Aviation Fire Safety:

Embracing New Technologies and Fuels

Presented by:
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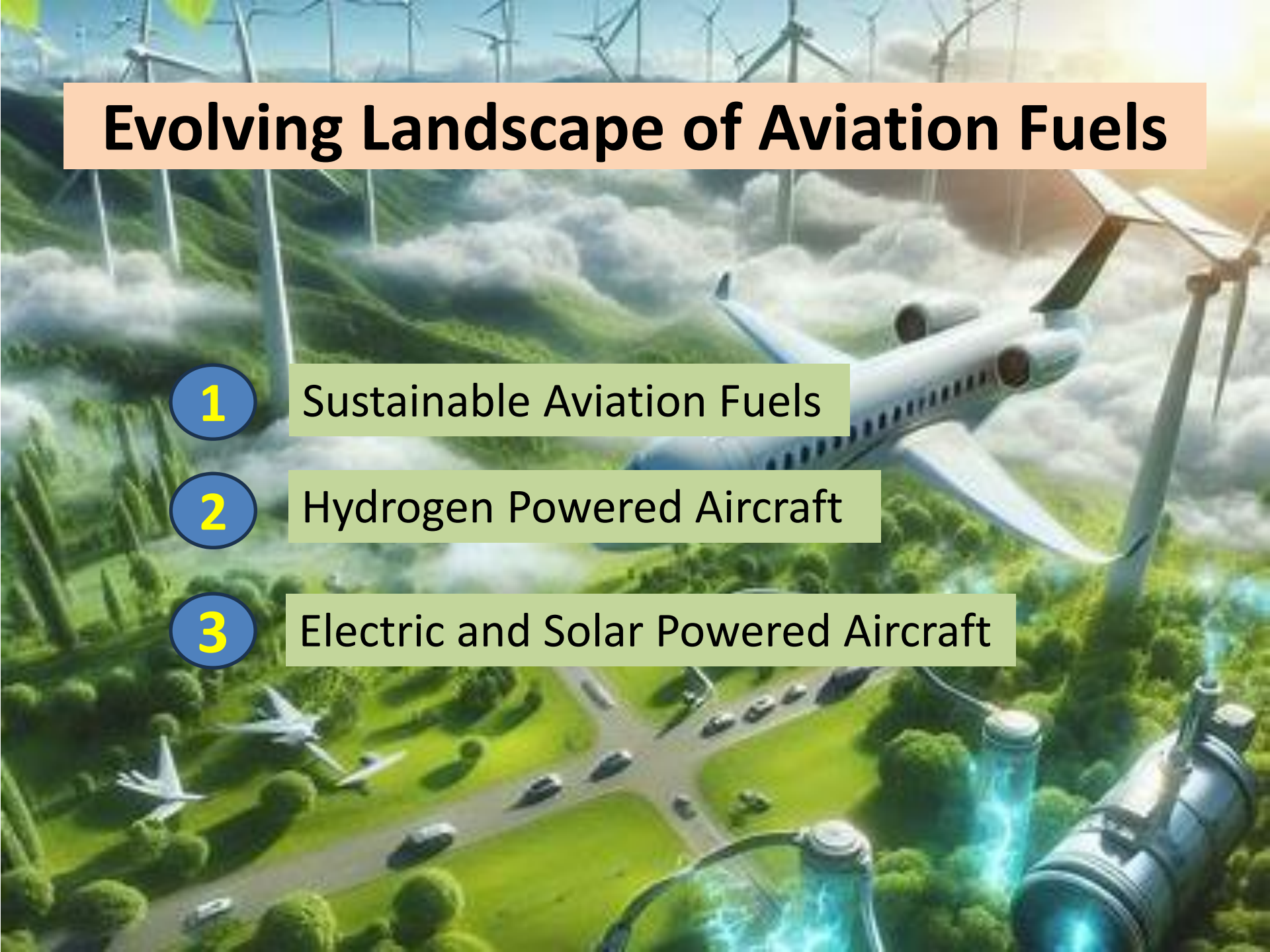
Technological Advancements in ARFF

1. Electric ARFF Vehicles
2. Drones for Situational Awareness
3. Fluorine Free Foam (F3)
4. Compressed Air Foam (CAF)
5. Encapsulator Agents


Evolving Landscape of Aviation Fuels
1
Sustainable Aviation Fuels
2
Hydrogen Powered Aircraft
3
Electric and Solar Powered Aircraft

Challenges of Emerging Fuels

- New Fire Dynamics
- Limited Experience
- Safety vs Environment
- Electric Aircraft Risks
- Hydrogen Leak Management

Revisiting the Essence of ARFF

ARFF : Aviation’s Final Defence

- **Mission : Save lives**
  - Minimize property damage

NEW TECHNOLOGIES IN ARFF

1. Electric ARFF Vehicles

Oshkosh

Oshkosh

Striker Volterra

- Hybrid Electric ARFF vehicle

  Channels mechanical and battery powers to maximise performance

- Improved Fire-fighter Safety:

  Electric mode for station entry/exit with zero emissions

Rosenbauer

Rosenbauer's

Panther Electric

- Fully Electric ARFF vehicle
  - Close-to-production concept and will be made available in 2024.
- Revolutionary Advancements:
  - Combines safety and functionality with electric mobility.

2. Enhancing ARFF with Drones

Drones for Situational Awareness

- Offer crucial situational awareness from the air.
- Response speed
- Accessibility to hard-to-reach areas.
- Comprehensive view of the incident scene.

By Jim Tise, FAA Communications

As part of a simulated exercise, the airport's aircraft rescue and firefighting (ARFF) unit arrives at the scene to assess the fuselage of an Airbus 380 that lays burning on a taxiway at Dallas/Fort Worth International (DFW) Airport.

In years past, ARFF responders could view an aircraft accident or incident only from the ground, missing an important perspective. But this past May, during a research effort coordinated between the FAA and DFW, firefighters got a new vantage point: a bird's-eye-view from an unmanned aircraft system (UAS), or drone, hovering over simulated accident scenes.

[FAA Fire Fighting With Drones. Using drones to aid aircraft rescue and… | by Federal Aviation Administration | Cleared for Takeoff | Medium]


Revolutionizing
Emergency Response

Revolutionizing Emergency Response

Drones Delivering Firefighting Agents Directly to Aircraft Fires

3. Fluorine Free Foams (F3)

Fluorine Free Foam (F3)

- Addressing Environmental Concerns
- A Safer Alternative
- Shift from Fluorinated Foams

Key Advantages of F3

- Non-Toxic & Environmentally Friendly: No PFAS content.
- Effective Fire Control: Rapid extinguishing with a foam blanket.
- Biodegradable: Minimizing long-term environmental impact.

Transitioning to F3

1. **Training and Awareness:**
   - Equipping ARFF Personnel.
   - Safety First

2. **Regulatory Collaboration:**
   - Ensuring Safe Adoption.
   - Compliance with Global Efforts

3. **Environmental Responsibility:**
   - Fulfilling Our Pledge
   - Embracing Innovations

4. Compressed Air Foam (CAF)

4. Compressed Air Foam (CAF)

- Next-Gen Foam Technology
- Enhanced Firefighting:
  - Superior fire suppression
  - Faster cooling, smothering
  - Reduced water usage
- Promising Future

5. Encapsulator Agents

- Encapsulator Agents: Water additives forming micelles.
- Alters Wa[illegible]ets: Creates smaller, h[illegible]rbent droplets.
- Effective [illegible]nd D classes of fire and Lithium-ion battery fires.
- FAA Recognition:

FAA, AC No. 150/5210-6E

Electric ARFF Vehicles

Drones

FFF

Compressed Air Foam

Encapsulator Agents

EVOLVING AVIATION FUELS & ARFF CHALLENGES

The Industry's Net-Zero Commitment

- Air Transport Action Group (ATAG) commitment to net-zero carbon emissions by 2050.
- Supported by energy transition, efficiency measures, and innovation.
- Collaboration with governments worldwide.

ICAO's Vision for 2050

- ICAO's goal (LTAG): Net-zero carbon emissions for international aviation by 2050.
- Deep cuts in aviation CO2 emissions.

FAA's Net-Zero Aspiration

- New aircraft technologies, sustainable aviation fuels, and improved air traffic management

New Frontiers in Aviation Fuels

Sustainable Aviation Fuels (SAF)

- Derived from various sources.
- Potential to reduce emissions by up to 100%.

- Virgin Atlantic Boeing 787 Dreamliner - "Flight 100",
- First transatlantic commercial flight, powered by 100% SAF
- From London and landed at the JFK Airport in New York.

Emirates A380 Demonstration Flight

22 November 2023

Powered by 100% SAF

https://www.emirates.com/media-centre/emirates-worlds-first-airline-to-operate-a380-demonstration-flight-with-100-sustainable-aviation-fuel/

Electric Propulsion

- Electric power for aircraft propulsion.
- Challenges: Battery capacity.
- Hybrid-Electric: Combining battery and aviation fuel.

Hydrogen Energy

- Jet engine propellent
- Fuel cell options.

Airbus aims to introduce the first commercial aircraft powered by hydrogen to the market by 2035.

The Green Saga continues...

CIAL

Being the world's first airport fully powered by solar energy, CIAL bolsters its green initiatives by setting up the world's first hydrogen plant in an airport.

Inks an MoU with BPCL for setting up a green hydrogen plant

BPCL will be allocated one acre of underutilized non-commercial land earmarked in the master plan of CIAL, ensuring maximum productivity of its land assets

BPCL will provide technology and CIAL to contribute water & green energy resources for the 1000 KW plant

Solar Power

- Solar-powered planes: Thousands of solar cells.
- Electricity for motors and on-board batteries.

CHALLENGES FOR ARFF PERSONNEL

Case Study – SAF Powered Aircraft

Engine Fire on Runway during take off

Challenges and Solutions

- Adapting to new fire dynamics
  - specialised training
- Limited Experience and knowledge
- Balancing sustainability and risk

Case Study – Hydrogen Powered Aircraft

Key Challenges

1. Detecting the invisible enemy
2. Firefighting a hot beast
3. Pressure cooker dilemma
4. Seeking expert advice

CASE STUDY – ELECTRIC AIRCRAFT

Key Challenges

- Understanding the thermal runaway
- De-energising and isolating electrical systems
- Re-ignition potential

Training Focus Areas – Electric Aircraft Fires

1. Lithium-ion battery understanding
2. Safe electrical system procedures and specialised firefighting procedures
3. Effective communication and coordination

Let’s Recap….

- Cutting-edge Developments Explored
  - Electric ARFF vehicles
  - Utilization of Drones for Enhanced efficiency
- Fluorine Free Foams, CAF and Encapsulator Agents
  - Eco-friendly attributes
  - Health-conscious features
- Exploration of New Aviation Fuels
  - Sustainable Aviation Fuel (SAF)
  - Electric Aircraft
  - Hydrogen-powered Aircraft

Key Takeaways

1. Dedication to Safety
2. Adaptation to New Technologies
3. Collaboration and Coordination
4. Environmental Stewardship
5. Community Engagement
6. Embracing Change


Thank You

Special Thanks To...

- Mr Ajith Kumar [Chief Conference Organizer]
- Mr Cletus M John Packiam (Exc Member, Organizing Committee]
- Dr Subhash Kumar
- Mr Selvaraj Arumugham
- Mr Hari Kumar D [Conference Coordinator]