AEROSPACE
SHORT COURSES

Aircraft Lightning: Requirements, Component Testing, Aircraft Testing and Certification (AERO0070)

Instructor: C. Bruce Stephens, Darren L. Stout, Tae Yoon *(This course may be taught by either instructor.)*

Course Description

This course provides details for direct and indirect effects of aircraft lightning testing and certification. Requirements for both composite and metallic aircraft, including proper RTCA/DO-160 classifications, are examined. The course will also include a high-level overview of Electromagnetic Compatibility (EMC), High-Intensity Radiated Fields (HIRF), Precipitation Static (P-Static) and Electrical Bonding requirements. The new requirements of Electrical Wiring and Installation System (EWIS) and Fuel Tank Safety (14 CFR 25.981 Amd. 102) will also be addressed.

Students will work in teams to gain hands-on experience building a project incorporating the information they learn as they progress through the course.

Course Highlights

- The electromagnetic environment of the aircraft
- Metallic and composite aircraft requirements
- The history of lightning requirements for aircraft certification
- Direct and indirect effects of lightning testing
- FAA compliance for lightning effects

Who Should Attend?

This course is designed for all design engineering disciplines, project managers, project engineers and laboratory personnel whose aircraft system may require protection from the effects of lightning.

Learning Objectives

- FAA certification process and requirements
- Directs effects of lightning criticalities
- RTCA/DO-160 levels for direct effects testing
- Indirect effects of lightning

- RTCA/DO-160 levels for indirect bench testing
- EASA requirements

Course Outline

Day One

- Introduction
- The electromagnetic environment of aircraft
- Metallic and composite aircraft requirements
- Electromagnetic Interference (EMI)
- Electromagnetic Compatibility (EMC)
- Electrical bonding
- Electrostatic Discharge (ESD)
- Prescription Static (P-STATIC)
- High Intensity Radiated Fields (HIRF)
- FAA certification process and requirements

Day Two

- The lightning environment
- The history of lightning requirements for aircraft certification
- Aircraft lightning attachment
- Effects of lightning on aircraft
- Directs effects of lightning
- Direct effects testing
- RTCA/DO-160 levels for direct effects testing
- Direct effects certification requirements
- EASA requirements
- Simulation for direct effects requirements

Day Three

- Indirect effects of lightning
- Indirect effects aircraft level testing
- Indirect effects design
- RTCA/DO-160 levels for indirect effects bench testing
- Indirect effects certification requirements
- EASA requirements
- Simulation for indirect effects requirements

Day Four

- Fuel systems
- 14 CFR 25.981, Amendment 102
- Aircraft wiring and shielding
- Electrical Wiring and Installation System (EWIS)

Day Five

- Pre-selected teams will simulate the process of determining aircraft lightning certification and testing requirements for various components installed on the aircraft.
- Electromagnetic Effects (EME) program management
- Future EME testing techniques; Final EME discussion and questions

Classroom hours / CEUs

31.50 classroom hours
3.15 CEUs

Certificate Track

Aerospace Compliance
Avionics and Avionic Components
Electromagnetic Effects

Course Fees

Early registration fee: $2,595 if you register and pay by the early registration deadline (45 days out).

Regular registration fee: $2,795 if you register and pay after the early registration deadline.

U.S. Federal Employee Discount

This course is available to U.S. federal employees at 10% off the registration fee. To receive the federal employee discount, you must enter the code **FGVT116** during the checkout process. Please note that you must validate your eligibility to receive this discount by entering your U.S. government email address (ending in .gov or .mil) when creating your online registration profile. This discount is available for both the early registration and regular registration fees.

Instructor Bios

C. Bruce Stephens is an FAA DER/EUM in the areas of EME, HIRF, Lightning, Fuel Systems, Structures and EWIS. His aircraft certification experience includes Beechcraft Starship, King Air, Bonanza, Baron, Hawker 4000, Hawker 800XP, Premier 1, JPATS, Learjet Model 45/75, Cessna Citation Latitude, and military projects related to Boeing 707, 737, 747, 767 KC-46A Tanker, and 777. Stephens continues to work on Part 27 and 29 rotorcrafts (MH139 Grey Wolf), and space vehicle certification projects. He has assisted several smaller companies with FAA EME certification projects and is interested in the certification requirements related to new EVTOL Aircraft. Stephens enjoys mentoring new FAA delegates and instructing several courses he has developed for The University of Kansas Aerospace Short Course program. These courses include HIRF, Lightning, EWIS, EZAP, DO-160, Fuel Systems, Introduction to EME, and EME Aircraft Testing/Certification. Stephens has been a Six-Sigma/Lean Master Black Belt consultant with experience in both aircraft and copper mining process improvement. He has instructed over 25 college courses, most being MBA level, including MBA Statistics, MBA Business Management, MBA Operations Management, MBA Six Sigma/Lean Production Management, Supply Chain Management, Six Sigma/Lean Black Belt and Green Belt. Universities Stephens has instructed at

include Webster University, Friends University, Embry Riddle University, Southwestern College, Newman University and The University of Phoenix. He has an executive M.B.A. and M.S. in Management from Friends University and a B.S. in Industrial Technology from Wichita State University.

Darren Stout is an EME/HIRF/Lightning ODA UM/AR at the Boeing Company. Darren has a wealth of experience in Electromagnetic Effects (EME), High Intensity Radiated Fields (HIRF), lightning effects, p-static effects, and transmitting personal electronic devices, RTCA/DO-160, MIL-STD-461, along with extensive experience in laboratory and aircraft testing. His experience is a result of over 22 combined years as an Electrical and EME engineer with Boeing, Lucent Technologies (Bell Labs), FAA, and BancTec. He also served six years in the United States Air Force as a B-52 navigator, instructor navigator, and radar navigator (bombardier), directing and performing higher headquarters missions including aircraft, systems, and munitions testing, and is a Desert Storm veteran. He has a BSEE degree in electrical engineering (lasers, fiber optics, and antenna arrays) from the University of Michigan - Ann Arbor, is an iNARTE certified EMC Engineer, and is a Level 2 Certified TEMPEST Professional.

Tae Yoon is an Electrical Systems and Equipment FAA DER with authorization in Electrical Systems, HIRF/Lightning, and EWIS. Yoon has 24 years of experience in aircraft design, development, manufacturing, certification, and field service with prior work experience at Boeing, Honda Aircraft, Northrop Grumman, and Sikorsky Aircraft. Over his career, he gained experience in all phases of aircraft and systems development and certification projects, ranging from early concept design to development, certification, and post- certification field service engineering. In addition to his experience as an FAA Systems and Equipment DER and Technical Manager, Yoon has also worked in factory floor/laboratory settings as a design and MRB support engineer/lab test engineer early in his career. He has designed and managed requirements on Electrical Wiring Interconnect Systems, electrical power systems, lithium-ion battery systems, electrical bonding and grounding of systems in composite and aluminum airframe from an early concept stage, and developed, validated, and verified various aircraft systems and electromagnetic engineering requirements. As for Yoon's other endeavors, he works as a certification and engineering consultant in the electric aviation industry and teaches aircraft system safety (per ARP4761) and systems engineering (ARP4754) courses. He has a passion for teaching and mentoring young engineers in the aviation field. Yoon graduated from Cornell University with a Bachelor of Science degree in mechanical and aerospace engineering on the dean's list.

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