Next generation of aviation
- Energy management for electrically propelled aircraft & Urban Air Mobility

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**Energy management for Electrically propelled aircraft**
- Battery models with distinct fidelities
- Design trajectories for All-Electric aircraft to minimize operating cost
- Design a power allocation algorithm for Hybrid-Electric Aircraft
- Compare two hybrid-electric architectures based on fuel consumption

**Battery dynamics**
Integrate different battery model into optimal control problems (OCPs):
- Ideal battery with constant voltage
- Empirical Circuit Model
- Single Particle model

**Power allocation for Hybrid–Electric Aircraft**
- Formulate the power allocation for a hybrid-electric propulsion system as OCP to save fuel
- Results show the optimal control approaches steer the engine to work in its highly efficient region where the specific fuel consumption is low

**Trajectory optimization for All-Electric Aircraft**
- Minimize the direct operating cost (combination of time cost and battery charge cost) for multi-phase flight missions
- Combine battery and flight dynamics
- Build Simulink model to test six distinct battery models

**Comparison of two hybrid-electric architectures**
- Two architectures: connected and independent
- Results show that the fuel saving by charging the battery during flight is very limited

**Future Work, References, and Acknowledgments**
- Take battery degradation into consideration
- Sensitivity analysis of fuel consumption for hybrid electric aircraft
- Network design for large-scale traffic models

**Urban Air Mobility-network design**
- Select vertiport locations and capacities that minimize the traffic congestion in hybrid ground-air transportation networks
- The model is based on a mathematical program with bilinear equilibrium constraints

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