Aircraft Fire Hazards, Protection & Investigation

5 to 7 August 2025
Woburn MA, USA

Instructor:
Dr. N. Albert Moussa, P.E.

BlazeTech
Bringing Science to Safety
Offering Aircraft Safety Courses since 1998

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Ubi fumus, ibi ignis

BlazeTech Corporation

Our services to the aircraft industry include R&D, testing, modeling and simulation, safety audits, consulting, accident investigation/reconstruction and expert witness, and product/technology assessment. Our products include a flash/fire discriminator; a variety of fire, explosion, and structural damage software such as BlazeTank™ for fuel tank explosion analysis; FuelShield™ to protect fuel tanks against ullage explosion and hydrodynamic ram; and unique instrumentation to characterize aerosols and ash in flows (particles size, shape, temperature, and mass flux). We provide customized training at client facility expanding on any subject matter in this course.

Course Developer and Main Lecturer

Dr. N. Albert Moussa, Technical Director of BlazeTech, has over 40 years of experience in fire and explosion in civilian and military aircraft. He authored one book on flammability and over 200 publications, presentations, and reports. He has worked on small- and full-scale testing of aircraft materials, components and entire systems, fire and explosion modeling and the design of fire detection and suppression systems. Since 1998, he has taught professional courses on these subjects and has given invited lectures at several universities and the NTSB Training Center. He has consulted on major aircraft fire/explosion accidents in the US and overseas. His forewarnings about aircraft fuel system vulnerabilities before the TWA800 and Concorde disasters have gained him prominence in the US and European media. His credentials include: William Lockwood Memorial Lecture Award, Engineer of the Year by the NE- AIAA Section, AIAA Distinguished Lecturer, Best Papers by SAE and ASEI, and several ASME citations. He served on national committees and was Associate Editor of an ASME Journal. He received his Bachelor degree (with Honors) from Stanford University and Masters/Doctoral degrees from MIT, with both dissertations on fire.

Course Would Benefit:

Engineers, Managers, Accident Investigators and Transport Specialists who are responsible for commercial/military aircraft, helicopters, or Unmanned Aerial Vehicles including design, operation, specifications, certifications, flight safety, field inspection, maintenance, materials, fluids, fire detection/suppression, protection equipment, bomb threats and security, survivability, vulnerability, Safety Management System, emergency response at airport, accident investigation, risk analysis and mitigation.

Course Schedule and Location

8:00-17:00 Tuesday-Thursday, at BlazeTech Corporation 29 B Montvale Ave., Woburn, MA 01801 USA or at Hotel nearby to be announced closer to course date.

Fee and Registration

Fee: $3,500. To register, fill out form below. Payments:
-Credit cards: fax to BlazeTech 781-759-0703
-Wire payments: contact us for details.
-Checks: mail to BlazeTech; discount $200 if check is received 1 month before course starts.
Registration is incomplete until payment is received. No walk-ins. We reserve the right to cancel the course.

All participants must show proof of compliance with US Federal and Massachusetts Covid-19 travel requirements at the time of the course; and those who do not will be denied entrance to the course.

Registration Form

Name: _____

Title/Position: _____

Company: _____

Address: _____

City, State, Zip: _____

Country: _____

Phone/Fax: _____

E-mail: _____

Specific Interest: _____

Payment: ☐ Check ☐ Credit Card ☐ Wire

Card #: _____

Expiration Date: _____ Amount: _____

3- or 4-Digits Security Code on card: _____

Name on Card: _____

Signature: _____Date:____

Billing Address for Card: _____

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How did you hear about the course?

☐ Colleague ☐ Website ☐ Email ☐ Other:

Course Objectives & Organization

While commercial air transport is very safe, the advent of new technologies poses new fire safety challenges, thus the motivation for this course. Expect a comprehensive and unique treatment of practical fire and explosion hazards onboard aircraft. Using case studies, we discuss initiating events, their evolution, systems survivability, design issues, protection methods and forensic implications, with the fundamentals introduced as needed. This approach is tailored to professionals who want to broaden and deepen their knowledge so as to handle new situations. We present a unified treatment of diverse situations that is pertinent to accidents, combat, and terrorist attacks for both commercial and military aircraft. The course is illustrated by videotapes and photographs of real events and well controlled and instrumented bench- and full-scale tests by FAA, NTSB, DOD, NASA and BlazeTech. Attendees will benefit from a grasp of:

- Discussion of numerous real accident case studies
- Presentation of related fundamentals
- Available simplified analyses for quick answers
- When to use such analyses vs. computer models?
- What to ask from Subject Matter Experts?
- Discussion of testing and accident reconstruction
- How to assess hazards from new technologies?
- Dynamic class exchange of current issues

Attendees receive class notes containing a wealth of key data and a certificate of completion. Course is equivalent to three Continuing Education Credit Units.

1. Introduction

- Outline of course rational and fire scenarios
- Reaction types and fire classifications
- Stages of fire development

2. Fuel Tank Fire and Explosion

- Ullage flammability and deflagration
- Predict fire/overpressure using BlazeTank
- N_2 Inerting: 9% vs. 12% O_2
- Penetration/perforation by debris/bullet impacts
- SFAR 88: lessons learned (TWA 800, B747, NY)

3. Engine Fires

- Fire in an F-16 simulated engine nacelle
- Fire tests on a full-scale AV8-B
- When to use hot surface vs. auto ignition temp.?
- Protection systems
- B747 cargo with GEnx engines climbing out of Miami
- Uncontained engine failures (CF6, DC-10, Sioux City, IA; Trent 972, A380, Singapore)

4. Post-Crash Fires

- Pool fire and anti-misting fuel (Air France 358, A340, Toronto, Canada)
- Fuel tank explosion (China Airlines, B737, Okinawa)
- Impact (Asiana 214, B777, San Francisco, CA)
- Collision of A350 with Coast Guard DHC-8 in Tokyo

5. Li- Battery Fires

- Primary cells, rechargeable cells, battery essentials
- Battery fire hazards and testing
- Fire in packing facility at airport, Los Angeles, CA
- Inadequate battery handling
- Cabin incidents and protection methods

6. Li- Battery Fires in Aircraft

- UPS 6, B747, Dubai, United Arab Emirates
- UPS 1307, DC-8, Philadelphia, PA
- Fires in APU Japan Airlines, B787, Boston
- FedEx Express 0004, MD-11, Memphis, Tennessee
- FedEx and UPS specialized protection systems

7. Drones and Safety Implications

- Electric and hydrogen-powered aircraft
- Flammability properties of hydrogen
- Crash fire hazards of liquid hydrogen-fueled aircraft

8. Flammability of Polymeric Materials

- Thermal degradation, ignition, flaming, smoldering, smoke, toxicity, flame retardants
- FAR 25.853 test methods
- Effects of pressure and oxygen concentration
- Attendant uniforms

9. Cabin Fires

- Breached fuselage vs. burn-through
- Flammability of seats and panels
- Flashover (full scale FAA tests)
- Passenger evacuation (British Airtours 28M, B737, Manchester, UK)

10. Fires in Cargo and Hidden Areas

- Ventilation and smoke movement
- FedEx 1406, DC-10-10, Stewart-Newburgh Airport
- Oxygen generator fire (ValuJet 592, DC-9 Everglades, Miami Dade County, Florida)

11. Smoke and Fumes

- NBS smoke chamber and smoke movement
- Air Canada 797, DC-8, Cincinnati, OH
- Cockpit protection equipment

12. Electrical Wiring Fires

- Wire types: Teflon, Tefzel, Kapton, TKT
- Wiring problems, causes, fixes, and challenges
- Swiss Air 111, MD-11, Nova Scotia

13. Flammability of Composite Structures

- Unique properties of composites
- Fire test methods
- Thermal degradation model
- Composites v. Aluminum structures
- Unmanned Aerial Vehicles

14. External Hazards That Can Impact Aircraft

- Classification of energetic/hazardous materials
- Detonation of Improvised Explosive Devices
- Air blast from explosives
- Internal explosions (Pan Am 103, B747, Lockerbie)
- Structural response: local v. global deformation
- Shoulder mounted missile (DHL A300, Baghdad)

15. Fire Detection Systems

- Types: smoke, ionization, thermal and optical
- Pros and cons of various detector types
- Use in various hazard zone classifications
- Sources of false alarms

16. Fire Suppression Systems

- Passive and active fire suppression in fuel tanks
- Halon replacement agents, clutter effects
- Hand held systems
- Ground-based AFFF fire suppression strategies
- Environmental issues with AFFF

17. Aircraft Accident Investigation

- Investigative process (ICAO, NTSB, FAA)
- Anatomy of a fire accident; accident precursors
- Forensic tools, NFPA 921
- Timeline and path line reconstruction
- Critical tests and modeling
- Contributory human factors

18. Summary of Fire/Explosion Pattern Recognition

- In-flight v. ground fires:
- Pre v. post crash fires (CRJ-100, Lexington, KY)
- Explosion: solid v. fuel vapor (TWA 800, B747, NY)
- Structural failure identifications
- Impact from debris v. ballistic threats
- Casualties from smoke inhalation v. thermal injury
- Lessons learned.