Certification of Alternative Fuel

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ICAO Alternative Fuels Workshop
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Presentation Overview

• CAAFI Certification and Qualification
• Fuel Approval Process
  – Fuel Specifications
  – Fuel Evaluation
  – Fuel Certification
• Alternative Aviation Fuels Status
  – Potential Alternative Fuels
  – Alternative Fuel Status
  – DXXXXX Specification
CAAFI Certification and Qualification

- Certification-Qualification Panel
  - Enable Supply
  - CAAFI
  - R&D Panel
  - Generate Ideas/Solutions
  - FAA
  - AIA
  - ATA
  - ACI-NA

- Fuel Specifications
- Fuel Evaluation Process
- Fuel Certification Process

- Environmental Panel
  - Assess Impact

- Business & Economics Panel
  - Generate Demand & Target Funding
Fuel Specifications
FAA Regulatory Structure

• 33.7 - Engine Ratings and Operating Limitations
  – Fuel Specification

• 25.1521 - Powerplant Limitations
  – Fuel Specification

• 25.1583 - Operating Limitations
  – Powerplant limitations in Airplane Flight Manual

• 91.9 – Civil Aircraft Flight Manual
  – no person may operate a civil aircraft without complying with the operating limitations specified in the approved AFM
ASTM

- **Specification-Writing Organization**
  - No Enforcement Role, but…
    - Convenient Venue to Review Industry “Oversight”
  - Equivalent to UK Aviation Fuels Committee (AFC)
    - DEF STAN 91-91 Jet Fuel Spec

- **Consensus-Based Organization**
  - Members Vote on Specifications
    - All Negative Votes Reconciled

- **Membership**
  - Users: Engine/Aircraft OEMs, Airlines, Military
  - Producers: Oil Cos, Additive Mfgs, Alt Fuel Cos.

“*We Won’t Use It*”

“*We Won’t Make It*”
Aviation Fuel Specifications

**Aviation Gasoline**

- ASTM D910-07a
  - Aviation Gasolines
  - 100LL, 80/87, 91/98
- ASTM D6227 - 04a
  - Grade 82 Unleaded Aviation Gasoline (82UL)
- Def Stan 91-90
  - Gasoline, Aviation: Grades 80/87, 100/130 and 100/130 Low Lead

**Jet Fuel**

- ASTM D1655 - 08a
  - Aviation Turbine Fuels (Jet A/A-1)
- ASTM D6615 – 06
  - Jet B Wide-Cut Aviation Turbine Fuel
- ASTM D7223 – 05
  - Aviation Certification Turbine Fuel
- Def Stan 91-91
  - Turbine Fuel, Aviation Kerosine Type, Jet A-1
- ASTM DXXXX
  - Aviation Turbine Fuel with Synthesized Hydrocarbons
Fuel Evaluation
Fuel Evaluation

Fuel Evaluation Process

Existing Fuel
1950's
1970's
1990's
2000's
New Fuel

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ASTM Fuel Evaluation Process

Specification Properties

Fit-For-Purpose Properties

Component/Rig/APU Testing

Engine Testing

ASTM Specification

ASTM Balloting Process

OEM Review & Approval

ASTM Research Report
Fuel Certification
Fuel Certification

Existing Engines

1950’s 1970’s 1990’s 2000’s

New Fuel

Fuel Certification Process

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# Draft FAA Certification Policy

## Aviation Fuel

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<th>Engine/Airplane</th>
<th>Existing Specification</th>
<th>New Specification</th>
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<td><strong>Drop-in Fuel</strong></td>
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**Operating Limitation**

- New Operating Limitation
- Unchanged Operating Limitation
Potential Alternative Aviation Fuels

- **Fischer-Tropsch**
  - Coal
  - Natural Gas
  - Biomass
  - Syn Gas (CO, H₂)
  - Gasify
  - FT Process

- **Conventional Refinery Processes**
  - Syn-Crude
  - Syn-Gas (CO, H₂)
  - FT Process
  - Gasify

- **HRJ from Plant Oil**
  - 2-3 years
  - Plants/Nuts
  - Oil Extraction
  - Hydroprocessing
  - Jet Fuel

- **HRJ from Algae**
  - 10 years
  - Algae
  - Harvested Algae
  - Process Facilitators
  - Bio-Crude

- **Metabolic**
  - Cellulose Plants, Sugar Cane, Switchgrass
  - Fermentation & Finishing
  - Jet Fuel

**Potential Alternative Aviation Fuels**
- Cellulose
- Sugar Cane
- Switchgrass

**Processes**
- Fermentation
- Finishing

**Fuels**
- Jet Fuel
Alt Fuels Status

SASOL Semi-Synthetic Jet Fuel (SSJF) – CTL FT Fuel
SASOL Fully-Synthetic Jet Fuel (FSJF) – CTL FT Fuel
Generic 50/50 FT Fuel Blends
Hydroprocessed Renewable Jet (HRJ) Fuel

Technical Evaluation
OEM Approval
Approved Spec
ASTM Ballot
Research Report

D1655
DXXXX
**DXXXXX Specification**

- **Key Provisions**
  - Aviation Turbine Fuel Containing Synthesized Hydrocabrons
  - Annex for Each Class of Synthetic Blending Component
  - Allow Re-Certification to D1655
  - Blend Syn Component with Conv Component OR D1655 Fuel
    - possible re-blending
    - But, no need for separate tracking
  - Annex 1
    - Hydroprocessed SPK
      - Includes 50% FT Fuel
      - Hydroprocessed Renewable Jet (HRJ) Will be Next Fuel
CAAFI Certification & Qualification Panel

CAAFI Certification & Qualification Panel

International Spec Writing Organizations

ASTM Standard Practice

EASA

Foreign Regulatory Authorities

USAF MIL-HDBK-510

FAA Certification Policy

CAAFI CQ
Thank You

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