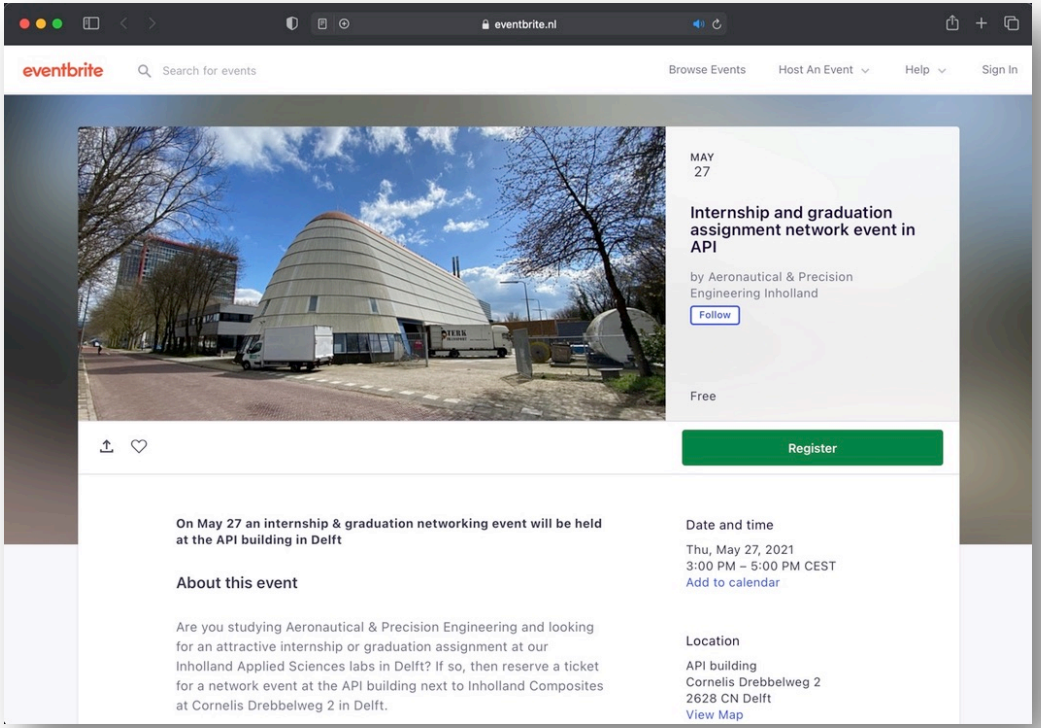
	assignment	Programme	supervisor	level
1	Repair research of thermoplastics	FIXAR	Rik Westerink	Internship / graduation
2	Hololens NDT composite damage assessment	FIXAR	Ruben vd Brink	Graduation
3	Thermoplastic 3D print robot integration	FIXAR	Ruben vd Brink	Internship
4	Automated Robot Sanding / Milling	FIXAR	Ruben vd Brink	Intership / graduation
5	Electric powertrain testing	Dragonfly	Arnold Koetje	Internship / graduation
6	System design of electric test vehicle	Dragonfly	Arnold Koetje	internship
7	Scale model design & manufacturing	Dragonfly	Ron Smetsers	Internship
8	Increased MTOW research for dragonfly	Dragonfly	Mark Ommert	Internship / graduation
9	DBT motorframe battery support structures	Dragonfly	Mark Ommert	Internship
10	Design and prototype cooling system	Dragonfly	Bob Brocken	Internship
11	Develop Dragonfly model for simulator	Dragonfly	Marco Withag	internship
12	Develop solar roof for electric vehicle	Dragonfly	Marco Withag	Internship
13	Flapping wing drone research (2x)	Biomimicry	Jean Luc Moerel	Internship / graduation
..	..	..	..	..

May 27th in API: internship & graduation networking event



https://www.eventbrite.co.uk/e/internship-and-graduation-assignment-network-event-in-api-tickets-155579904683

Project: Repair research of thermoplastic composites

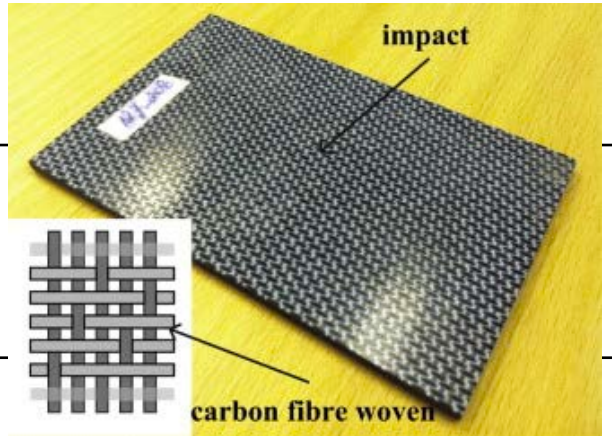
Theme:	Manufacturing/Structures	Customer	InHolland Composites Lab	Team coach	Rik Westerink

What

Context: Thermoplastic composite laminates play an increasing role in aircraft structure since it's introduction in the J-nose of the A340 by Fokker Aerostructures. While InHolland already has experience with thermoset composite repair procedures, this is not the case for thermoplastic composites. InHolland would like to expand the composite repair minor to include thermoplastics repairs and need to gain experience.

Objective project: to research and develop repair methods and procedures required for thermoplastic composites laminates used in aircraft structures.

Opportunity:
- Lean more about thermoplastic composites materials
- Hands on experimental research (make, repair and test samples in our lab)
- Contribute to the improvement of the composite repair minor of InHolland
- Opportunity to learn how to work with the autoclave, hot press and tensile test equipment



How (scope)

- Literature research of relevant damage cases for thermoplastic composite laminates in large aircraft
- Literature research of thermoplastic repair procedures
- Build on the experience of the PIXAR (thermoset) composite repair project
- Secure and/or manufacture laminates that represent actual laminates used in large aircraft
- Simulate damage on samples
- Experimental development of repair method

Project: Hololens NDT composite damage assessment

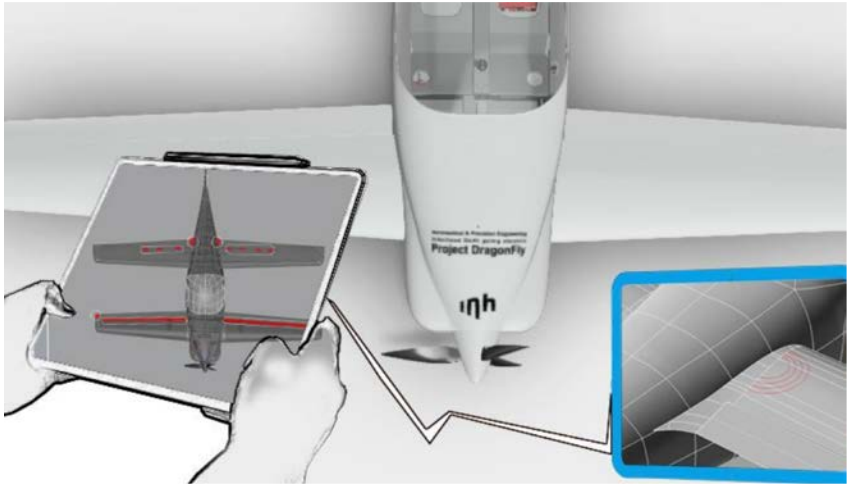
Theme:	Augmented Reality	Customer	SPECTO Aerospace	Team coach	Ruben van den Brink

What

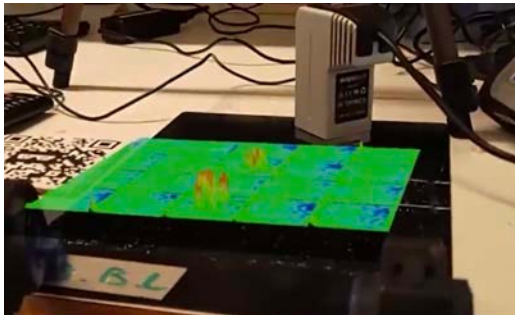
Context: In the aviation industry a lot of manual labor and paper work are necessary for composite repairs. Everything has to be inspected and repaired by hand and every single step has to be documented. To improve the repair process is SPECTO adding Augmented Reality to their repair process.

Objective project: To continue the development of this Augmented Reality application for composite repairs several subjects must be researched. Think about the capability research of AR, accuracy and implementability.

Opportunity:
- Work with high tech Augmented Reality development
- Learn about composite repairs of airplane parts
- Develop research and programming skills



How (scope)
- Add on previous research, continue literature research
- Research Augmented Reality capabilities
- Develop AR applications for implementation
- Test in actual composite repair process at SPECTO



Project: Thermoplastic 3D print robot integration

Theme:	Fanuc robot Automation	Customer	Inholland Composites	Team coach	Ruben van den Brink

What

Context: Rapid prototyping is now transforming into rapid building. This implies that Inholland Composites is looking for ways to quickly develop products and mold with the help of 3D printing. A partnering company is developing a 3D print head for an industrial robot arm. Inholland Composites wants to implement this into their capabilities.

Objective project: Implementing a 3D print head on an industrial robot arm at the API building. Test the capabilities of this system.

Opportunity:
- Work with high tech industrial robot arm
- Develop your programming skills
- Develop additive manufacturing knowledge
- Rapid mould building and products

How (scope)

- Add on previous research, continue literature research
- Research the 3D printing head
- Attach printing head to Fanuc robot
- Test software for G-code generation
- Build your products

Project: Automated Robot Sanding / Milling

Theme:	**Fanuc robot Automation**	Customer	**Inholland Composites**	Team coach	**Ruben van den Brink**

What

Context: Automate manual labor to lower production costs and increase employee safety. This can be done by using an industrial robot arm such as the FANUC robot at the API building. The focus of Inholland Composites is currently on Automated Sanding and Automated mould Milling.

Objective project: Improve the current Milling or Sanding system that's in place at Inholland Composites.

Opportunity:
- Work with high tech industrial robot arm
- Develop your programming skills
- Develop knowledge in automation

How (scope)

- Add on previous research, continue literature research
- Research the current setup
- Make improvements in the current setup

Project: Electric Powertrain testing

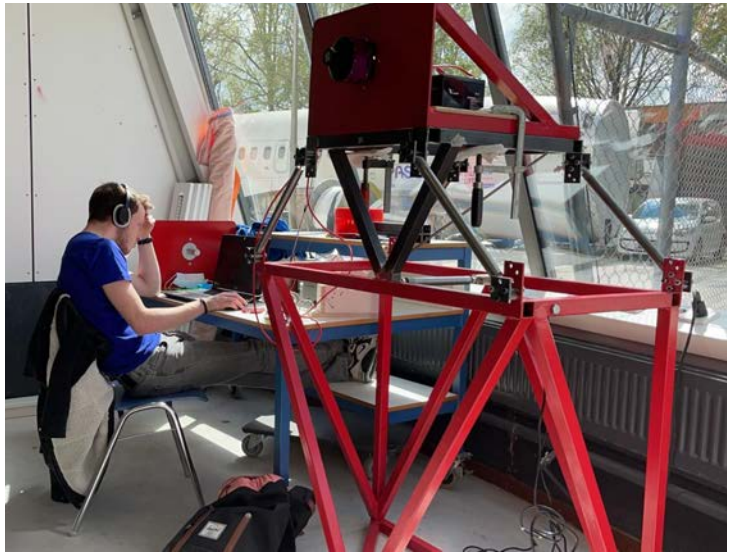
Theme:	Performance/Manufacturing/Structures/Smart Systems	Customer	Saluqi Motors	Team coach	Arnold Koetje

What

Context: Saluqi Motors designs and build electric motors integrated with cooling and power electronics inverter using highly effective patented architecture. Inholland will integrate motors from Saluqi in the electric powertrain for project DragonFly and requires a dedicated ground test system for motor validation.

Objective project: to continue the development of the test stand which is currently located at the Inholland Applied Sciences labs in Delft. The test stand needs a systems engineer that can modify the existing test stand and make it work in the LabVIEW development platform according a well defined testplan.

Opportunity:
- Work with electric powertrains designed for aerospace applications
- Learn more about power electronics, sensors and electric interfacing for cockpit designs
- Learn how to work with LabVIEW, an application used by NLR, NASA and many other aerospace research institutes.



How (scope)

- Add on previous research, continue literature research
- Do online LabVIEW course (2 weeks)
- Design throttle control system system for ground tests
- Modify test stand
- Develop test plan and performance criteria
- Execute test plan

Project: System design of electric test vehicle

Theme:	**Performance/Manufacturing/Smart Systems**	Customer	**Saluqi Motors**	Team coach	**Arnold Koetje**

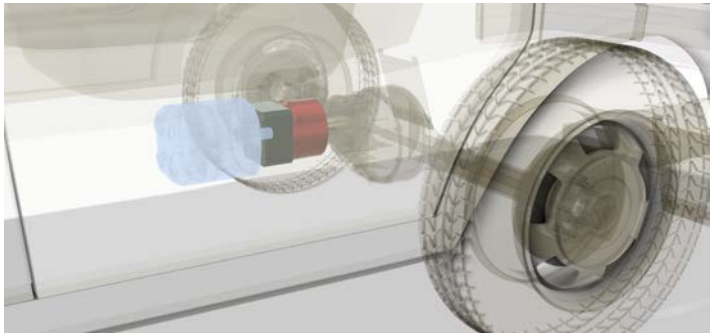
What

Context: Saluqi Motors designs and build electric motors integrated with cooling and power electronics inverter using highly effective patented architecture. Inholland will integrate motors from Saluqi in the electric powertrain for project DragonFly and requires a dedicated ground test system for motor validation. In this project a car will be electrified with a Saluqi motor to perform endurance tests using road conditoins. The 2nd purpose of this project is to integrate the test stand on top of the car to do performance tests on a runway with the twin configuration as used in the Dragonfly.

Objective project
Create systems design of the electric car and execute required modifications using an electric motor from Saluqi and a modular battery system.

Opportunity:
- Work with electric powertrains designed for aerospace applications
- Learn more about power electronics, sensors and integration on automotive application
- Enhance your CAD and systems engineering skills

How (scope)
- Add on previous research, continue literature research
- Setup assembly drawing in CAD
- Design electric powertrain system system
- Design and manufacture mechanical support structure as part of systems design
- Develop test plan and performance criteria
- Execute test plan



Scale model design & manufacturing for scaled model flight testing Dragonfly

Project: Increased MTOW research for Dragonfly

Theme:	Structures, Build/Test	Customer	Inholland	Team coach	Mark Ommert

What

Context: Project DragonFly aims to convert an existing aircraft towards a more sustainable solution using a battery electric propulsion system. The netto energy density of a battery cell is currently limited to 200Wh/kg at the moment, which results in a flight time that is still not acceptable. Hence, Project DragonFly would like to assess the feasibility to increase the MTOW of the airplane in order to increase flight time.

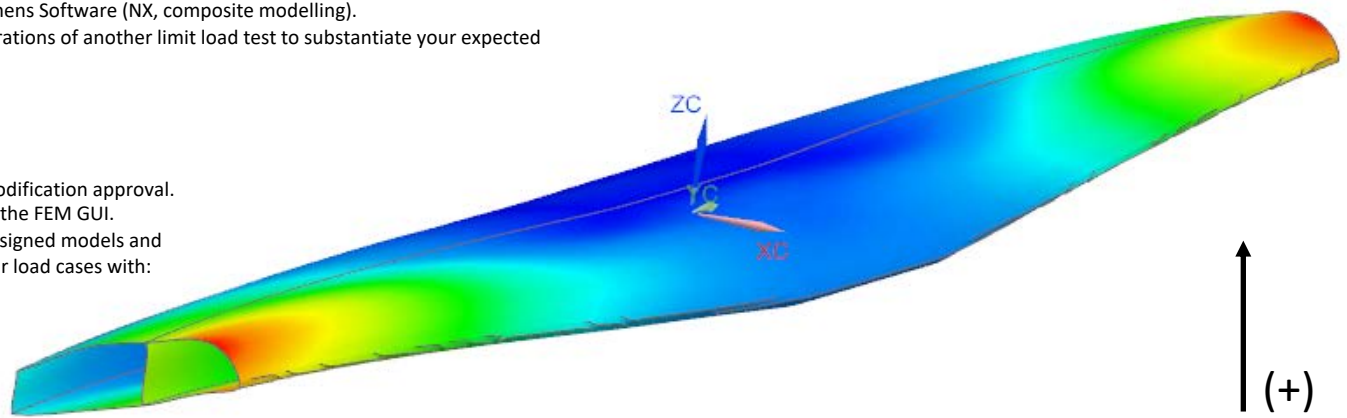
Objective project: to assess the feasibility of MTOW increasement for the two-seater composite Dragonfly mk.II airplane using a theoretical and practical approach.

Opportunity:

- Gain knowledge about design modification procedures for experimental aircraft.
- Get access to data from a recent limit load test and compare this to simulations.
- Learn how to work with relevant Siemens Software (NX, composite modelling).
- Optional: get involved into the preparations of another limit load test to substantiate your expected results gained from simulations.

How (scope)

- Add on previous research.
- Start literature research for design modification approval.
- Learn Siemens NX software including the FEM GUI.
- Perform FEM simulations with pre-designed models and compare to physical limit load test, for load cases with:
  (1) Normal MTOW, and;
  (2) Increased MTOW.



Project: DBT motorframe battery support structures

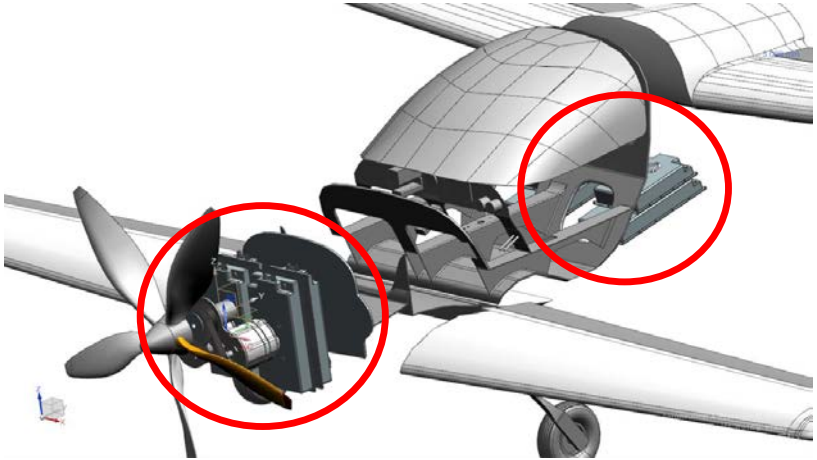
Theme:	Structures, Design/Build/Test	Customer	Inholland	Team coach	Mark Ommert

What

Context: Project DragonFly aims to convert an existing aircraft towards a more sustainable solution using a battery electric propulsion system. The electric propulsion system has been designed, but still needs a solution for integration. How and where do you attach the batteries to the Dragonfly motor frame? Design, build and test is the approach for this assignment.

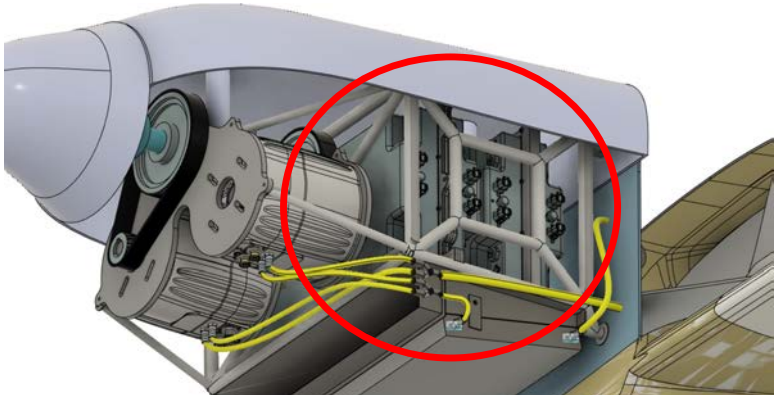
Objective project: to have integrated battery support structures into the Viking Dragonfly mk.II airplane that meet relevant requirements from the customer and authorities.

Opportunity:
- Gain knowledge about design methodologies for a REAL experimental aircraft.
- Improve your CAD Software skills (NX/Fusion360).
- To put theory into practice by prototyping your own design.



How (scope)

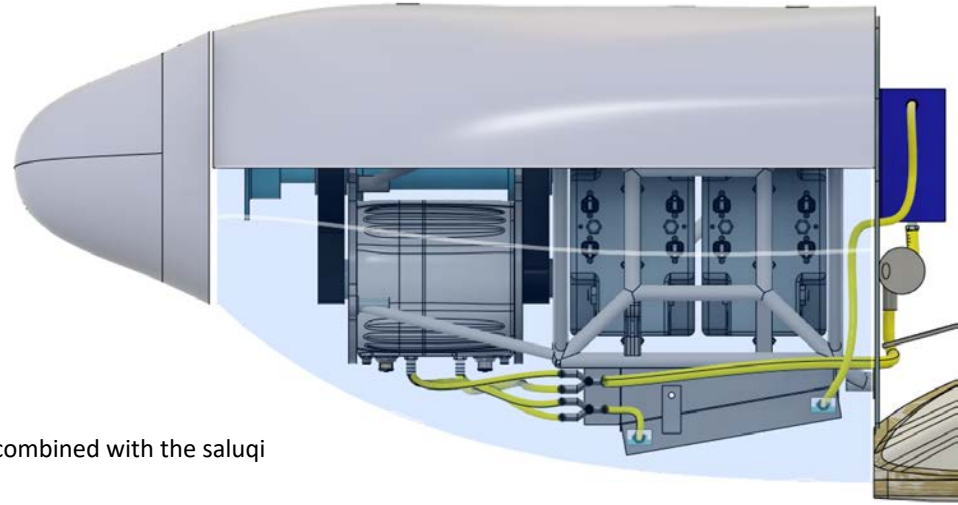
- Define the load cases acting on the battery support structure.
- Create a design taking into consideration material choice, manufacturing, costs, strength and stiffness.
- Verify the design using structural calculations and/or FEM analysis.
- Build and validate your design.



Design and prototype cooling system

What: The dragonfly will be equipped with a electric motor and batteries which will have to be thermally managed. A group of 3th year students did an analysis om a cooling system and made a preliminary design of a heater exchanger and cooling duct in the Dragonfly motor fairing. This design has to be validate and constructed.

Objective: The objective of the assignment is to continue the development of the dragonfly cooling system and be able to test and validate the system in practice. Initially with a simplified setup but eventually with the ducts as proposed for the dragonfly engine cowling.



Opportunity:

- Perform and analyze tests and get familiar with data processing.
- Work on the realization of a (prototype) system
- Work on composites production.
- Learn more about power electronics and cooling systems.

How:

- Add on previous research, continue literature research.
- Assembly the entire cooling system.
- Test (using a windtunnel) the performance of the cooling system combined with the saluqi motor and spike batteries .
- Validate (wherever possible) the test data with the AMESIM simulation model.
- Build a composite cooling duct and its performance and influence.

Develop Dragonfly model for flight simulator

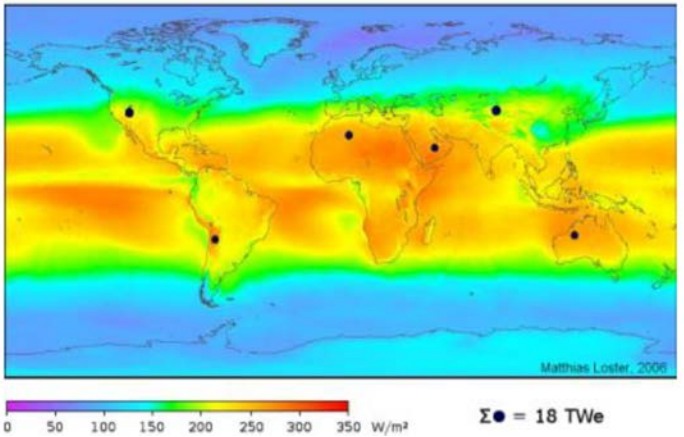
Developing a composite body part with integrated solar cells for an electric vehicle

Theme:	/Manufacturing/Structures/Electronics	Customer	Inholland Composites	Supervisor	Marco Withag

What

Context:
The distribution of solar irradiance on the earth's surface depicted in the picture on the side clearly shows the potential of solar energy close to the equator. Emphatically Africa as a continent has the biggest potential. However, many countries in Africa lack a stable electrical grid that has the capacity for a vast amount of energy. Small electic vehicles with integrated solar cells can be a great solution for this energy problem. For this assignment we are looking for an intern with a hands-on mentality. Prior knowledge of surface design and composite manufacturing is a plus.

Objective project:
Research has been performed into integrating solar cells into composite structures. The next objective is to design and manufacture body parts for an electric vehicle with integrated solar cells. In addition, you will also perform research on the required electrical systems to charge the batteries using the generated solar energy.



Opportunity:
- Work on electric vehicles, and solar energy systems.
- Learn to master composite manufacturing techniques.
- Develop your CAD/CAM skills

How (scope)
- Determine the loadcases.
- Designing body parts for an EV.
- CAD/CAM of the composite body parts.
- Manufacturing the body parts.
- Research into the required electrical components to charge the batteries.
- Developing and executing test plans.

Project: Flapping Wing Micro Aerial Vehicle (FWMAV)

Theme:	Performance/Manufacturing/Structures/Smart Systems	Customer	Biomimicry Lectorate	Team coach	M. Gallo, J-L. Moerel

What

Context: The Biomimicry Lectorate seeks for inspiration from nature to come to new engineering solutions to all kinds of problems. Small drones inspecting crops in greenhouses may benefit from efficient insect flying behaviour and therefore the concept of FWMAV is being researched as one of the application cases within the Lectorate.

Objective project: to continue research and development of FWMAV started by 6 students in previous year. Challenges are related to:

- complex time-dependant aerodynamics,
- designing the drone and all its component on very small scale (spanwidth < 10cm),
- new energy sources (batteries are too heavy),
- autonomous flight (maNy obstacles to be avoided in the dense foliage of crops)

Opportunity:

- **Work with advanced software (CFD, FEM) to simulate complex physical phenomena**
- **Learn about designing on very small scales**
- **(Re) design, build, fly, test FWMAV**

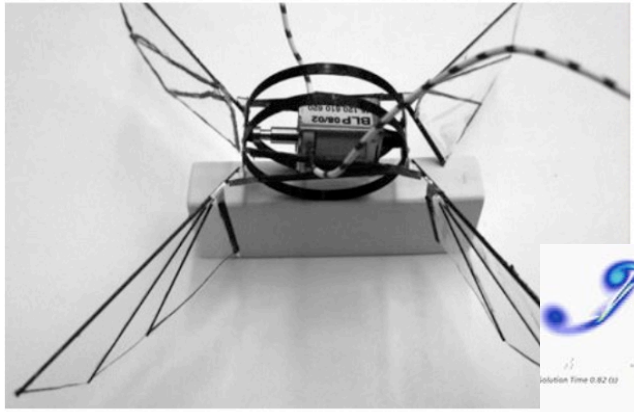
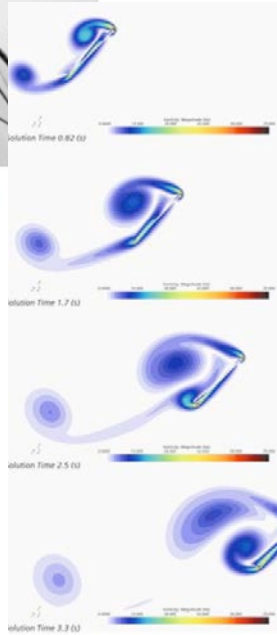


Figure 1-2 - Atalanta project FWMAV of the TU Delft



How (scope)

- Assignments yet to be defined based on outcome current graduation assignments (nearing completion now)
- Modelling & Simulation involved as well as DBT
- Multidisciplinary work, so students need to work together, share information, etc.

Next steps

- Send email to projectdragonfly@inholland.nl before June 7
  - Include top 3 of assignments
  - Include short motivation
  - Include CV
- You will get feedback via email before June 15