Introduction to Fuel Tank Safety and Ignition Prevention: Design, Certification and Compliance (AERO0361)

Instructor: Franklin L. Cummins, 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 regulation, with specific emphasis on electrical design aspects. Some review of regulatory history, 14 CFR 25.981 [25-102] and 25.954 are included for reference as well as TCA, STC work. Specific design implementations are examined and evaluated. The course will also include a high-level overview of electromagnetic effects and compatibility (EME/EMC), lightning effects (direct and indirect), high intensity radiated fields (HIRF), precipitation static (P-static), electrical bonding requirements, and requirements for electrical wiring interconnection system (EWIS).

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 of the airplane's fuel system from ignition/explosion.

Course Highlights
- The electromagnetic environment: considerations for 25.981 and 25.954
- Metallic and composite aircraft structures: considerations for 25.981 and 25.954
- The history of fuel tank protection requirements for aircraft certification
- Direct and indirect effects of lightning and HIRF testing for 25.981, 25.954 compliance
- Requirements for in-tank mounted equipment (including FQIS)
- Requirements for out-of-tank mounted FQIS
- Requirements for fuel control equipment mounted out-of-tank
- Fuel tank bonding and continued safety
- 25.981 ICA; critical design configuration control limitations

Learning Objectives
- FAA certification process and requirements
- Direct effects of lightning zoning and criticalities
- RTCA/DO-160 levels for direct effects testing
- Indirect effects of lightning
Course Outline

Day One
Purpose and overview
- General/definitions
- Regulatory environment
Background and regulatory actions
- TWA 800/SFAR 88
- 24 CFR26/Lessons learned
Electromagnetic Effects and Electromagnetic Compatibility (EME/EMC)
The HIRF environment
Electrical bonding
Electrostatic Discharge (ESD)
Prescription Static (P-STATIC)
FAA certification process and requirements
25.981 team workshop

Day Two
Compliance considerations
- FQIS
- EWIS
- COS / ICA / CDCCL
- AC25-981
- AC120-97A
Design implementations
- Establish design requirements with the following considerations
- Temperature threat and design mitigations – heat sources
- Auto ignition temperature and margin
- Consideration of latent failure(s)
- Temperature of fuel tank wall
- Temperature of components within the fuel tank
- Temperature of components adjacent to the fuel tank
25.981 team workshop

Day Three
Fuel Tank Construction
- Fuel and Sealing
- Bonding
Electrical (Spark) threat
• Consideration of Latent Failure
• Ground Return Fault
• Connections Fault
• Wire harness runs internal and external

Lightning Threat and Design Mitigations
• Consideration of latent failure
• Lightning flashover
• Lightning transients
• E-field streamers and vents
• 25.981 team workshop

Day Four
Compliance implementation
• 14 CFR 25.981, Amendment 102/125
• Aircraft wiring and shielding
• Bonding
• Electrical Wiring Interconnect System (EWIS)

Verification and validation
• V&V methods
• Validate requirements as established in compliance plan are correct
• Verify design requirements established in implementation have been met
• 25.981 team workshop

Day Five
• Teams will prepare final 14 CFR 25.981 report-out
• Teams will report on 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
• ICA/COS (keeping the initial design compliant)
• EWIS and product changes
• 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: $2,495 if you register and pay by the early registration deadline (45 days out).

Regular registration course fee: $2,695 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.

Netherlands Defence Academy Discount
This course is available to Netherlands Defence Academy employees at a discounted registration fee. Please contact the NDA Procurement and Contracting department for details. Please note that you cannot register using our online system when requesting this discount.

Instructor Bios

Franklin Cummins has more than 30 years of experience in avionics and electrical design, and certification. He is experienced in in-service aircraft modification, special missions modifications and initial TC development. As a Lead DAS Administrator for a modification center, he developed and taught classes in 14 CFR part 21 FAA Order 8110.4 for engineering, management and quality personnel. He also maintains the following ratings: FAA Private Pilot (1987), Instrumentation (1990), Commercial/Multi (1998), FAA DER, Systems & Equipment - Electrical (1998) and Systems Safety, EME, EWIS.

C. Bruce Stephens is an HIRF/Lightning/EWIS ODA UM/AR at the Boeing Company and a consultant DER at his company, Stephens Aviation, with a wealth of experience in High Intensity Radiated Fields (HIRF) and Lightning protection of Aircraft. Stephens retired from Hawker Beechcraft after 28 years of service. He has HIRF/Lightning experience on both Part 23 and Part 25 including composite aircraft. Stephens is working with the Boeing Team to develop EWIS requirements and means of compliance on several aircraft projects. Stephens is a Six-Sigma/Lean Master Black Belt consultant, developing implementation and training materials, and teaches at a number of universities, including Webster University and Southwestern College. 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.
This class is available for delivery at your company. Your company can realize substantial savings by bringing an aerospace short course to your workplace. On-site delivery is ideal for organizations that need to train 10 or more employees on a specific topic. For more information on on-site course delivery, or to request a cost proposal, please contact us at 913-897-8782, or email us at ProfessionalPrograms@ku.edu.

CONTACT US:

KU Lifelong and Professional Education (KULPE)
Aerospace Short Course Program
12600 Quivira Road, RC 125
Overland Park, Kansas 66213
Email: ProfessionalPrograms@ku.edu
Phone: 913-897-8530 (Registration)