

AEROSPACE

SHORT COURSES

Introduction to Fuel Tank Safety and Ignition Prevention: SAE ARP6205 (AERO0362)

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

Course Description

This course provides details on all elements of fuel tank design needed for compliance with the related regulations, with specific emphasis on electrical design aspects. Some review of regulatory history of 25.954 and 25.981 up to Amendment 25-146 is included for reference for TC, ATC, and STC activities, while the main emphasis of this course will explore the guidance material for fuel tank safety compliance provided within the FAA advisory circulars and SAE ARP6205 document. This course will also include a high-level overview of electromagnetic effects (EME), lightning effects (direct and indirect), high intensity radiated fields (HIRF), precipitation static (P-static), electrical bonding and grounding requirements, and requirements for electrical wiring interconnection system (EWIS), as they pertain to the affected fuel tank safety regulations, advisory circulars, and SAE ARP6205.

Who Should Attend?

This course is specifically meant for those who are interested in the latest aerospace recommended practice SAE ARP6205 and its relation to fuel tank safety. This course is also designed for all design engineering disciplines, project managers, project engineers, and laboratory personnel whose aircraft system may require protection of the airplane's fuel system from potentially catastrophic conditions, including ignition and explosion.

Course Highlights

- The history of fuel tank protection requirements for aircraft certification
- SAE ARP6205 role in modern aircraft fuel tank safety
- The electromagnetic environment relating to fuel tank safety
- Direct and indirect effects of lightning and HIRF testing
- Fuel tank electrical bonding and grounding and continued airworthiness requirements
- Critical Design Configuration Control Limitations (CDCCLs)

Learning Objectives

- Aircraft certification process, regulations and requirements for fuel tank safety
- Definition of fuel system including its components
- Direct and indirect effects of lightning, including zoning and testing
- Identifying and listing CDCCLs in fuel tank design, modifications, and maintenance
- Understanding inherently safe, inherent reliability, and fault tolerance

- Understanding failure mode and effects analysis (FMEA)
- Understanding Airworthiness Limitations (AWLs)

Course Outline

Day One

Purpose and overview

- General/definitions
- Regulatory environment and related fuel tank safety regulations and guidance

Background and regulatory actions

- History of fuel tank safety, including TWA 800/SFAR 88
- Modern fuel tank safety requirements and Amendment 25-146

Definition of fuel system and its components

Fuel tank safety team workshop

Day Two

Approach to compliance

- Compliance tasks and certification plans
- Identifying fuel system design features and elements
- Aircraft lightning environment, lightning strike zones, and verification
- Identifying ignition sources and performing safety assessment
- Supporting data and failure mode and effects analysis (FMEA)
- Electrical bonding and grounding
- Electrostatic Discharge (ESD)
- Precipitation Static (P-Static)
- Electromagnetic Effects (EME) threats
- The HIRF environment

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Day Three

Fault-tolerant protection and assessing non-fault tolerance

- Effective fault-tolerance
- Electrical and electronic system components
- Protection reliability, design reliability, and inherent reliability
- Compliance with “extremely improbable” requirements
- Assessment of non-fault tolerance
- Definition of remote

Fuel Tank Construction

- Fuel and Sealing
- Placement of fuel system components
- Wire harness runs internal and external

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Day Four

Compliance implementation and establishing airworthiness limitations

- Critical Design Configuration Control Limitations (CDCCLs)
- Replacement times, airworthiness limitation inspections, and test procedures
- Aircraft wiring and shielding
- Electrical Wiring Interconnect System (EWIS)
- Fuel tank wiring design and degradation
- 24 CFR26 continued airworthiness lessons learned

Verification and validation

- V&V methods
- Product changes
- Validate requirements as established in compliance plan are correct
- Verify design requirements established in implementation have been met
- Fuel tank safety team workshop

Day Five

- Teams will prepare final fuel tank safety report-out
- Teams will present their simulated compliance models and provide examples of appropriate compliance statements for FAA/EASA including design review, testing, analysis, and compliance inspections of the fuels system's type design
- Final Q&A/test

Classroom hours / CEUs

31.50 classroom hours

3.15 CEUs

Certificate Track

Aerospace Compliance

Aircraft Maintenance and Safety

Electromagnetic Effects

Electrical Wiring Interconnection System (EWIS)

Course Fees

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

Regular registration course 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

Darren Stout is an EME/HIRF/Lightning ODA EUM/AR at the Boeing Company and is also the president of Stout Aviation LLC. 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 30 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 was certified as a Level 2 Certified TEMPEST Professional.

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.

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