EUDP2018-I AeroLoop
Accelerate and enhance quality in aerodynamic and aeroacoustic design loops

Christian Bak

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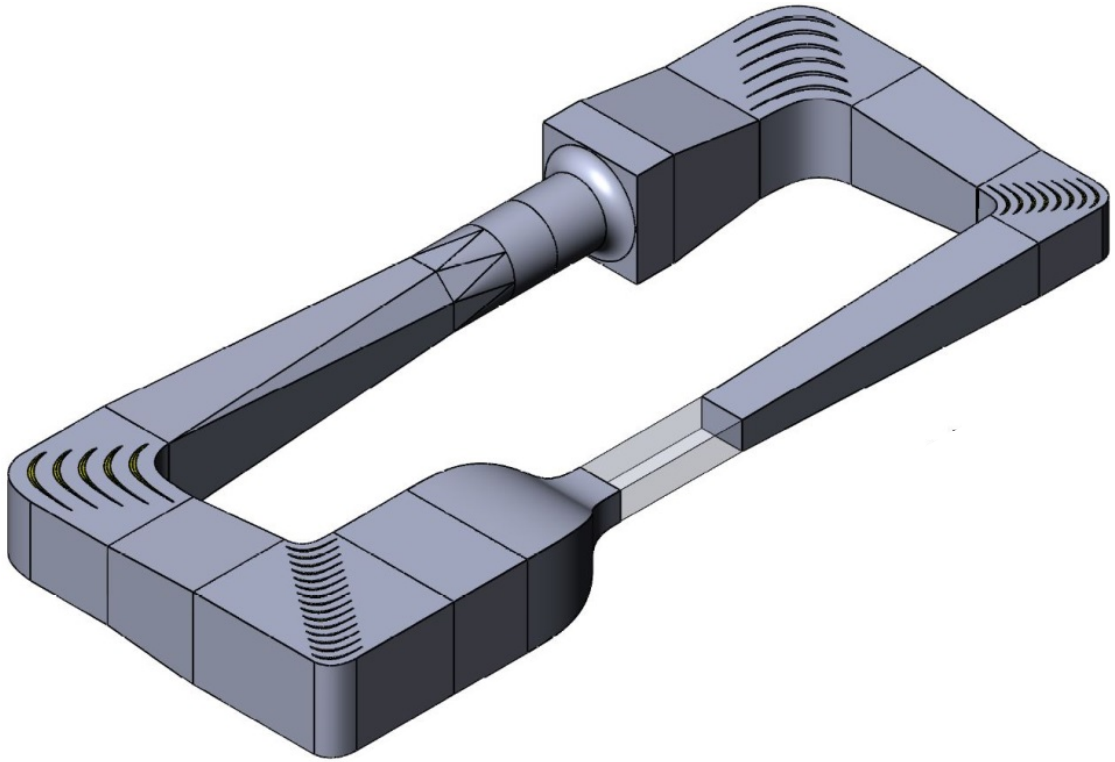
DTU Wind Energy

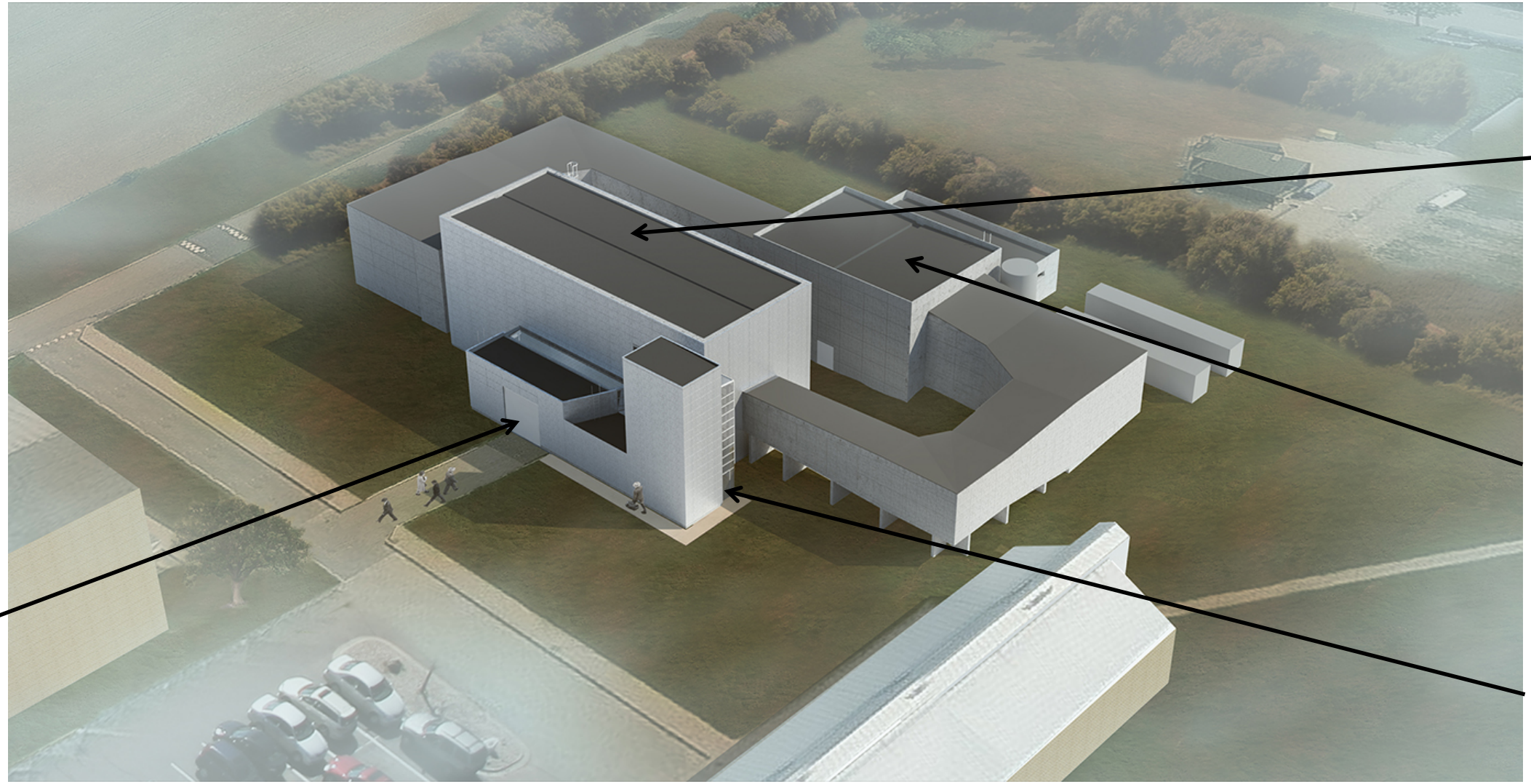
Presentation at Wind Energy Denmark 2018

30 October 2018



BACKGROUND

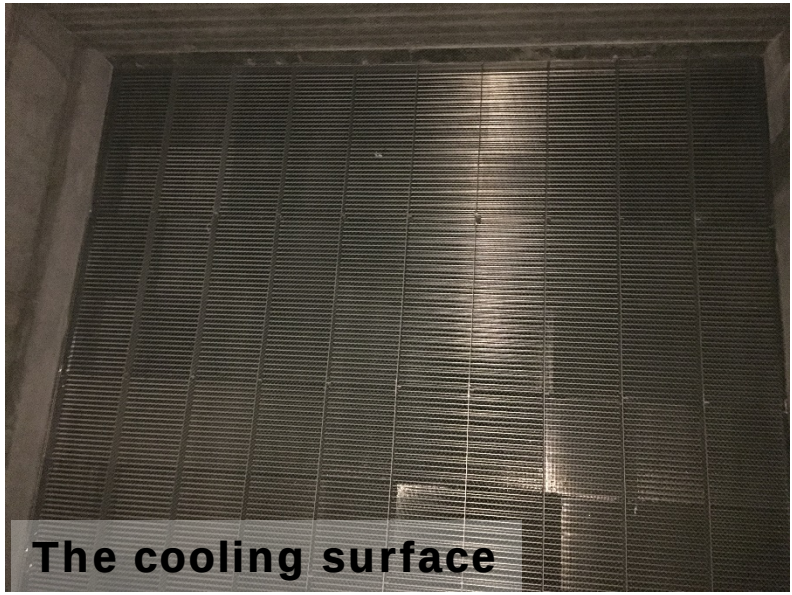
Poul la Cour Tunnel inaugurated April 2018



Poul la Cour Tunnel
The different components


The fan upstream


The contraction and screens


The cooling surface

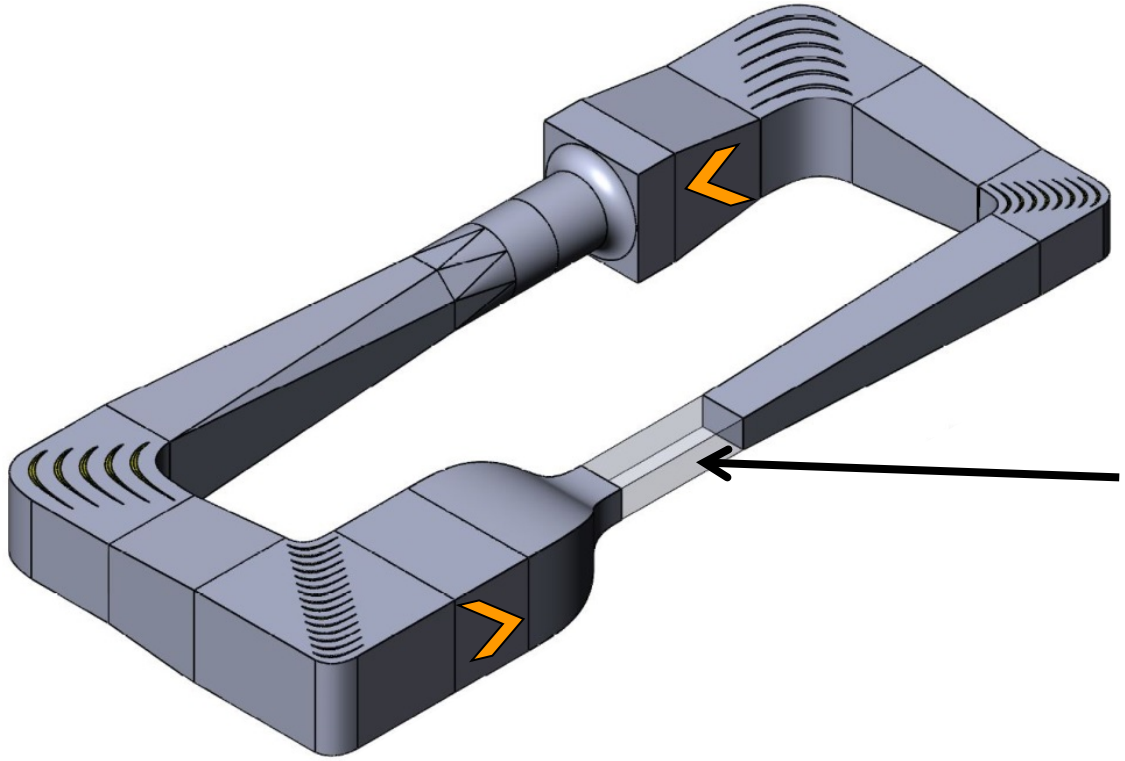

The fan downstream


The test section

Poul la Cour Tunnel
The history in short

- 2011, April:
  - Green light from the Research and Innovation Agency to find national agreement for a wind tunnel as a national research infrastructure.
- 2011, December:
  - Discussions with the Danish wind turbine industry (Siemens, Vestas, LM Wind Power, Suzlon), universities (AaU, AU), GTS institutes (FORCE) and other relevant institutions (DONG, The Danish Wind Industry Association): A project description was submitted to the Research and Innovation Agency
- 2012, May
  - DKK 44 mio was granted mid 2012
- 2012-2016
  - The design was discussed with the Danish stakeholders within wind energy
- 2018, April
  - The Poul la Cour Tunnel was inaugurated

Poul la Cour Tunnel
The design is unique



Description	Value
Maximum flow speed [m/s]/[km/h]	**~105/378**
Test section: Width [m]	**3.00**
Test section: Height [m]	**2.00**
Test section: Length [m]	**~9**
Maximum turbulence intensity [%]	**Max 0.1**
Anechoic room with background noise at 60m/s [dB]	**<70**

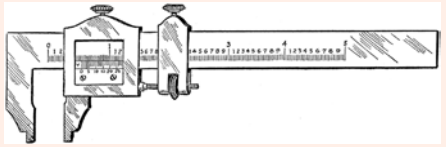
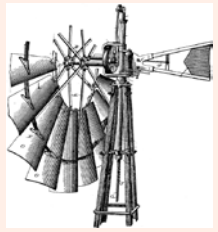
THE AEROLOOP PROJECT

AeroLoop
Partners and time

- **Partners**
  - DTU Wind Energy
  - Vestas
  - SiemensGamesa
  - Suzlon
  - LM Wind Power

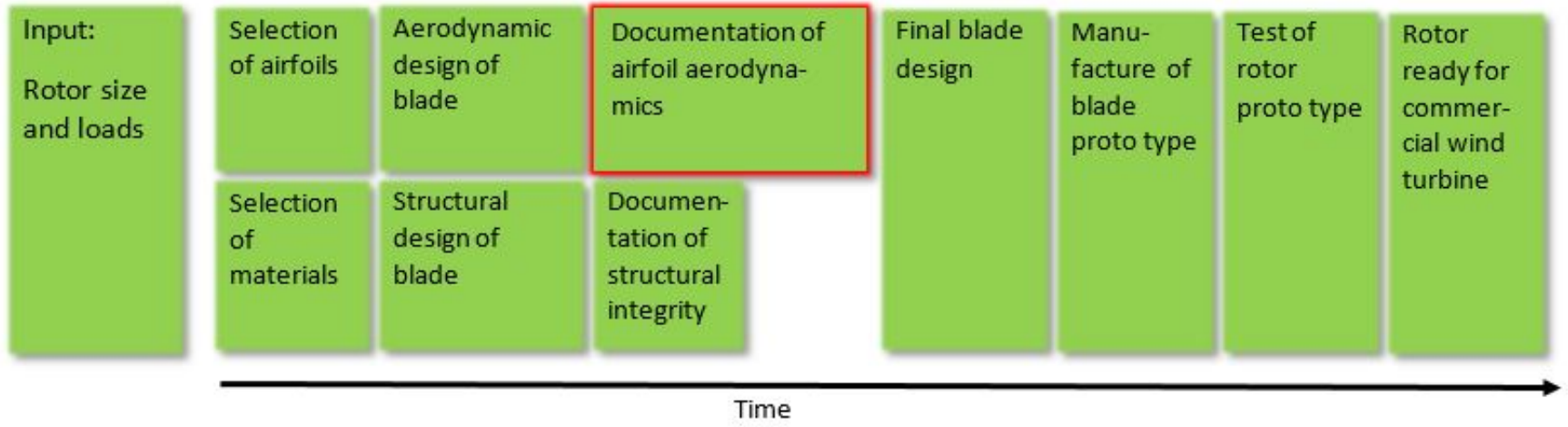
- **Period**
  - Project start: 1 October 2018
  - Project end: 30 September 2020

AeroLoop Objectives

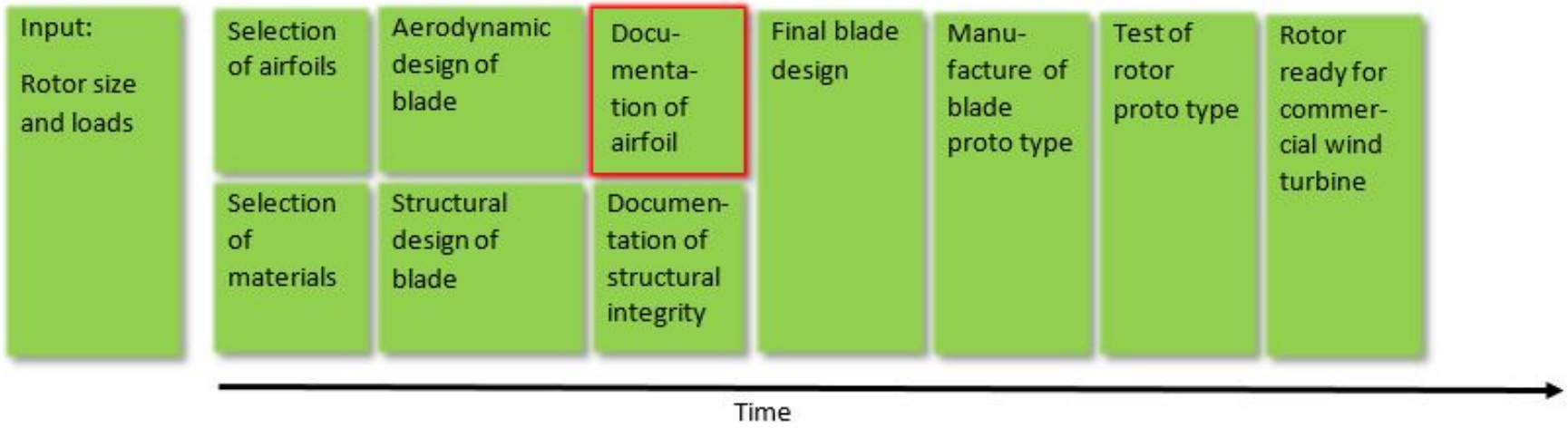
The 4 AeroLoop Objectives		
1.		High quality measurements
2.		Accelerated wind tunnel measurements by increasing the turnaround cycles substantially
3.		Benchmarked wind tunnel measurements by comparing to several other wind tunnels
4.		Improved airfoils for each of the partners

AeroLoop
Why the name *"AeroLoop"*

Blade design process *before* the AeroLoop project



Blade design process *after* the AeroLoop project



AeroLoop activities
Increasing the performance of the wind tunnel

Transition

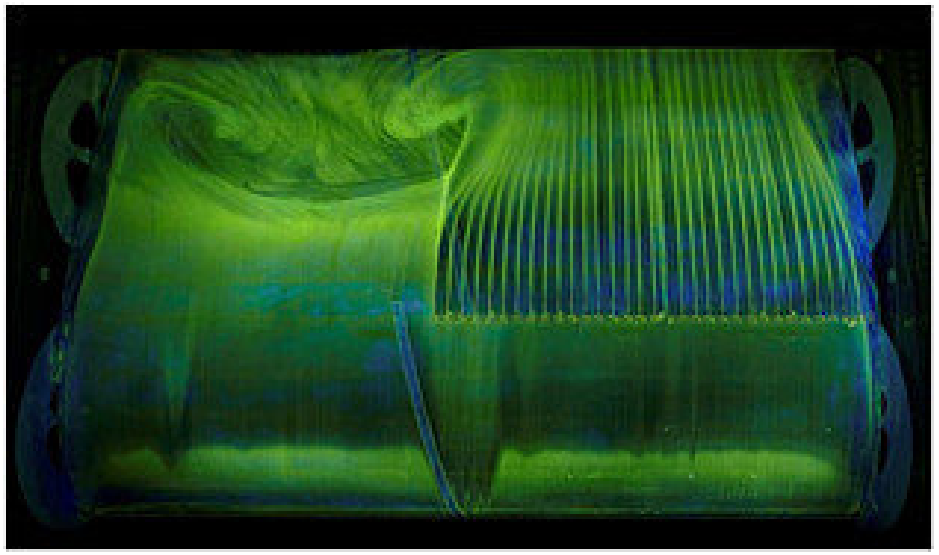
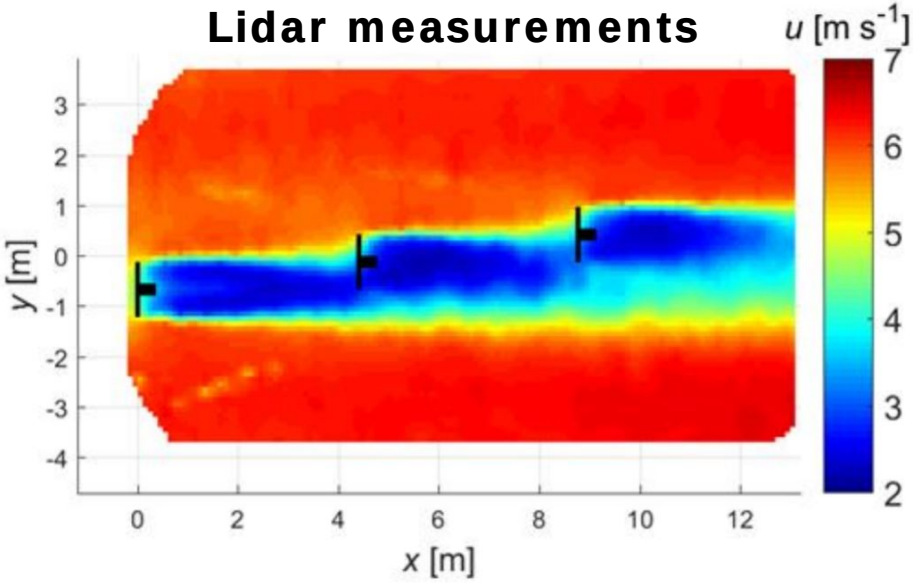


Photo from LM Wind Tunnel

Lidar measurements



Dynamic stall

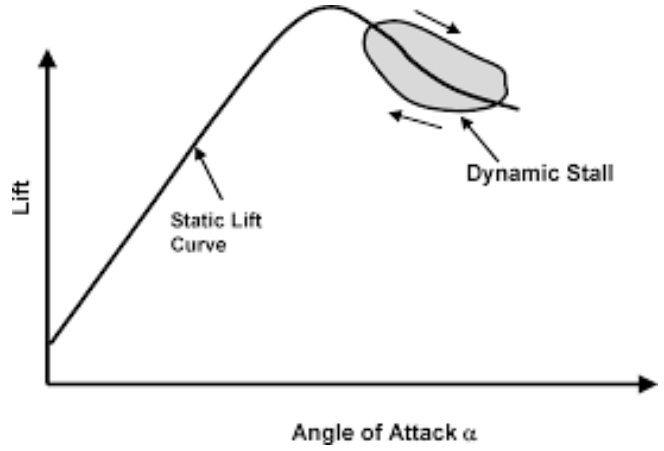
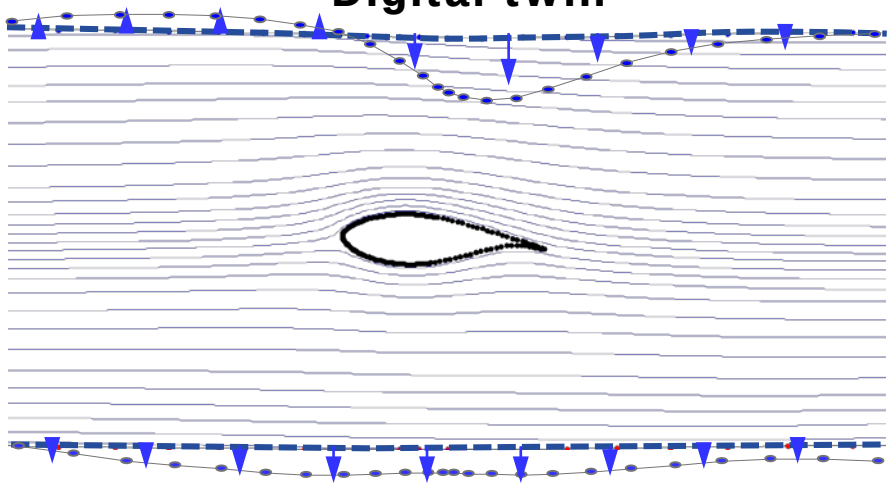
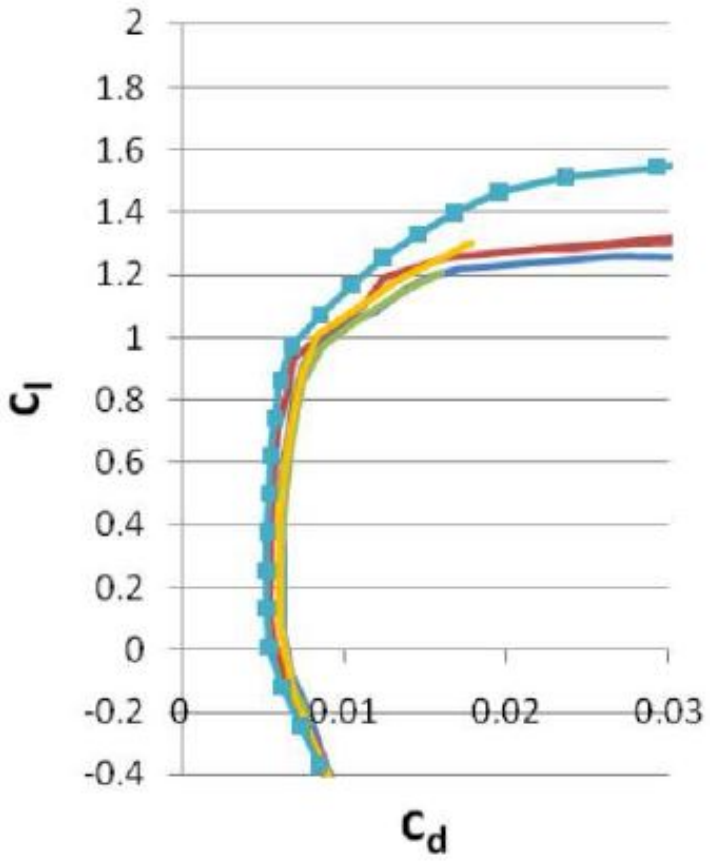


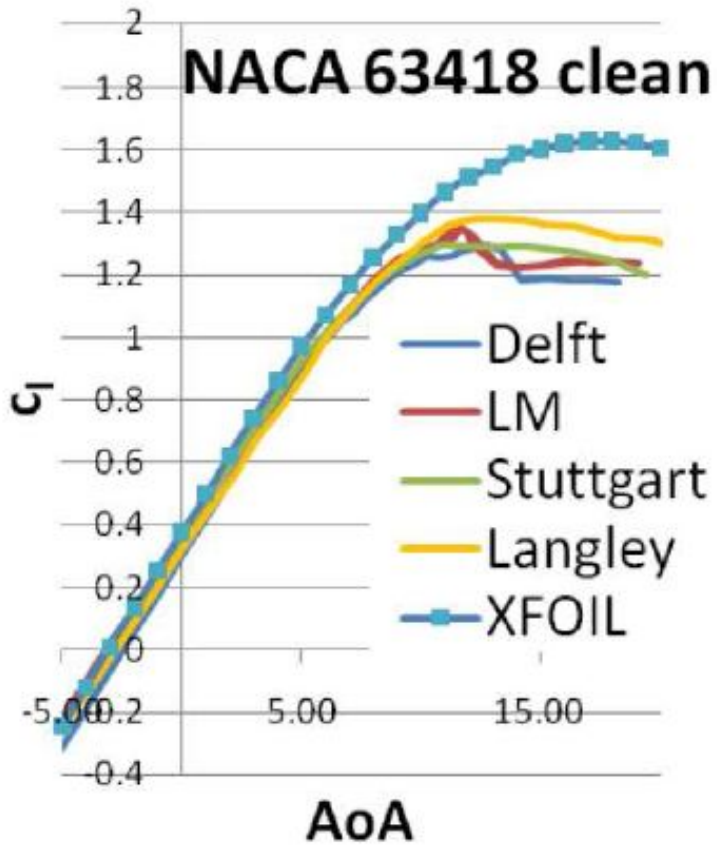
Figure from AIAA

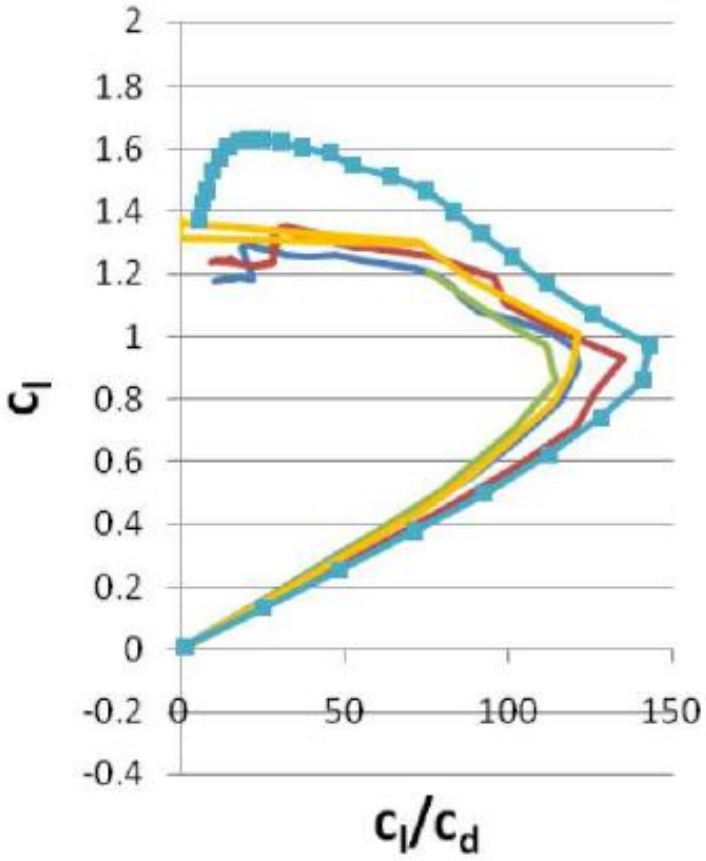
Digital twin



AeroLoop activities
Benchmark

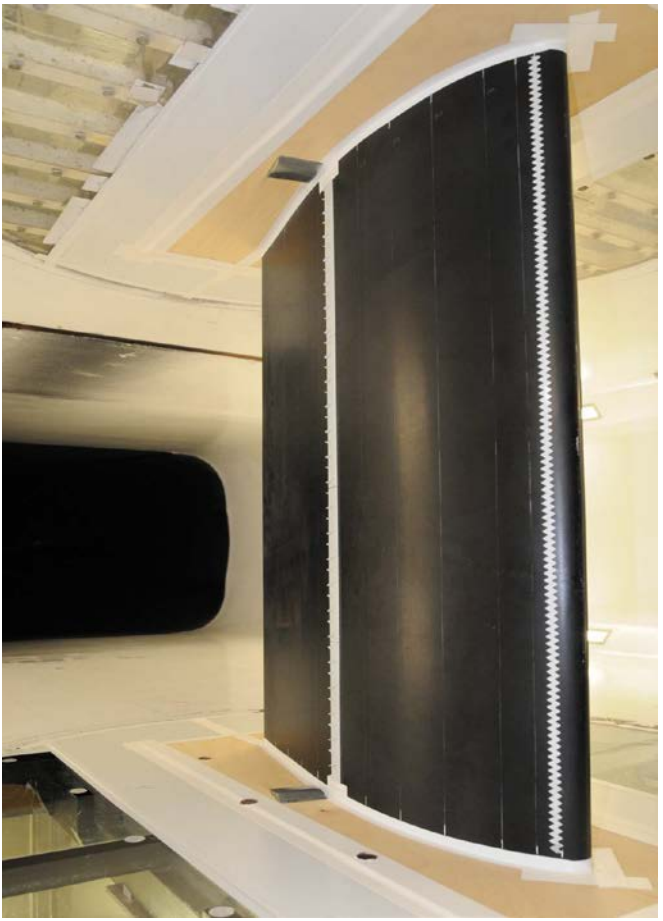






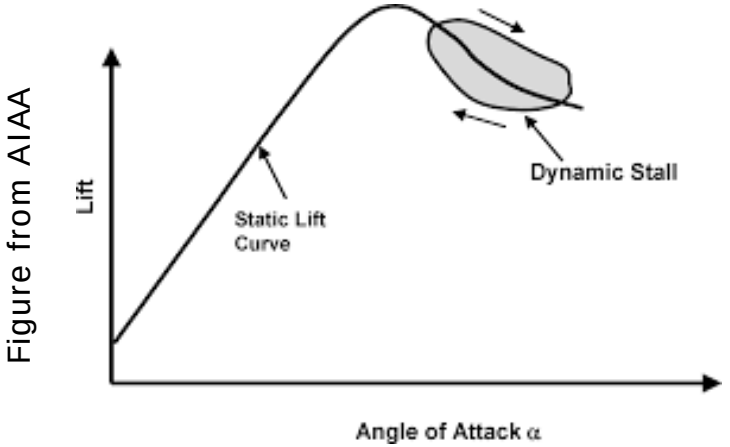
AeroLoop activities
Develop new products (examples)

Add-ons

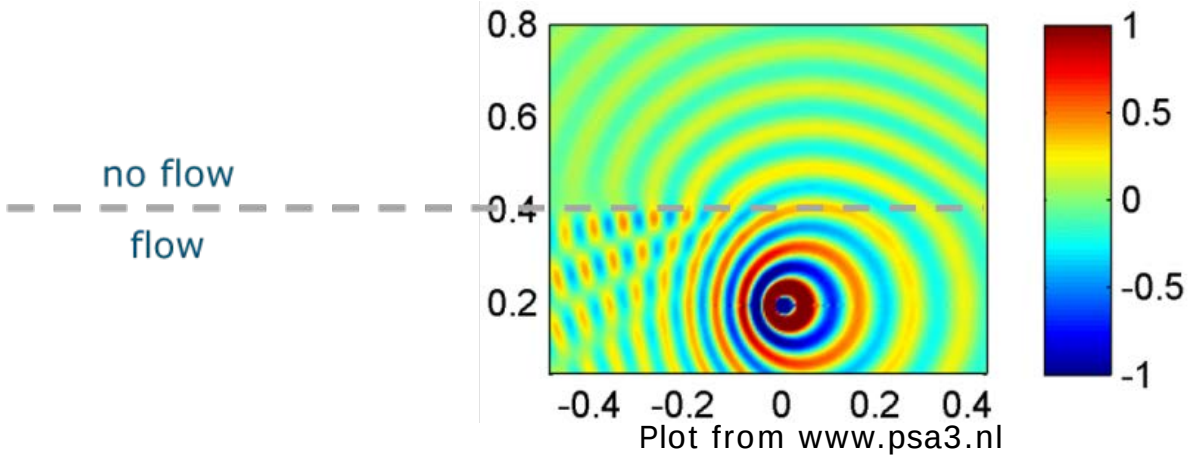


Leading edge roughness

Dynamic stall



Noise



Plot from www.psa3.nl

AeroLoop
Summary

- We just had a kick-off meeting
- First benchmark tests around February 2019
- The EUDP grant gives
  - the opertunity to lick off the new wind tunnel facility
  - will increase the value of the facility for the industry and the society

Thank you!

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Acknowledgement to EUDP