Evaluating Methods for Counting Aircraft Operations at Non-Towered Airports

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Does Anyone Care about Airport Operations Estimates?

- Airports, States, FAA
- Why?
Fun Facts

• Approximately 3300 public airports in FAA system plan
• Only about 500 public airports have an air traffic control tower that tracks airport takeoffs and landings (operations)
• How much traffic occurs at those airports without towers?

INDIANA

• 115 Public Airports
• 12 with ATC Towers
• 3037 based single engine GA aircraft
• >1.2M GA operations each year
We Reviewed 3 Estimating Methods

1 - Multiplying the number of based aircraft by an estimated number of operations per based aircraft (OPBA)

2 - Applying a ratio of FAA instrument flight plans to total operations (IFPTO)

3 - Expanding a sample count into an annual estimate through statistical extrapolation.
• Is there a consistent number(s) of OPBA that occur at small, towered airports that can then be applied to non-towered airports? (taking into account climate, population, and flight schools)
## Summary of OPBA by Region

<table>
<thead>
<tr>
<th>NOAA Climate region</th>
<th>Number of airports</th>
<th>AvgBA per region</th>
<th>Avg Ops per region</th>
<th>AvgPop</th>
<th>OPBA mean</th>
<th>Median</th>
<th>95% Confidence Interval for the median</th>
<th>Low</th>
<th>High</th>
<th>OPBA range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaska</td>
<td>1</td>
<td>965.8</td>
<td>152,018</td>
<td>263,382</td>
<td>157.40</td>
<td>157.40</td>
<td>(298.02, 426.85)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Central</td>
<td>33</td>
<td>141.01</td>
<td>49,187</td>
<td>162,441</td>
<td>429.54</td>
<td>360.13</td>
<td>(201.75, 1,015.54)</td>
<td>177.42</td>
<td>798.85</td>
<td></td>
</tr>
<tr>
<td>E. N. Central</td>
<td>13</td>
<td>188.52</td>
<td>67,823</td>
<td>260,933</td>
<td>473.92</td>
<td>462.29</td>
<td>(266.65, 550.52)</td>
<td>177.42</td>
<td>798.85</td>
<td></td>
</tr>
<tr>
<td>Hawaii</td>
<td>1</td>
<td>22.80</td>
<td>104,224</td>
<td>13,689</td>
<td>4,771.68</td>
<td>4,771.6</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Northeast</td>
<td>28</td>
<td>187.06</td>
<td>72,081</td>
<td>353,687</td>
<td>432.95</td>
<td>408.37</td>
<td>(351.95, 504.20)</td>
<td>225.91</td>
<td>828.52</td>
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<tr>
<td>Northwest</td>
<td>8</td>
<td>202.90</td>
<td>80,577</td>
<td>224,704</td>
<td>382.95</td>
<td>779.38</td>
<td>(264.80, 453.03)</td>
<td>219.87</td>
<td>779.38</td>
<td></td>
</tr>
<tr>
<td>South</td>
<td>41</td>
<td>154.19</td>
<td>65,312</td>
<td>352,947</td>
<td>597.89</td>
<td>338.00</td>
<td>(302.52, 522.53)</td>
<td>132.17</td>
<td>2,481.89</td>
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</tr>
<tr>
<td>Southeast</td>
<td>38</td>
<td>212.66</td>
<td>95,457</td>
<td>171,804</td>
<td>561.74</td>
<td>439.42</td>
<td>(338.62, 572.66)</td>
<td>190.89</td>
<td>2,491.54</td>
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</tr>
<tr>
<td>Southwest</td>
<td>15</td>
<td>394.01</td>
<td>16,802</td>
<td>391,318</td>
<td>487.23</td>
<td>396.66</td>
<td>(336.31, 646.39)</td>
<td>192.52</td>
<td>819.86</td>
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<tr>
<td>West</td>
<td>27</td>
<td>381.98</td>
<td>124,391</td>
<td>388,546</td>
<td>370.13</td>
<td>326.30</td>
<td>(282.28, 362.85)</td>
<td>139.69</td>
<td>875.89</td>
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<tr>
<td>W. N. Central</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>205</td>
<td>222.35</td>
<td>85,890</td>
<td>394,118</td>
<td>501.68</td>
<td>377.78</td>
<td>(350.30, 412.86)</td>
<td>132.17</td>
<td>4,471.68</td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- Avg = Average
- BA = Based Aircraft
- Ops = Operations
- OPBA = Operations per Based Aircraft
- NA = Not Applicable

**Prepared by:** Purdue University
Based on the study objectives and data -

• There were no practical and consistent OPBAs found or modeled at small, towered airports nationally or by climate region, even when considering the number of flight schools based at the airport.

• Therefore, the research team cannot recommend an OPBA or OPBA equation for estimating annual operations at non-towered airports.
Is there a consistent ratio of IFR flight plans to total operations (IFPTO) that can be used to estimate operations at non-towered airports? (taking into account climate)
Based on the study objectives and data -

• No practical and consistent IFPTOs found in the dataset of small towered airports nationally or by climate region.

• Cannot recommend an IFPTO for estimating annual operations at non-towered airports.

• Recommendation: take sample of actual operations and extrapolating into annual operations from the sample.
Statistical Extrapolation

Tested sample sizes and time frames of:
A. One week in each season
B. Two weeks in each season
C. One month in spring, summer, or fall
D. One month in winter
The **two weeks in each season** scenario has a combination of statistics reported that indicate preference over the others.
How to take samples?

Aircraft Traffic Counters

Different aircraft counting technologies included

1 - automated acoustical counter.
2 - sound-level meter acoustical counter,
3 - security/trail cameras, and
4 - video image detection with a transponder receiver.

Tested at TYQ, I42, EYE, and LAF
Aircraft lift-off (rotation point) should be within approximately 700 feet of a point perpendicular of the counter, which may require multiple counters. Counter can be as far as 250 feet from runway centerline.

Example of configuration conducive for Automated Acoustical Counters.

Example of difficult configuration for Automated Acoustical Counters.
Aircraft lift-off (rotation point) should be within approximately 700 feet of a point perpendicular of the counter, which may require multiple counters.

Counter can be as far as 75 feet from runway centerline.
Video Image Detection and ADS-B Transponder Receiver Highlights

Best used at airports with centralized terminal and hangar area with limited access points and little touch-and-go activity.

- Accuracy levels as high as 90% were achieved for recording aircraft entering or exiting the runway environment.
- Unable to count touch-and-goes.
- ADS-B transponder receiver option adds little to no value considering the low equipage rate of the U.S. general aviation fleet with ADS-B out.
- Most expensive option.
- Least labor intensive option.
- Requires service contract.
- Can also be used for automated billing of landing fees.

Example of configuration conducive for Video Image Detection.

Example of difficult configuration for Video Image Detection.
Security/Trail Camera Highlights

- Not usable at airports with centralized terminal and hangar area with limited access points and little touch-and-go activity.
- Accuracy levels approaching 100% can be achieved for recording aircraft entering or exiting the runway environment.
- Unable to count touch-and-go.
- Exceptionally slow moving aircraft may be missed.
- As ambient temperature approaches temperature of target aircraft, target may be missed.
- Labor intensive because manual tally of images is required.
- Information on aircraft type, make, and model can be obtained from aircraft registration number.
- Low cost for airports with simple airfield configurations.
- Can also be used for detecting wildlife.

Example of configuration conducive for Security/Trail Cameras.

Example of difficult configuration for Security/Trail Cameras.

Prepared by Wackert, Inc.
Not all images are planes
Not all birds are planes
Wildlife and planes don’t mix
General Aviation – Nonstop Service to Everywhere!