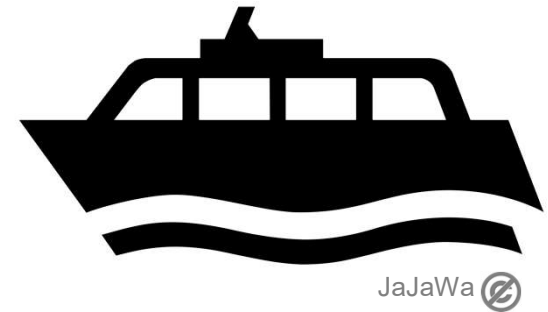
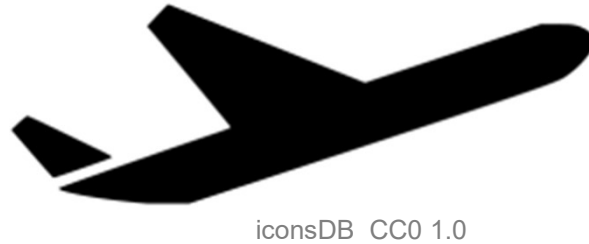


Disruptive R&D Innovations for Decarbonizing Transportation



- *Largest contributor to WA's carbon emissions*
- *Most fossil-dependent sector (about 5% biofuels, 0.1% electricity)*
- *Lowest efficiency sector in the U.S. economy (79% wasted energy)*

<https://www.llnl.gov/news/us-energy-use-rises-highest-level-ever>

National Academy of Engineering: R&D Priorities to Reduce Carbon Emissions from Aviation

The National Academies Press. doi:10.17226/23490 (2016).

- Lower energy required to fly
 - *lower weight*
 - *lower drag*

} B787
composites
more electric aircraft
winglets

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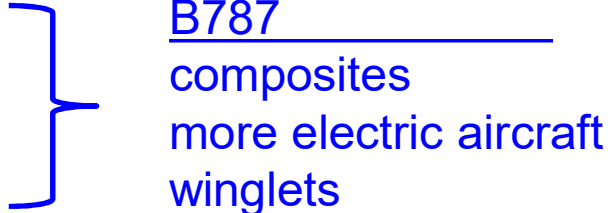
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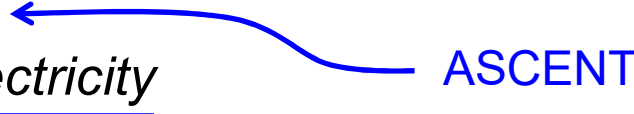
- Lower life-cycle carbon intensity of the energy source
 - *sustainable aviation fuels*
 - *renewable hydrogen or electricity*

← ASCENT

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ASCENT
- Improve efficiency for converting energy into thrust
 - *combustion engine and turbine improvements*
 - *hybrid-electric and all-electric propulsion*

All-Electric Flight: Eviation's "Alice" (Israel)

- 9 passengers
- 1/5th the operating cost
- 600 mile range
- 150 plane order backlog

www.bloomberg.com/news/articles/2019-10-24/eviation-lands-more-customers-as-electric-plane-orders-top-150



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Washington Aero Sector: Positioned for Leadership

- *Electric propulsion systems on Alice (magniX, Redmond)*
- *Flight testing & certification of Alice (AeroTEC, Seattle & Moses Lake)*
- *Electric Aircraft Working Group (Washington State D.O.T.)*

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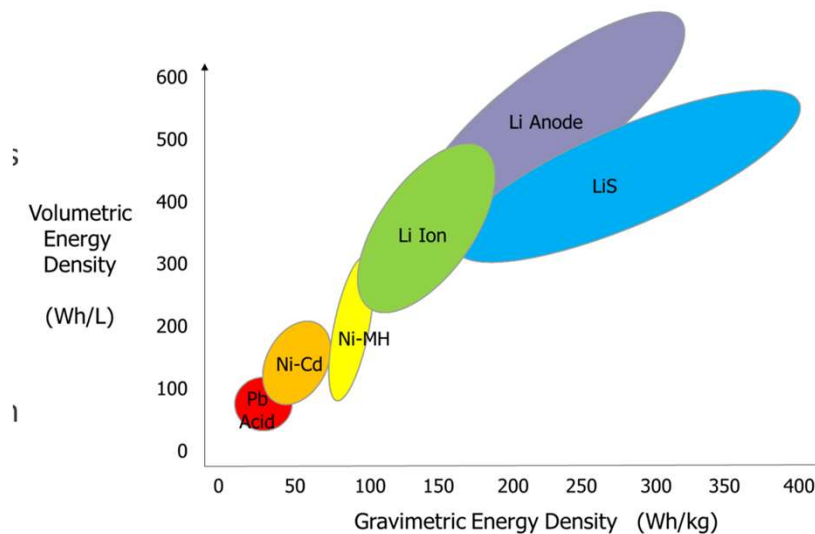


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Aviation Battery, Pack, & Integration Research

Higher energy density chemistries are needed



- *LiS battery research @UW sponsored by JCATI and BAE Systems (includes BattGenie)*

- *PNNL and UW LiS research funded thru DOE Battery 500*

Safety demands new design, control, & integration tools



- *New pack, system, and airport designs for high power operation*

- *Real-time hardware-in-the-loop (HIL), Power HIL, sensing, and control tools for integration*

Accelerating R&D Momentum in Electric Flight Must Build on Global Partnerships

