Cert-Qual Sessions Overview

**Plenary**
SAJF Certification and Qualification

- Certification Overview
- SAJF Approval Status
- The Path Forward

**Unconference 1**
Enhancing Fuel Qualification Process

- OEM Review Process
- Stakeholder Engagement
- Approval Process Improvements

**Unconference 2**
Key Fuel Qualification Challenges

- Key Technical Issues
- SAJF Compositional Considerations

**Cert-Qual Breakout**

- Centralized Mgt of Test & Review Process
- Generic Spec

You Are Here
Discussion Topics

* D4054 Clearinghouse Concept
* D7566 Generic Annex
D4054 Clearinghouse Concept
D4054 Qualification Process

**Tier 1**
- Specification/Properties

**Tier 2**
- Fit-For-Purpose Properties
- Phase 1
  - ASTM Research Report
- ASTM Balloting Process
- Re-Eval As Required
- ASTM Specification
  - Re-Eval
  - Accept
  - ASTM Review & Ballot

**Tier 3**
- Component/Rig Testing

**Tier 4**
- Engine/APU Testing
- Phase 2
  - ASTM Research Report
- OEM Review & Approval
- FAA Review

Mark Rumizen
October 26, 2016
OEM Approval Process

STEP 1
Producer Testing & Data Rpt Issuance

STEP 2
OEM Initial Review

STEP 3
OEM Tier 3 & 4 Testing Recommendations

STEP 4
Producer Testing & Final Re Rpt Issuance

STEP 5
OEM Engineering Review

STEP 6
FAA Review

STEP 7
Producer Ballots Annex and Research Rpt
**Steps 1-2 of OEM Review Process**

1. **Fuel Producer**
   - Process Description
   - 100 gals of fuel

2. **D4054 Clearinghouse**
   - Test fuel
   - Tier 1 & 2 Testing
   - Phase 1 Research Rpt
   - Quest’s & Comments or Rejection

**OEM Step 3 Review**

3. **Quest’s & Comments**
   - Phase 2 Test Requirements
   - Consolidated Phase 2 Test Requirements

**Steps 5-6 of OEM Review Process**

4. **Tier 3 Testing**
   - Tier 4 Testing
   - Phase 2 Research Rpt

5. **D4054 Clearinghouse**
   - Test fuel
   - Tier 1 & 2 Testing
   - Quest’s & Comments or Rejection

6. **OEM Step 7 Review**
   - OK for Ballot

**Fuel Producer**

7. **Consolidated Phase 2 Test Requirements**
   - TBD gals of fuel

- **Quest’s & Comments or Rejection**
- **Phase 2 Test Requirements**
- **D4054 Clearinghouse**
- **Test fuel**
- **Tier 1 & 2 Testing**
- **Quest’s & Comments**
- **OEM Step 3 Review**
- **Tier 3 Testing**
- **Tier 4 Testing**
- **Phase 2 Research Rpt**
- **OK for Ballot**
- **Consolidated Phase 2 Test Requirements**
- **Quest’s & Comments or Rejection**
- **OEM Step 7 Review**

Mark Rumizen, October 26, 2016
Tasks:
- D4054 Process Guide
- OEM Review Meetings
- Phase 1 Support:
  - Tier 1 & 2 Testing
  - Draft Phase 1 Research Report
  - Coordinate Resolution of OEM Comments
  - Tier 3 & 4 Testing Recommendations
- Phase 2 Support:
  - Tier 3 & 4 Testing
    - Subcontract/Partner As Necessary
  - Draft Final Research Report
  - Coordinate Resolution of OEM Comments

Funding:
- FAA Seed Money Under ASCENT
  - Project 31 (UDRI)
  - Should Cover Admin and Tier 1 & 2 Testing
- Additional Support will be Necessary
  - ASCENT is Structured as a Cost-Share Arrangement
    - In-kind Contributions
      - Testing Partners
    - Direct Contributions
D7566 Generic Annex

Specific Criteria to Ensure Compositional Control and Product Quality

Permit Production of ANY Pathway at Nominal Blend %

D7566 Generic Annex Currently Under Consideration By ASTM

D4054 Qualification

D7566 Generic Annex Currently Under Consideration By ASTM
Annex Ax

Ax.4 Materials and Manufacture
Defines and locks in conversion process

Table Ax.1
Detailed Batch Requirements

Table Ax.2
Other Detailed Requirements (MOC Requirements)

Existing Annexes are Limited to a Specific Conversion Pathway and Feedstock(s)

A1.4 Materials and Manufacture

A1.4.1 FT-SPK synthetic blending components shall be comprised of hydroprocessed synthesized paraffinic kerosine wholly derived from:

A1.4.1.1 Paraffins and olefins derived from synthesis gas via the Fischer-Tropsch (FT) process using Iron or Cobalt catalyst.

A1.4.1.2 Subsequent processing of the product shall include hydrotreating, hydrocracking, or hydroisomerization and is expected to include, but not be limited to, a combination of other conventional refinery processes such as polymerization, isomerization, and fractionation.\textsuperscript{17}
Batch testing requirements are unique to each annex, and are more stringent than Table 1 properties for conventional jet.
Other detailed testing requirements are intended for process start-up and MOC, but are applied for each batch for annexes A2-A5.

### Annex Ax

**Ax.4 Materials and Manufacture**

#### Detailed Batch Requirements

<table>
<thead>
<tr>
<th>Property</th>
<th>FT-SPK</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocarbon Composition</td>
<td></td>
<td>D2425</td>
</tr>
<tr>
<td>Cycloparaffins, mass %</td>
<td>Max</td>
<td>15°C</td>
</tr>
<tr>
<td>Aromatics, mass %</td>
<td>Max</td>
<td>0.5</td>
</tr>
<tr>
<td>Paraffins, mass %</td>
<td>Max</td>
<td>report</td>
</tr>
<tr>
<td>Carbon and Hydrogen, mass %</td>
<td>Min</td>
<td>99.5</td>
</tr>
<tr>
<td>Non-hydrocarbon Composition</td>
<td>Max</td>
<td></td>
</tr>
<tr>
<td>Nitrogen, mg/kg</td>
<td>Max</td>
<td>2</td>
</tr>
<tr>
<td>Water, mg/kg</td>
<td>Max</td>
<td>75</td>
</tr>
<tr>
<td>Sulfur, mg/kg</td>
<td>Max</td>
<td>15</td>
</tr>
<tr>
<td>Sulfur, mg/kg</td>
<td>Max</td>
<td>15</td>
</tr>
<tr>
<td>Metals (Al, Ca, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Pd, Pt, Sn, Sr, Ti, V, Zn), mg/kg</td>
<td>Max</td>
<td>0.1 per metal</td>
</tr>
<tr>
<td>Halogens, mg/kg</td>
<td>Max</td>
<td>1</td>
</tr>
</tbody>
</table>

Table Ax.2

Other Detailed Requirements (MOC Requirements)
Each of these blend components underwent extensive D4054 testing and evaluation.

6. Materials and Manufacture

6.1 Aviation turbine fuel, except as otherwise defined in this specification, shall consist of the following blends of components or fuels:

6.1.1 Conventional blending components or Jet A or Jet A-1 fuel certified to Specification D1655; with up to 50% by volume of the synthetic blending component defined in Annex A1.

6.1.2 Conventional blending components or Jet A or Jet A-1 fuel certified to Specification D1655; with up to 10% by volume of the synthetic blending component defined in Annex A2.

6.1.3 Conventional blending components or Jet A or Jet A-1 fuel certified to Specification D1655; with up to 10% by volume of the synthetic blending component defined in Annex A3.

6.1.4 Conventional blending components or Jet A or Jet A-1 fuel certified to Specification D1655; with up to 50% by volume of the synthetic blending component defined in Annex A4.

6.1.5 Conventional blending components or Jet A or Jet A-1 fuel certified to Specification D1655; with up to 30% by volume of the synthetic blending component defined in Annex A5.
Proposed D7566 Generic Annex

- Not Limited to Specific Conversion Pathway or Specific Feedstock
- Producer NOT Required to Negotiate D4054 Process
- But Blend % Limited to 5 – 10%
- True “commodity” Specification
Some Concerns:

- Improved Test Methods Required
  - Hydrocarbon Composition (D2425)
  - Oxygenates (at very low detectability level)
  - Hydrocarbon Molecular Class Distribution/Limits
  - C Number Distribution
  - GC x GC Not Yet Standardized
  - Others?

- Tracking/Monitoring of Producers?
  - Any Producer Can Make Fuel Provided it Meets Generic Annex

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October 26, 2016
Thank You

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