2022 AQMP Mobile Source
Working Group Meeting #2 – Aircraft

April 6, 2021

Cleaning The Air That We Breathe...
Draft Aircraft Emissions Inventory and Potential Control Strategies
• Airports covered
  • Commercial (7), General Aviation (31), Military (3)
• Years covered
  • 2018 base year; 2023, 2031, and 2037 forecast years
• Emission calculation methodology
  • Aircraft operations (airports, FAA’s databases)
  • FAA’s AEDT tool; EPA’s average emission factors; FAA survey data
• Draft inventory released April 2, 2021
2018 aircraft operations by major category

- **Air Carrier**: 27%
- **Air Taxi**: 5%
- **GA**: 67%
- **Military**: 1%

Total = 3,422,479 operations
Aircraft operations by major aircraft type and commercial airport
Aircraft operations by major aircraft type and commercial airport (cont’d)
# Taxi times and mixing heights for commercial airports

<table>
<thead>
<tr>
<th>Airport</th>
<th>Taxi time (min)</th>
<th>Mixing height (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>LAX (2018)</td>
<td>12.18</td>
<td>19.24</td>
</tr>
<tr>
<td>LAX (2023)</td>
<td>13.26</td>
<td>21.01</td>
</tr>
<tr>
<td>LAX (2031)</td>
<td>15.76</td>
<td>24.97</td>
</tr>
<tr>
<td>LAX (2037)</td>
<td>17.91</td>
<td>28.39</td>
</tr>
<tr>
<td>LGB</td>
<td>4.39</td>
<td>13.17</td>
</tr>
<tr>
<td>SNA</td>
<td>5.75</td>
<td>9.63</td>
</tr>
<tr>
<td>BUR (pre-terminal)¹</td>
<td>1.25</td>
<td>4.67</td>
</tr>
<tr>
<td>BUR (post-terminal)²</td>
<td>2.49</td>
<td>2.97</td>
</tr>
<tr>
<td>PSP</td>
<td>5</td>
<td>5</td>
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<tr>
<td>ONT</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>SBD</td>
<td>Default</td>
<td>Default</td>
</tr>
</tbody>
</table>

¹Pre-terminal replacement taxi times used for 2018 and 2023
²Post-terminal replacement taxi times used for 2031 and 2037
2018 aircraft emissions by major category

**NOx Emissions**
- Air Carrier: 90%
- Air Taxi: 3%
- GA: 3%
- Military: 4%

Total = 6,307 tons per year

**VOC Emissions**
- Air Carrier: 6%
- Air Taxi: 4%
- Military: 17%
- GA: 73%

Total = 1,307 tons per year
2018 aircraft emissions by airport type

**NOx Emissions**
- GA: 2%
- Military: 4%
- Commercial: 94%
Total = 6,307 tons per year

**VOC Emissions**
- Commercial: 24%
- Military: 7%
- GA: 69%
Total = 1,307 tons per year
Aircraft emissions for commercial airports (NOx)
Aircraft emissions at Los Angeles International Airport

![Graph showing aircraft emissions trends from 2018 to 2037 for VOC and NOx emissions](image)

- **VOC**
- **NOx**

<table>
<thead>
<tr>
<th>Year</th>
<th>VOC Emissions (tpy)</th>
<th>NOx Emissions (tpy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>4,000</td>
<td>1,000</td>
</tr>
<tr>
<td>2023</td>
<td>5,000</td>
<td>1,500</td>
</tr>
<tr>
<td>2031</td>
<td>6,000</td>
<td>2,000</td>
</tr>
<tr>
<td>2037</td>
<td>7,000</td>
<td>2,500</td>
</tr>
</tbody>
</table>
Aircraft emissions at Bob Hope Airport

- **Emissions (tpy)**
  - VOC
  - NOx

- **Years:** 2018, 2023, 2031, 2037
Aircraft emissions at John Wayne Airport

- VOC
- NOx
Aircraft emissions at Long Beach Airport

- Emissions (tpy)
- VOC
- NOx

<table>
<thead>
<tr>
<th>Year</th>
<th>VOC</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>2023</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>2031</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>2037</td>
<td>250</td>
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</table>
Aircraft emissions at Ontario International Airport

![Bar chart showing emissions over time for 2018, 2023, 2031, and 2037. The chart compares VOC and NOx emissions.](image-url)
Aircraft emissions at Palm Springs International Airport

- VOC
- NOx
Aircraft emissions at San Bernardino Airport

Bar graph showing emissions (tpy) for VOC and NOx from 2018 to 2037.
Comparison of NOx emissions with 2016 AQMP

- **NOx emissions (tpd)**
- **2016 AQMP**
- **Draft 2021 Inventory**
Growing contribution of aircraft emissions

Aircraft NOx emissions (tpd)

2018: 4.8%
2023: 7.4%
2031: 9.3%
2037*: 10.2%

*2037 emissions are preliminary
Potential updates to aircraft emissions inventory

- Focus on forecast years: 2023, 2031, 2037
- Distinction between passenger and cargo aircraft
- FAA’s new Terminal Area Forecast (TAF) that will include the effects of COVID-19 on civil aviation (expected to be publicly available mid-to-late April at www.faa.gov)
  - Expected to result in lower forecasted aircraft operations
- Latest forecast of aircraft models/engines
  - Reflecting retirement of older aircraft
  - Increased use of newer aircraft
- Operational improvements not reflected in draft inventory
Potential aircraft control strategies

• New aircraft engine and auxiliary power unit (APU) standards (EPA/ICAO)

• Operational improvements
  • De-rated take-off
  • Single engine taxiing
  • Reduced APU usage/Zero-emission APU

• Routing aircraft with cleanest aircraft models/engines

• Promoting zero-emission aviation

• Others?
Next Steps

• Update draft aircraft emissions inventory
  • FAA’s updated forecast (2023, 2031, 2037)
  • Updated aircraft models/engines forecast based on inputs from airports and airlines
  • Draft report available for review
    • Comments Due May 14, 2021

• Evaluate potential control strategies
  • Pursue potential future engine standards through EPA/ICAO
  • Work with airports, airlines, and stakeholders to evaluate potential strategies
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