Sustainable Aviation Biofuel -
Boeing’s Work in China

International Energy Agency Task 39 Meeting
Beijing, April 2018
Boeing – China

Four Pillars of Partnership

- Leadership
- Sustainability
- Production
- Provision

Technology and Innovation
Biofuel in China - Three Imperatives

**DRIVE**
Biofuel Technology Towards Aviation Use

**FACILITATE**
Globally Harmonized, In-Country Practical Standard/ Regulation

**SUPPORT**
Aviation Biofuel Commercialization and Airlines Application
Biofuel for Boeing in China - Three Imperatives

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SUPPORT
Aviation Biofuel Commercialization and Airlines Application
Research Efforts – Two focus areas

**Waste Cooking Oils**
- **Background** --- Illegal recycling of waste cooking oil generates food safety issues
- **Feedstock** --- Feedstock collection & logistics in eastern China
- **Technology** --- New catalyst for waste cooking oil to aviation biofuel

**Agricultural Residues**
- **Background** --- Huge capacity, yet severe air pollution
- **Feedstock** --- Evaluation of collectable quantity based on retaining soil sustainability
- **Technology** --- Process assessment and technical optimization
Waste Oil to Aviation Biofuel

- 250 gallon/day pilot plant
- Built by Hangzhou Energy Engineering & Technology, in collaboration with Boeing and COMAC
- Aviation biofuel produced meets or exceeds requirements
Agriculture Waste to Aviation Biofuel

- Collaboration with Guangzhou Institute of Energy Conversion
- Lab-scale feasibility demonstrated
- 2 pilot plants built
- Techno-economic analysis performed
- Sustainability and impacts analysis underway

Pilot Plant (Foshan, Guangdong)
Capacity: 35 gallons/day

Pilot Plant (Yingkou, Liaoning)
Capacity: 165 gallons/day
Ag Waste – Sustainability Assessment

Total Crop Residues

Competing Uses

Maintain Soil

Sustainable Residue for Aviation Biofuel

Jilin Province: corn

Anhui Province: rice, wheat
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### Global Commercial Jet Fuel Standards

<table>
<thead>
<tr>
<th>Governing body&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Standard</th>
<th>Key Fuels produced</th>
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<tbody>
<tr>
<td>ASTM</td>
<td>D1655</td>
<td>Jet-A</td>
</tr>
<tr>
<td>UK MoD</td>
<td>Def Stan 91-91</td>
<td>Jet-A&lt;sup&gt;1&lt;/sup&gt;</td>
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<tr>
<td>Chinese GB (SAC)</td>
<td>GB 6537</td>
<td>Jet-A&lt;sup&gt;1&lt;/sup&gt;</td>
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<tr>
<td>Russia GOST</td>
<td>10227</td>
<td>No. 3</td>
</tr>
</tbody>
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1. The 4 standards listed in Boeing flight manuals, many others exist.
2. Tested to D1655.
3. Tested to Def Stan 91-91.

Note: Fuel and standard listings are not comprehensive, but intended to cover the most commercial used standards and fuels.

- **Allow 5 biofuel pathways**
- **Allows 1 biofuel pathway**
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Use of biofuels by airlines in China

- China’s 1st biofuel demo flight conducted by Air China
- China’s 1st biofuel passenger flight conducted by Hainan Airlines
- China’s 1st transpacific biofuel flight conducted by Hainan Airlines
Boeing is committed to partnering for a better future