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BELOIT

A Wisconsin company, and the 7<sup>th</sup> Largest Manufacturer of electric motors in the world

# Electric Motors in Airplanes

Like an “electric car”?

No...many more variables than that

so...

- How and where would you use electric motors in planes?

and

- Why bother?

# Why?

**ACARE\* Targets for 2050:** For new aircraft and whole industry relative to 2000

\*ADVISORY COUNCIL FOR AVIATION RESEARCH AND INNOVATION IN EUROPE

Reduce noise	65%
Reduce fuel use & CO <sub>2</sub> emissions	75%
Reduce NO <sub>x</sub>	90%

# How?

- Better designed and built electric motors - increasingly, (incredibly), more efficient



TRADITIONAL



NEW

- Power up at least 5X over “old designs”
  - nm/kg
- Some electric motors turn 98% of electricity to mechanical energy
  - Even the best internal-combustion engines can manage only about 45%.

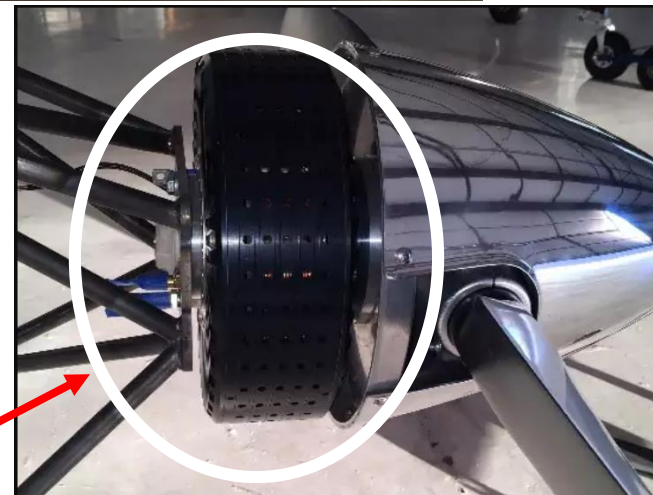
# 1. Small planes – Short flights



Cessna Caravan (208)

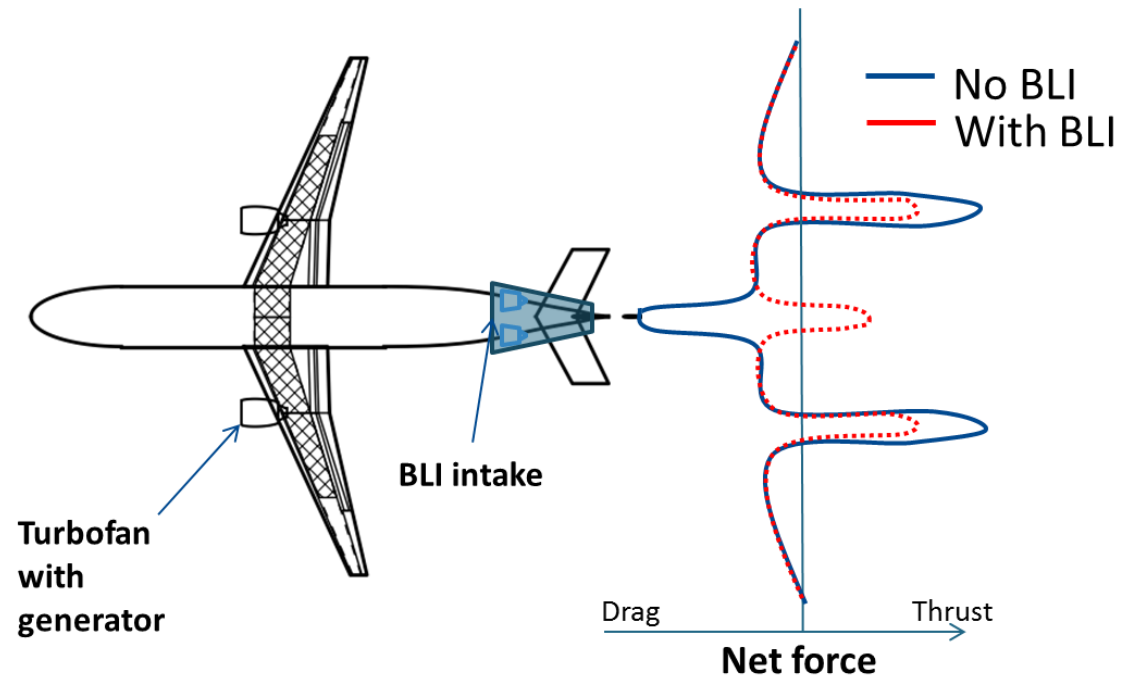
Magnix did all of its development in Australia at the Gold Coast. Have just moved to Seattle.

The entire motor

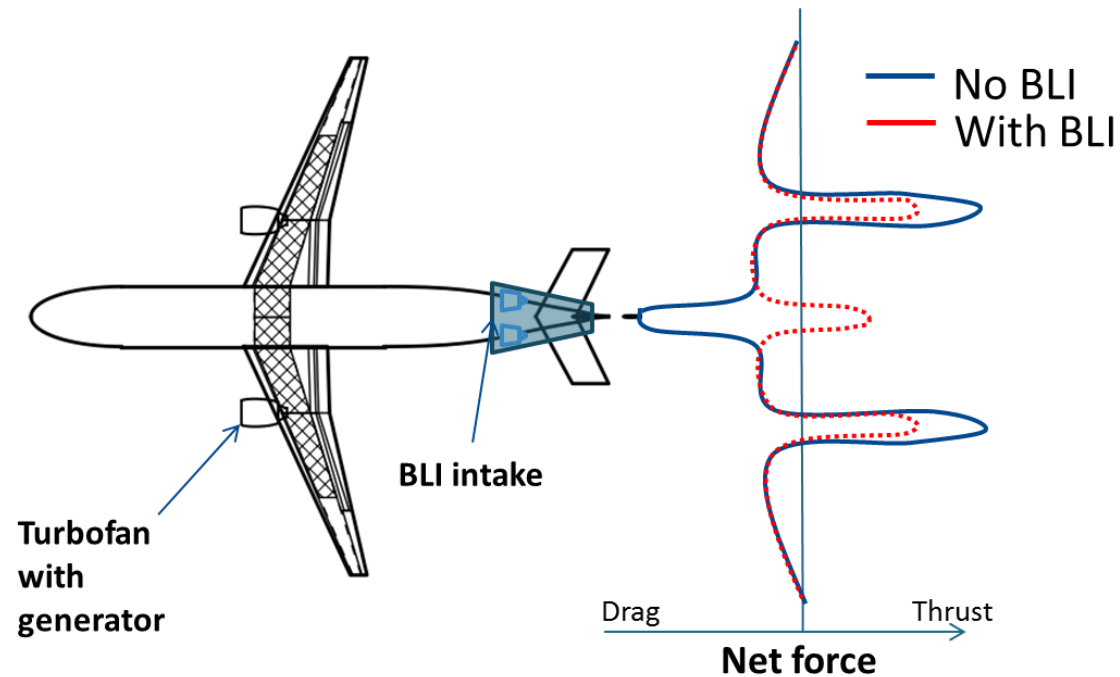




## 2. BLI (Boundary Layer Induction)



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Relatively  
conventional  
aircraft – only  
far more  
efficient





### 3. Gas turbine to power electric motors

- Used to be long skinny cylinders - evolved to turbofan engines –up to 13 feet diameter
- 787 - 80% of thrust from fan, only 20% from ejected hot gases.



- Zunum plan to use a helicopter turbine in rear of fuselage generating electricity to run electric motor fan jets. <https://zunum.aero/> A US company.

## 4. Making every airliner more efficient.

- Taxiing using jet engines is really inefficient.
  - e.g. Schiphol airport Amsterdam – “it's a 20 minute taxi at least! – [yatima2975](#) Jun 22 ”
  - FedEx - Memphis
- Don't use gas turbines to taxi
- Use electric motor(s) built into wheel hub(s)

“Blue-Sky”  
Concepts



Boeing



Airbus



