An Introduction To On-Demand Mobility & Challenges To Its Implementation

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What is On-Demand Mobility (ODM)?

- Immediate and flexible air transportation
  - Users dictate trip origin, destination, and timing
  - 1-9 passengers or up to 2000 lb payload
- ~2-3x faster than cars & hub-and-spoke over ~10-500 mile range

**Drive - Fly Travel Time**

- [AIAA 2016-3466]

**Drive - Fly Mode Choice**

- [BTS, 2001 National Household Travel Survey]
What is On-Demand Mobility (ODM)?

• A range of missions, aircraft types, & operations
  • Enable trips that were not time/cost effective with current transport (e.g., conventional takeoff and landing commuter)
  • Alternative to car travel to avoid/alleviate city congestion (e.g., vertical takeoff and landing air taxi, “urban air mobility”)
  • New, more rapid methods of cargo distribution (e.g., sUAS package delivery)
• May be enabled by the convergence of technologies including electric propulsion, increasing autonomy, and advanced NAS operations
Conventional Takeoff and Landing (CTOL) Mission

- Concept of operations
  - Trips of approximately 50 to 500 mi
  - Operate from 5,000+ public-use airports
  - Enable point-to-point travel and/or improve connectivity to hub-and-spoke
  - Single pilot, autonomous, or remote operator

Locations of 3,331 airports in the FAA’s National Plan of Integrated Airport Systems

NASA X-57 Maxwell
Cirrus SR-22
Cessna 402
Vertical Takeoff and Landing (VTOL) Mission “Urban Air Mobility”

• Concept of operations
  • Trips of approximately 10 to 100 mi
  • Operate from new “vertiport” infrastructure and/or existing heliports
    • Barges, roof tops, parking garages, ...
  • Enable point-to-point (daily) commutes and/or package delivery
  • Single pilot, autonomous, or remote operator

Drive - Fly Travel Time

Door-to-Door Time (min)

0 50 100 150 200

0 20 40 60 80 100

Direct Distance (mi)

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Combined Mission Example: NASA LaRC to DC

- Combined ODM travel:
  - Saves ~1h 25m (~47%)
  - Less variability in total time

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<tr>
<th></th>
<th>Drive</th>
<th>ODM</th>
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<tr>
<td></td>
<td>Min</td>
<td>Max</td>
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<tr>
<td>Drive/Taxi</td>
<td>2h 40m</td>
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<td>10m</td>
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<tr>
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<td>Nominal Total</td>
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## Prioritized Barriers to Successful ODM System Implementation from ODM Roadmapping Workshops

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Prioritized order, but any barrier can limit feasibility, utility, growth

http://www.nianet.org/ODM/roadmap.htm
Questions?
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