



# TEACHING ACTIVITIES FOR FUTURE MULTIFUNCTIONAL COMPOSITE MATERIALS

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# OUTLINE

- Future multifunctional composite materials in aviation
  - Structural batteries
  
- TRACKS Course
  - A research project course

# Multifunctional materials in future aviation

Airbus aspires to make all-electric regional aircraft by 2050.

Due to the low energy to weight ratio of existing monofunctional battery technologies, unrealistically high energy storage per passenger is needed.

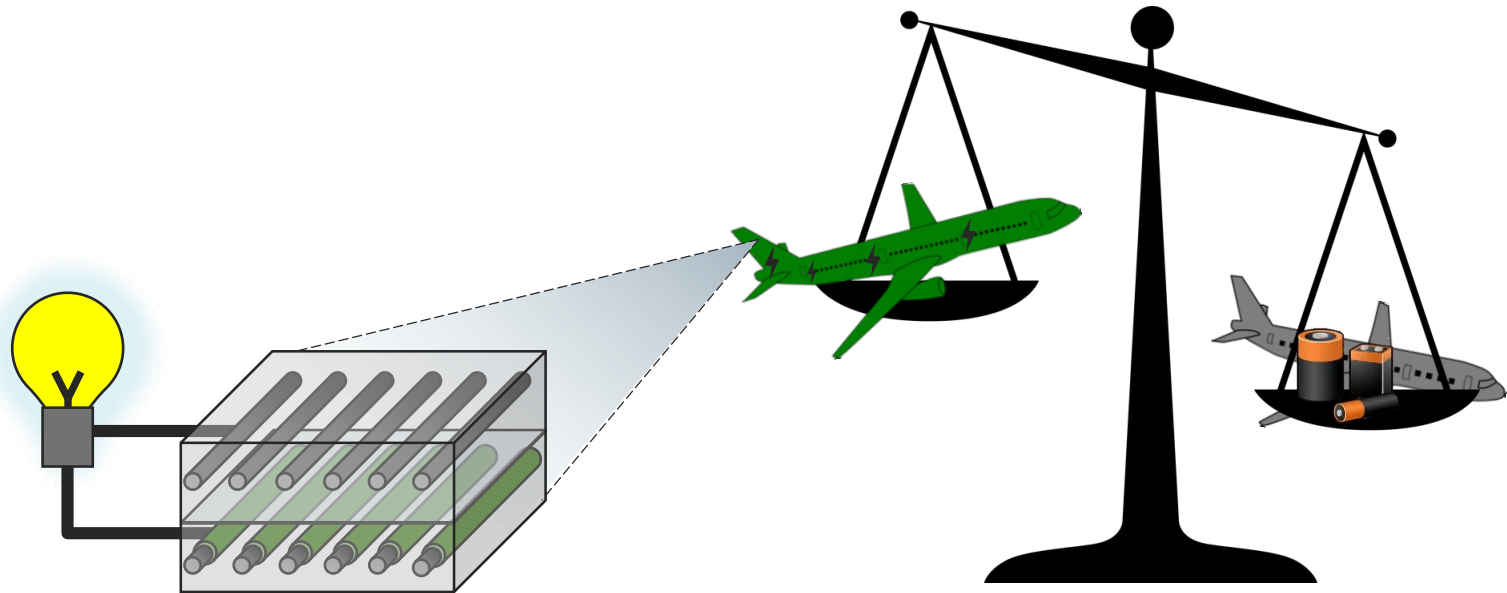


E-fan X hybrid-electric flight demonstrator

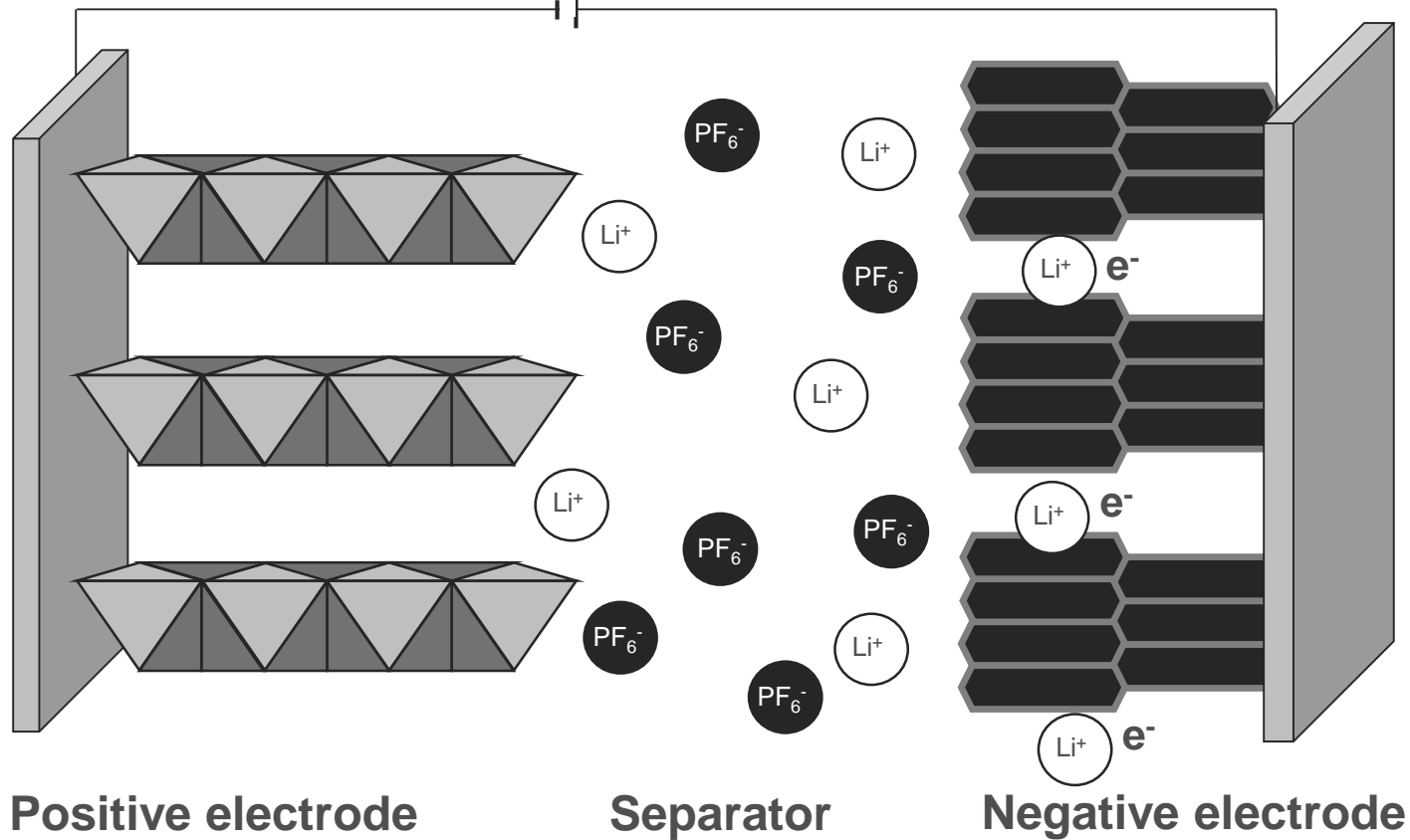
*Picture from: airbus.com*

# STRUCTURAL POWER COMPOSITES

STRUCTURAL BATTERIES: "MASSLESS" ENERGY STORAGE



# LITHIUM ION BATTERY



# DEVICE ARCHITECTURES – STRUCTURAL BATTERY

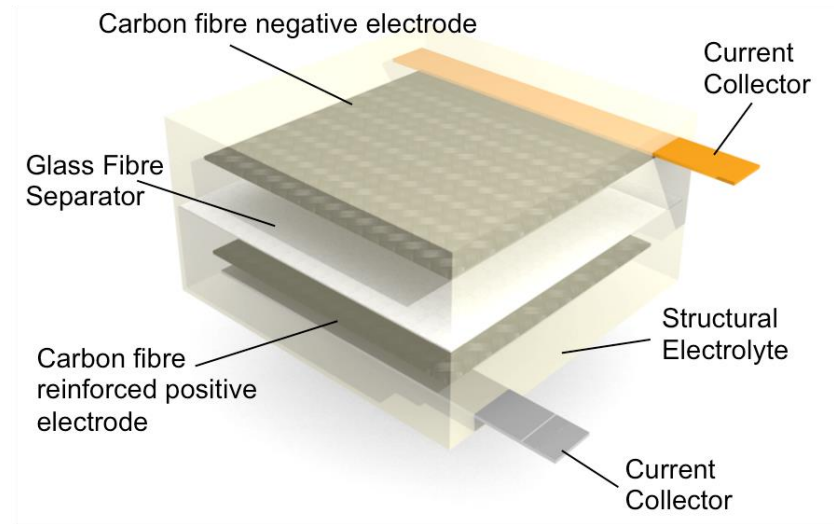


Image courtesy: Ross Harnden

## Laminated architecture

- Requires highly conductive electrolytes



# TRACKS course

A new educational model at Chalmers

Equip student with the right tools to address complex societal challenges.

One of the biggest investments in education in the near 200-year history of Chalmers.

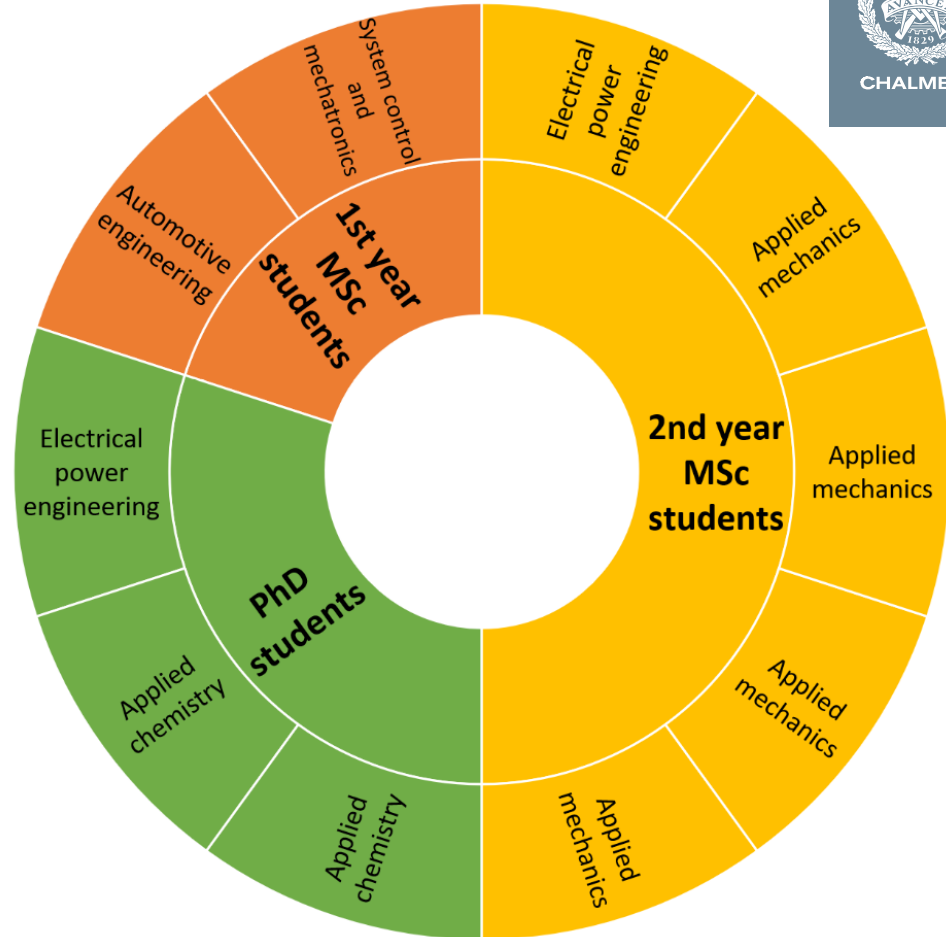
- Allow students to create cross-disciplinary competencies
- Meet the students expectation and need for a more individualized study plan

# TRACKS course

Design and implementation

## Learning activities

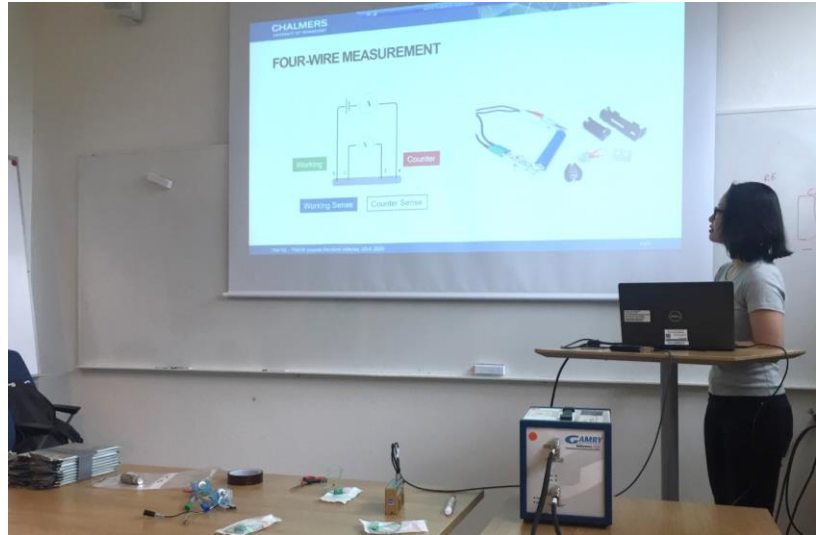
- Lectures / Guest lectures
- Tutorials
- Peer-to-peer teaching
- Laboration
- Supervision meetings





# TRACKS course

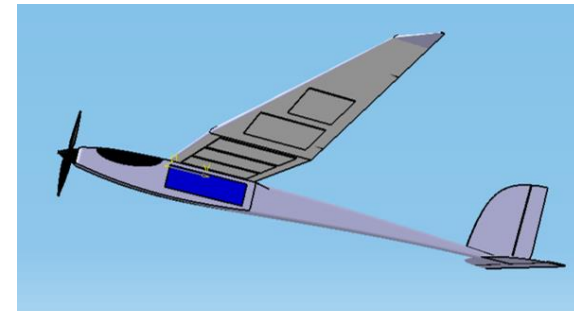
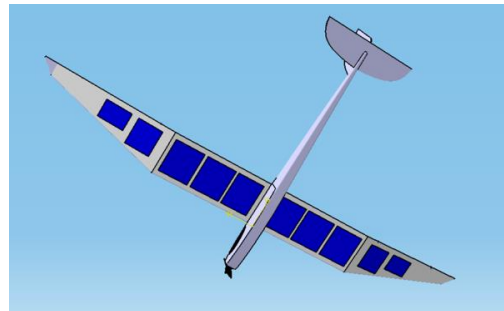
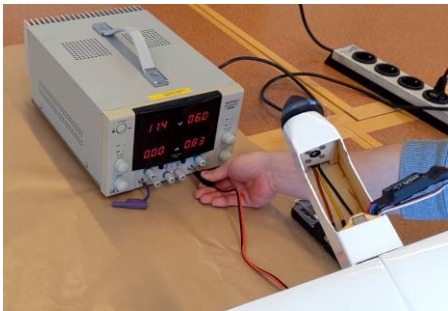
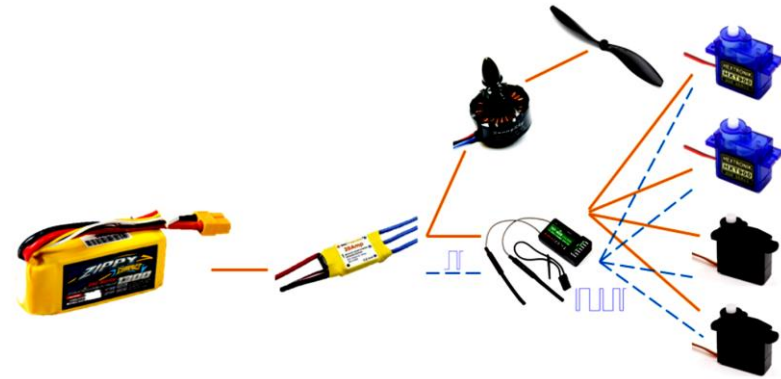
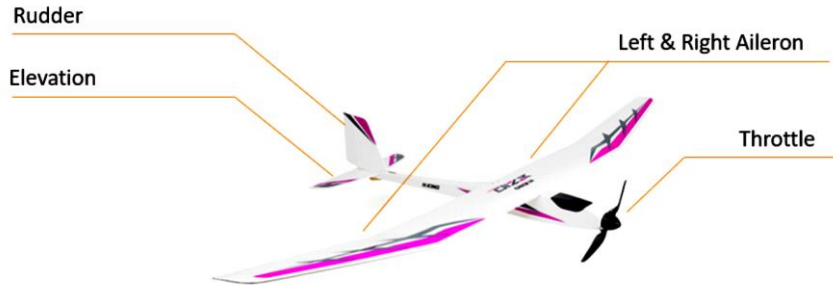
## STRUCTURAL BATTERIES – DESIGN, MANUFACTURE and CHARACTERISATION



# TRACKS course

STRUCTURAL BATTERIES – DESIGN, MANUFACTURE and CHARACTERISATION

Goal: A flying glider aircraft powered by st



# TRACKS course

## Outcome and evaluation

Based on your skills and knowledge gained upon completing the course, what do you consider most valuable for your future career?

” This course has been a great way of practising sharing knowledge. One might think primarily to ask a book or the web for guidance, but asking other people with another set of knowledge than your own is often the most enriching and effective. ”

”1. Have more experience about how to work in a multidisciplinary team, communicate with different team members and teachers.  
2. Obtain more experience about how to conduct research, what is the difference between theory and real application.”

**Thank you for your attention!**



**CHALMERS**