testing at ETL can include HIRF and EMI on fully fueled aircraft.

Shielding Effectiveness Diversity:

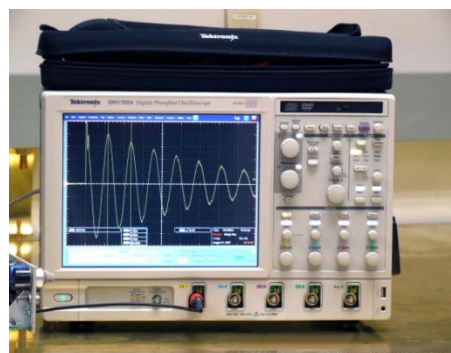
WSU/NIAR is not simply limited to the SE testing of panel materials. Research and testing has also been completed on determining the SE characteristics of wire or cables. Many of the principals remain the same, yet the outcome of the results can provide insight into how effective a cable's shielding/insulation is at cancelling electromagnetic interference.

Application:

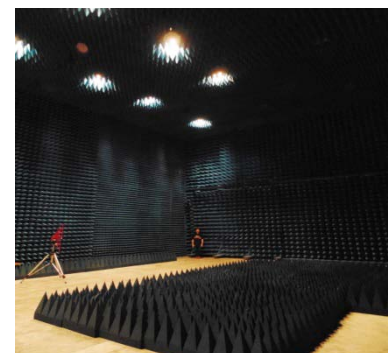
Using this technology, WSU/NIAR has been able to quickly analyze multiple variations in design and materials, leading to a clear understanding of the factors that contribute to indirect effects/shielding effectiveness material properties. This understanding results in well targeted shielding efforts, as well as accurate/successful design decisions. The goal of the presentation is to educate the Kansas UAS industry on the capabilities and value of environmental lab testing at the ETL facility.



SE Testing in Reverb Chamber



Lightning Waveform on Oscilloscope



Large Anechoic Chamber