Batteries for Urban-Air Mobility (UAM): Electric Vertical Takeoff and Landing (e-VTOL) Aircraft

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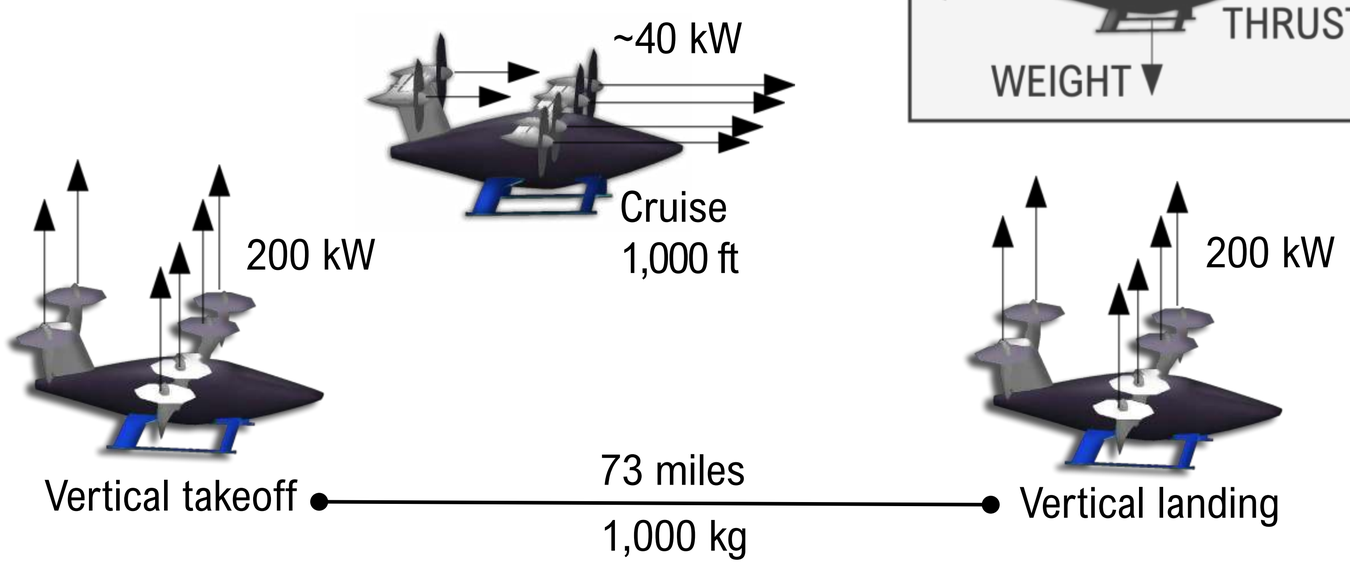
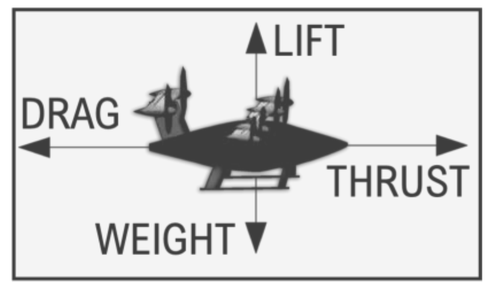
The case for UAM in the energy & transportation landscape:

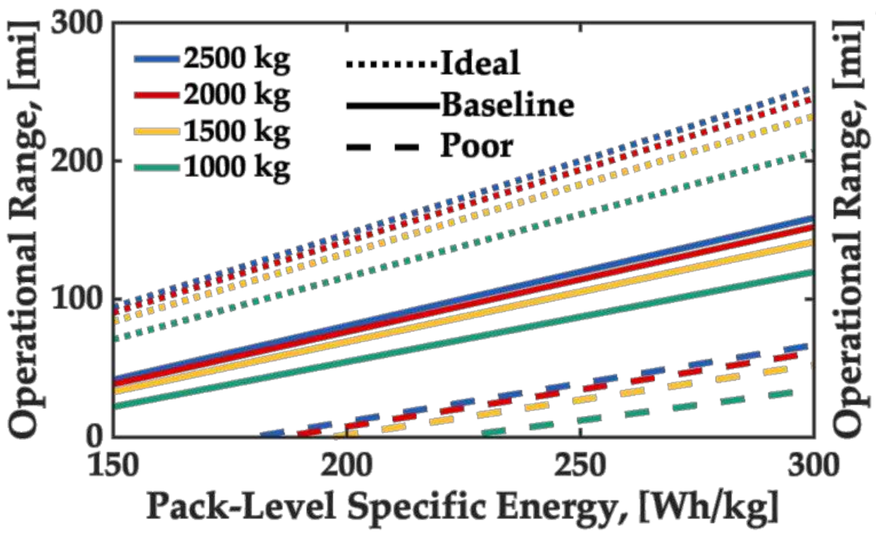
- Urban Congestion – Value of time and Infrastructure.
- Urban Air pollution driven by passenger commute and transportation of small goods.
- e-VTOLs present an approach that entails low or zero emissions, equivalent energy efficiency and very low land-utilization.
- Distributed propulsion enabled by electric powertrains “open-up” the design space.
- Unique battery and material requirements present significant challenges.

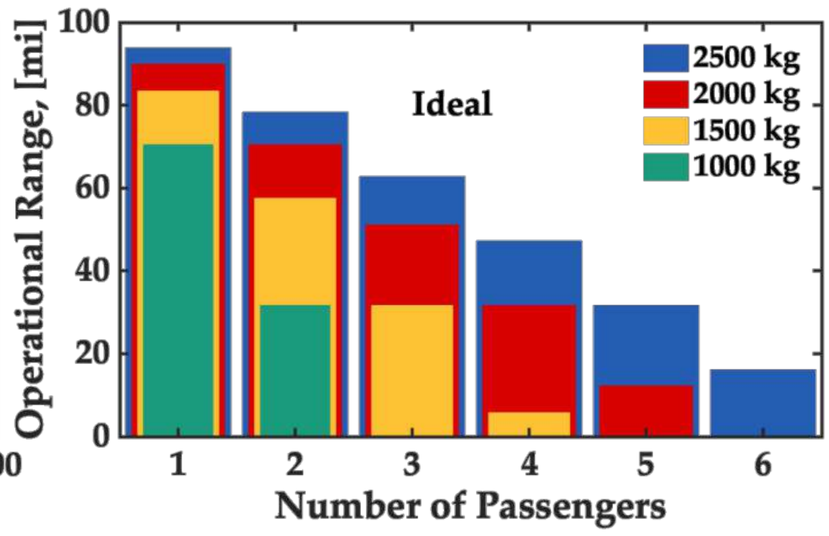
Canonical mission:



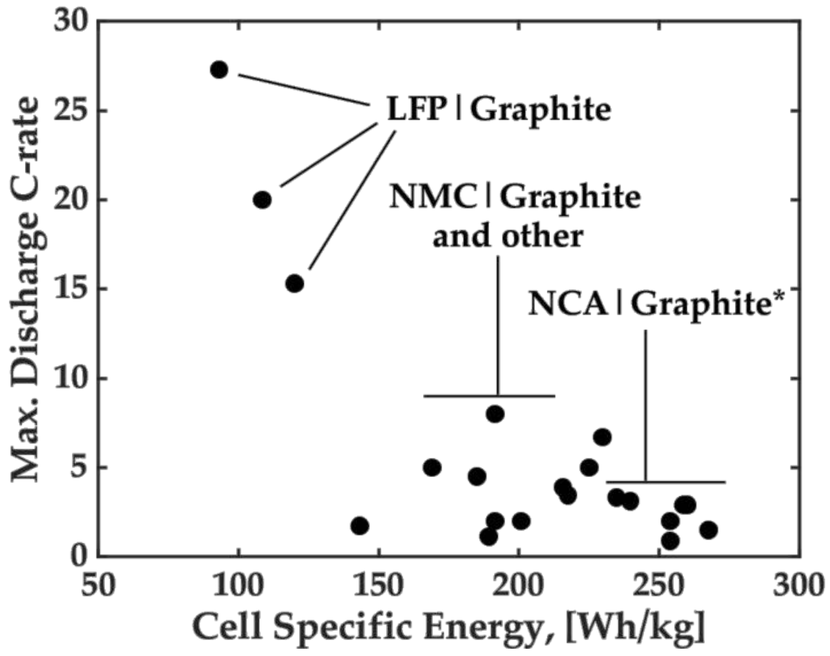


Specific energy v. operational range:



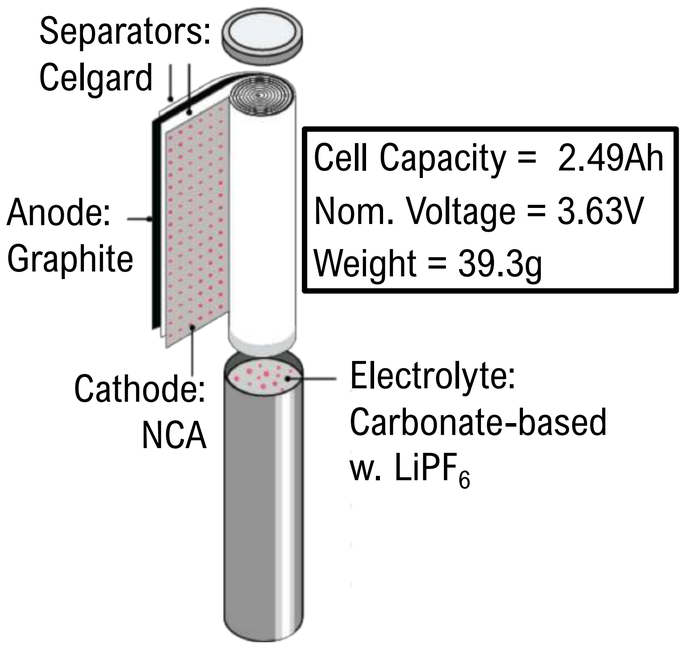


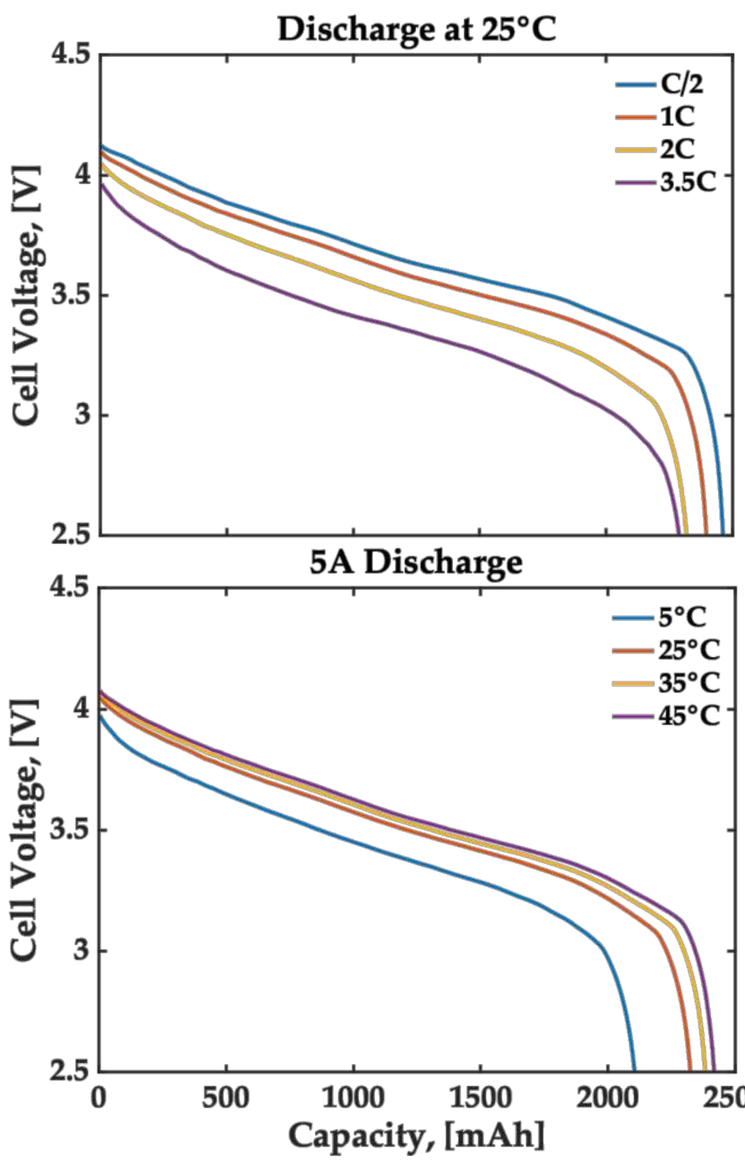
State-of-the-art Li-ion batteries[1]:



Cell modeling:

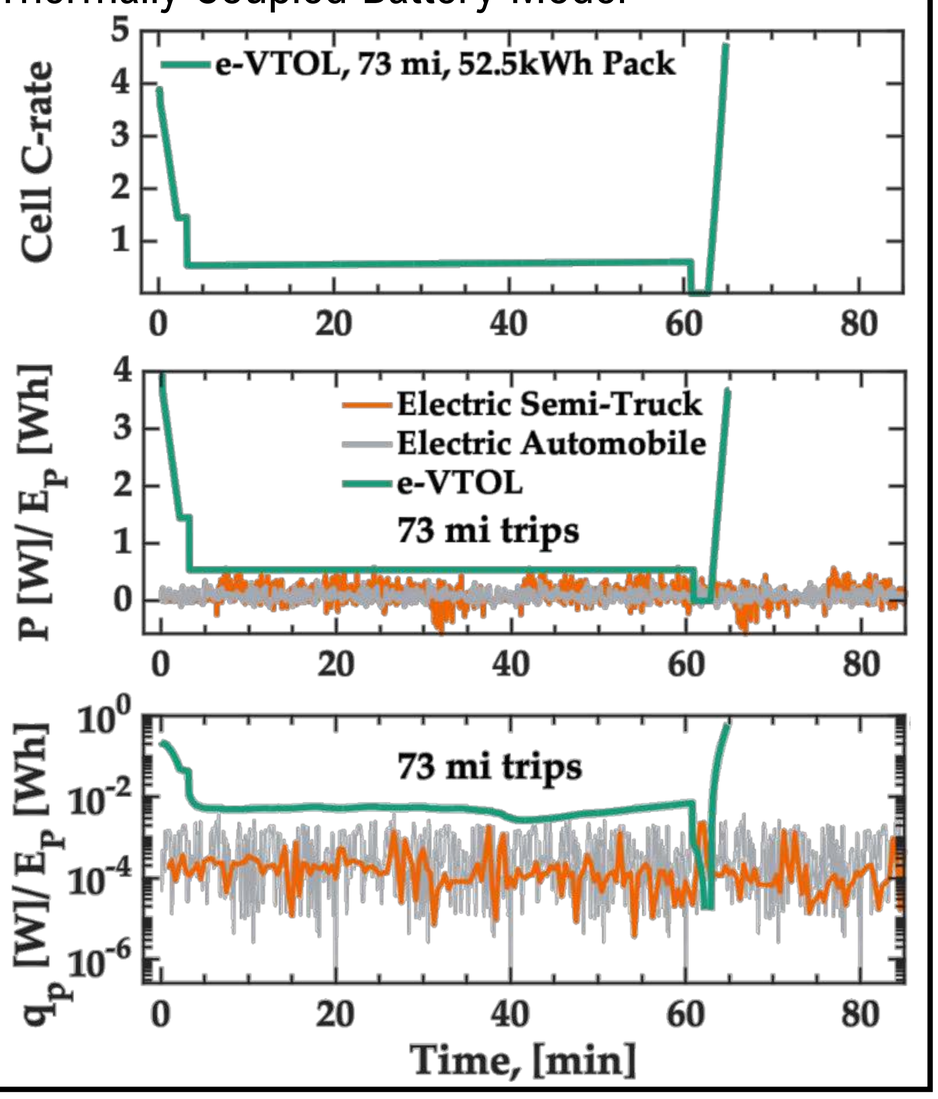
- Specific Energy of 245/150 Wh/kg at the cell-level and pack-level
- Pack Energy 52.5 kWh (Reserve of 15.5 kWh)
- Cell specification for the P2D Battery Model:





Looking inside the battery pack:

Simulations were performed using a Pseudo-2D Thermally Coupled Battery Model[1]



References:

1. Fredericks, W. L.*, Sripad, S.*, Bower, G. C., & Viswanathan, V. (2018). *ACS Energy Lett.*, 3(12), 2989-2994.