Transformative Flight Working Group #1

Working Group Debrief & Discussion

5th Transformative Vertical Flight Workshop

18-19 January 2018

Holiday Inn at Fisherman’s Warf
San Francisco, California

Private and Personal Use
TVF Working Group Road Map Outline

• Acceptance
  - Time savings, personal convenience
  - Mission/Business advantage
  - Energy Savings
  - Greater safety
  - Environmental benefits

• Technology
  - VTOL/STOL Specific
  - High Density Airspace Operations
  - Energy efficiency, Energy Storage
  - Navigation sense & avoid
  - Affordability
  - Safety
  - Noise
  - Emissions
TVF Working Group Road Map Outline

• Certification
  - Manufacturing & Production
  - Training
  - Mission ops
  - Security, physical & Cyber

• Infrastructure
  - Urban Vertiport
  - Suburban airpark
  - Airspace, communications, Navigation, surveillance
  - Electric utility distribution & availability
  - Recycle/recharge/refuel
  - Liability concerns
Focus on these

- Acceptance
  - Time savings personal convenience
- Certification
  - Training
- Infrastructure
  - Urban Vertiport
  - Suburban Airpark
Transportation Utility

- How useful is the mode of transportation?
- Utility is primary factor of usage
- Automobile, self-operated
  - Daily use
    - Commuting
    - Shopping
    - Short distance
- Aircraft, professionally operated or self-operated
  - Occasional use
    - Long Distance
    - High speeds
    - Usually not door-to-door
The Question of Congestion

What is the cost? (2014 data Texas A&M Transportation Institute Mobility Scorecard)

- Time:
  - 6.9 billion hours additional travel time
  - 42 hours per person annually, 62 hr./yr. regions with population > 1 million

- Fuel:
  - 3.1 billion gallons wasted
  - Increased infrastructure costs, maintenance
The Commute

• Heading home with 780,000 of your closest friends
• http://bigbytes.mobyus.com/commute.aspx

• Largest opportunity for aircraft utility
Training

• 40 hours instruction, of which 10 hours @ night
• 40 hours instruction, of which 6 hours @ night
• 50 hours of instruction
• Above are drivers license requirements, various states

• Private pilot training: (FAA)
  – 40 hours total flight time
  – 20 hours instruction
  – 10 hours solo
  – These are minimums
Cost vs. Utility

- **Automobile**
  - High utility
    - We use it everyday
  - Low cost

- **Airplane**
  - Low utility
    - Use in special case or conditions
  - High cost
  - Cost is related to level of usage
Cost to manufacture – person hours per unit

• Light aircraft:
  – Cirrus ~ 2500 person hours
  – C-172 ~ 2000 person hours

• Automotive assembly averages:
  – 35.1 hours (Hyundai)
  – 33.88 hours (Ford)
  – 32.29 hours (GM)
  – 30.37 hours (Toyota)
Operating Costs -- Energy

- **Tesla-X, 4-5 passenger**
  - 500 Wh/mile @ 60mph, ~30KW, ~40 hp
  - Curb weight ~5,300 lbs

- **C-Max Hybrid, 4-5 passenger**
  - ~45 mpg commuter driving
  - Curb weight ~3,600 lbs

- **GA aircraft, 4 passenger**
  - 1900 lbs, empty weight
  - 235 hp, installed
  - 176 hp @ cruise, 150 kn

- **Commuter flight vehicle -- minimum size**
  - 800 lbs?, empty weight
  - Two passenger?
  - VSTOL/VTOL
Environmental Benefits

• Reduced dependencies on paved surfaces
  – Reduced highway maintenance
  – Eliminate need for additional surface routes

• Parity in energy use?

• Reduction in traffic noise?
Infrastructure

- Airparks
  - Can serve fixed wing or VTOL aircraft
  - Require significant land area
  - Difficult to locate near many users
  - Lake Norman, NC
Infrastructure

- Vertiports
  - Or existing parking garages
  - Open parking lots – suburban settings
  - Motor Mart Garage
    Boston, 1,037 parking spaces
  - Built 1927, Historical Register
Future?

- Commuter aircraft
- Minimum size
  - One – two passenger
- Minimum weight, KISS Principle
- VTOL/VSTOL
- Not a flying car but can move to a parking place
- Used daily, high utility
- Large production volumes
TVF Working Group Members

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