

Business and Market Opportunities Panel



AHS Transformative Vertical Flight Concepts Workshop
NASA Ames Research Center
Aug 3rd, 2015

Civil Vertical Lift Operators Needs Perspective
Mark Moore, NASA Langley Research Center

Market Drivers for Civil Vertical Lift
Rich Ouellette, Boeing

Silicon Valley Early Adopter CONOPs and Market Study
Kevin Antcliff, NASA Langley Research Center

Existing Civil Vertical Lift Transportation



Civil VTOL Transportation Characteristics

Relatively short ranges (<200 miles)

Helipad operation (established compact infrastructure)

Short hover time required (<30 seconds)

Close proximity operation (noise sensitivity)

HeliJet - Only scheduled VTOL service in North America

(26) daily trips between Victoria and Vancouver

3 hours 20 minutes by car and ferry

35 minutes by Sikorsky S-76 helicopter @ \$275 ticket

65 miles by air (indirect routing due to noise issues)



Do Existing Vertical Lift Concepts Match Civil Transportation Market Needs?



Existing VTOL: Payload, range speed, efficiency, cost, noise, safety characteristics

- Helicopters: Dominant solution, but with poor range, speed, efficiency, cost, noise.
- Tilt-Rotors: Greater speed, but with much higher expense (haven't yet emerged)
- Autogyros: Even lower speed, range, efficiency – but improved cost

What's Different?: Civil VTOL Transport Mission Requirements

- Helipad Takeoff/Landing Locations
 - No sustained Hover Requirement
- High Volume, Close Proximity Operations
 - Severe Noise Constraints
- Non-aggregated trips
 - Need for payload optimized aircraft
- Economic Competiveness Cost Sensitivity

Touchdown/Lift- Off Area

50' Diameter LLA

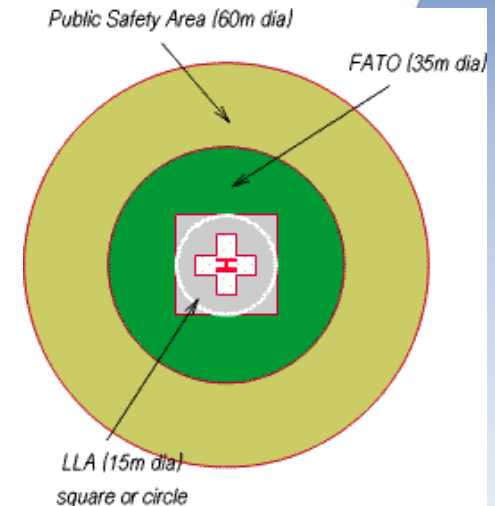
LLA = Level Landing Area

115' Diameter FATO

FATO = Final Approach
and Touchdown Area

200' Diameter PSA

PSA = Public Safety Area

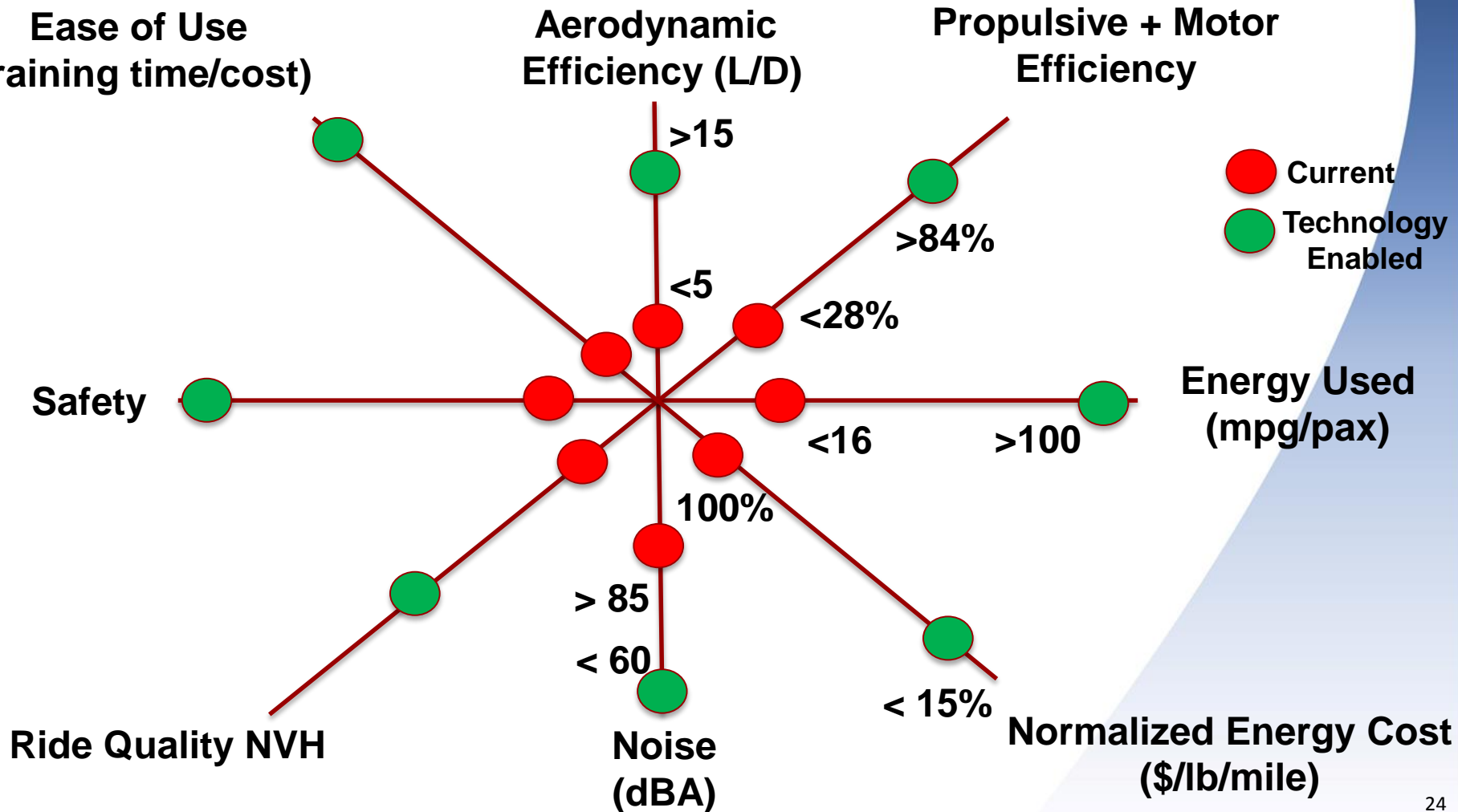


Focusing on a civil VTOL transportation mission eliminates sustained hover to fundamentally change the sizing requirements.

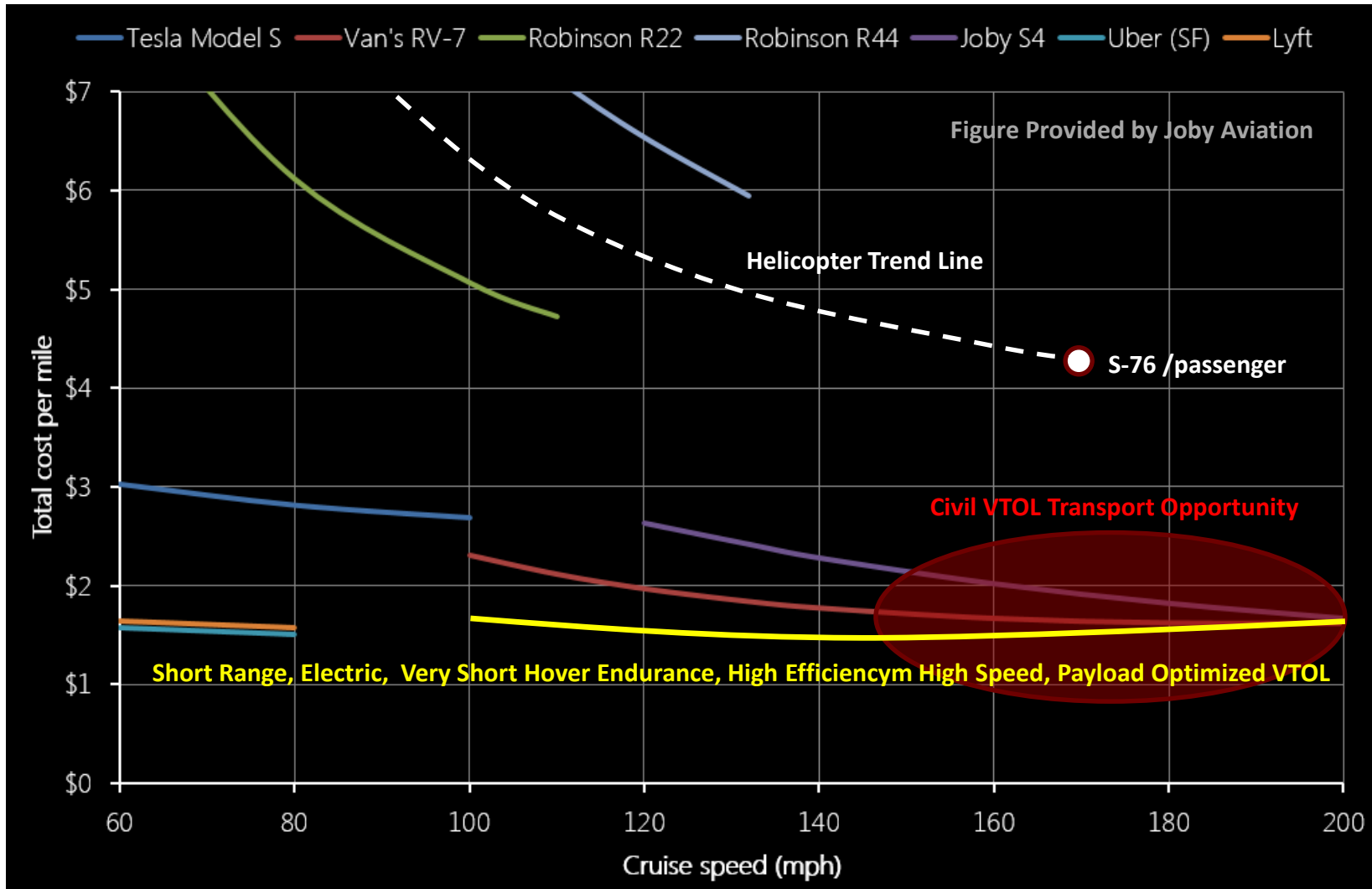
Do New Technologies Offer an Opportunity To Better Meet Civil VTOL Transportation Needs?



Distributed Electric Propulsion and Autonomy have the potential to be strong enablers of the Civil VTOL Transport mission.



Civil VTOL Competitiveness (After Acceptance) Will Depend on Comparative Vehicle Operating Cost

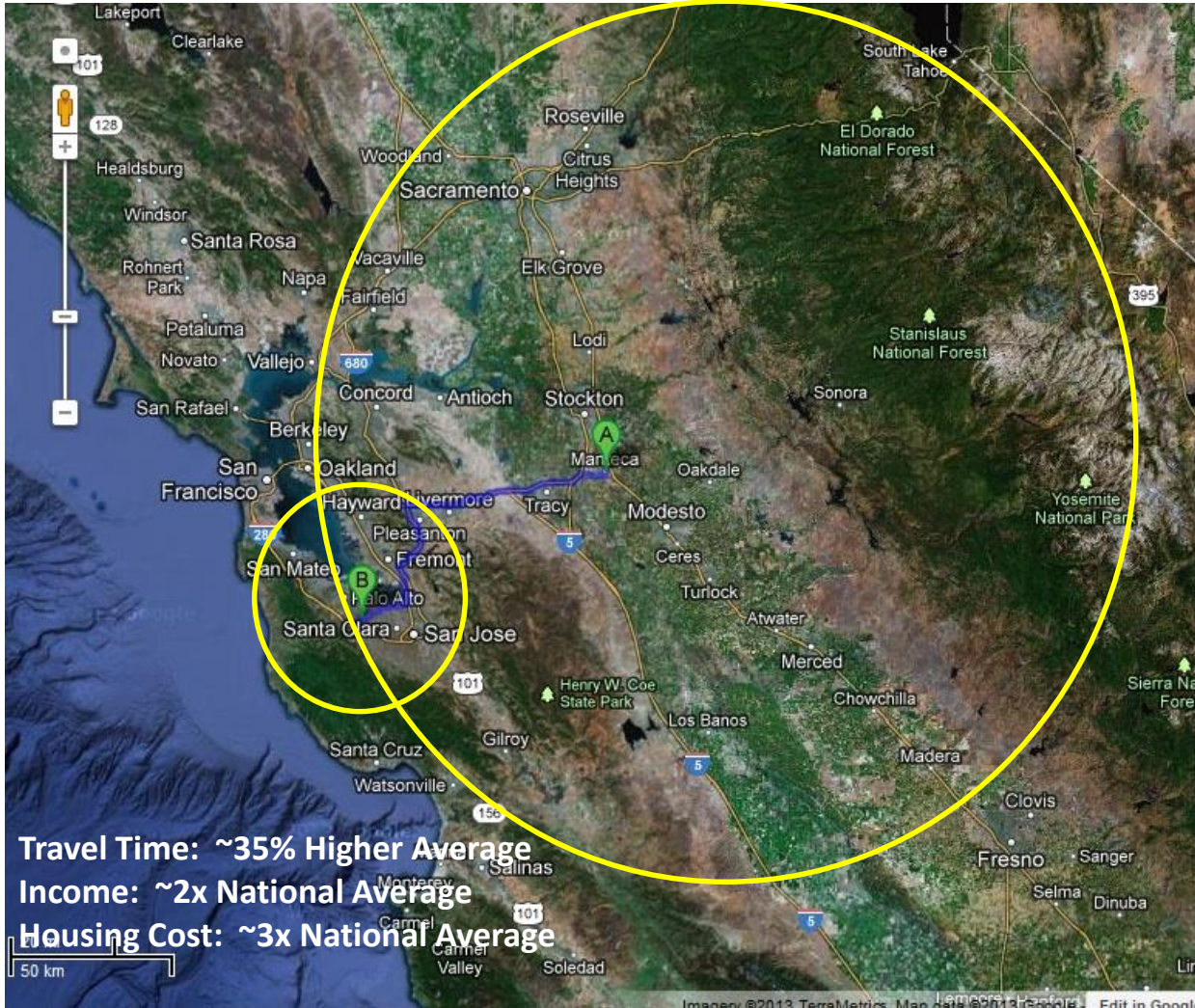


Total Vehicle Operating Cost per Mile vs Cruise Speed
Across Various Transportation Options

Silicon Valley Early Adopter Market Study



What if personal travel speeds could increase 4x through aerial mobility?



Regional Impact

Average Bay Area trip speed of <30 mph increase to 120 mph

3-D alternatives provided to 2-D ground highway congestion

Geographic constraints are removed (mountains, bridges, need for highways...)

Scarce resource constraints are removed (housing cost...)

Synergy with the developing telecommuting technologies

Creates new opportunities for society to reshape itself to utilize resources far more efficiently/effectively through unlimited regional accessibility.

San Francisco Bay Area/Silicon Valley