NASA Aeronautics Research Mission Directorate

ODM Technical Roadmap Report Out

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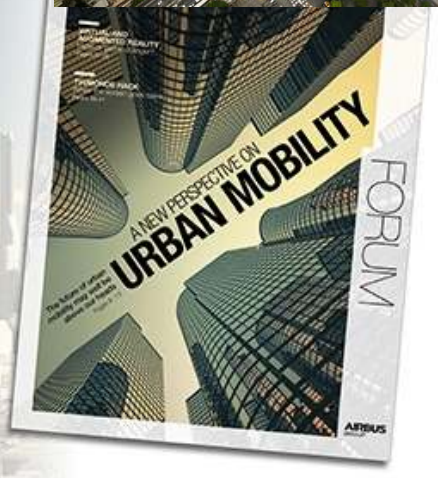
Transformative Vertical Flight Workshop
September 29, 2016
Hartford CT

ODM is Taking Off!



Technology

Uber plans self-flying drone taxis to beat city traffic

share

The Ehang 184, a passenger drone CREDIT: EHANG

Quick Review: High-Speed, On-Demand Mobility

Mobility: Movement of people and goods.

High-speed Mobility: Mobility at speeds significantly above typical surface transportation speeds (>>70 mph). Enabled by aircraft (air-mobility) for distributed travel needs and high-speed rail for centralized, dense urban corridors.

Scheduled Mobility: Public transportation services aggregating the needs of many users with the specifics of a trip (origin, destination, and departure time) determined by service providers (e.g. bus, rail, airline operators).

On-Demand Mobility (ODM): Personal transportation capabilities in which the specifics of a trip (origin, destination, and departure time) are chosen by the user.

High-Speed ODM: ODM at >>70mph

- Enabled by small personal, charter, and high-frequency commuter aircraft (Thin-Haul)
- Includes manned and unmanned (passengers & cargo; “piloted” & autonomous)
- Currently a niche market due to cost, safety, and trip reliability considerations.

ODM shorthand for High-speed ODM using small aircraft

Example Missions

Thin Haul Commuter

Advanced General Aviation

Urban VTOL Air-Taxi

Small Unmanned Aircraft

Why Now? Technology Convergence

Autonomy

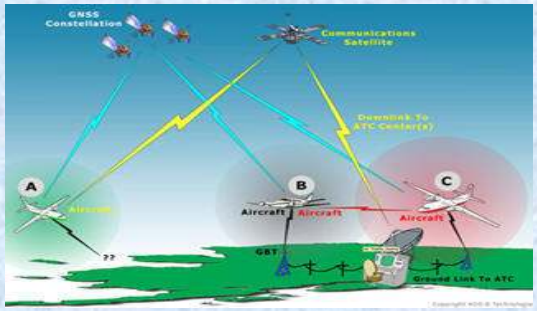
- Increased safety (70%+ of accidents are pilot error)
- Simplified vehicle operation
- Increases user base 100x
- High-density airspace operations
- Navigation and Guidance assistance -> Full Autonomy

Distributed Electric Propulsion

- Scale-free Propulsion
- Highly Redundant and Reliable
- Robust Operations
- High power/weight, Quiet
- High cruise efficiency concepts








NASA Aeronautics

NASA Aeronautics Vision for Aviation in the 21st Century

ODM Integrates 5 of 6 Strategic Thrusts

6 Strategic Thrusts

- Safe, Efficient Growth In Global Operations
- Innovation in Commercial Supersonic Aircraft
- Ultra-Efficient Commercial Vehicles
- Transition to Low-Carbon Propulsion
- Real-Time System-Wide Safety Assurance
- Assured Autonomy for Aviation Transformation

U.S. leadership for a new era of flight

NASA-FAA Joint ODM Roadmapping

Identify technical and regulatory barriers, and potential solutions, underpinning ODM

- Guide NASA aeronautics research
- Renew collaboration in the spirit of AGATE and SATS programs

Build community of interest

- Operators, airframers, suppliers, start-ups, universities, other gov.

Kickoff at AirVenture 2015, wrap-up September 29, Hartford CT.

Related Activities

FAA, CFR 14 Part 23 Rewrite

- Risk continuum
- Performance-based certification
- Consensus Standards

FAA BAA: Compliance methods for Advanced Flight Controls in GA, Hybrid Aircraft

ASTM International

- F37 (light sport), F39 (Aircraft Systems), F44 (GA Aircraft)

GAMA EPIC

- ELECTRIC PROPULSION & INNOVATION COMMITTEE

ODM Workshop Participants

- Over 50 companies
- US & international universities
- DoD
- International aero research organizations
- EASA
- FAA
- 4-NASA centers & HQ

ODM Roadmap Elements

Stakeholders

Industry

FAA

NASA

ODM Barriers / Metrics

Barrier Decomposition, Targeted Outcomes

Technology Survey, Candidates

Research Themes

Tech Challenges, Roadmap

Prioritized, ODM Technical Barriers

Ease of Certification Metric Time/Cost Required	Affordability Metric Total Operating Cost/Pax Mile	Safety Metric Fatal Accidents per Vehicle Mile	Ease of Use Metric Required Operator Training Time & Cost	Door to Door Trip Speed Metric mph
Average Trip Delay Metric Time	Community Noise Metric Perceived Annoyance @ standoff	Ride Quality Metric Passenger Comfort Index	Efficiency Metric Energy/Pax Mile	Lifecycle Emissions Metric Total Emissions /Pax Mile

Product of Kansas City Workshop, Oct. 2015

Missions Provide Focus

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ODM Missions and Technologies

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