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AN INVESTIGATION OF THE AERODYNAMIC PARAMETERS FOR SOLAR PLANE WING PROFILE USING CFD MODELLING

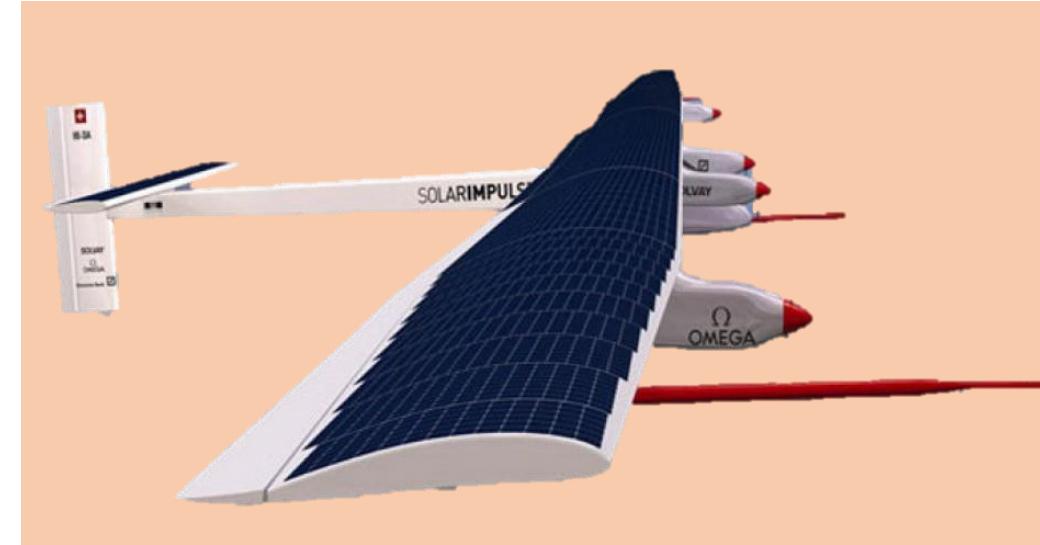




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SOLAR
PLANE

HISTORY OF SOLAR PLANES

- **SUNRISE 1 (1974)**
- **SOLAR IMPULSE 1 (2009)**
- **SOLAR IMPULSE 2 (2011)**



None of the studies describe
the effect of partially flat
surfaces
in the wings of a solar plane

CFD STUDIES OF SOLAR PLANES

- LOW AOA – GOOD ACCURACY** ↘
- THE ACCURACY OF ANSYS FLUENT** ↘
- CL/CD max FOR AOA = 4°** ↘



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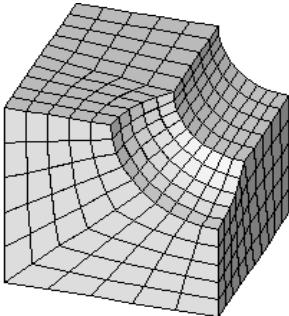
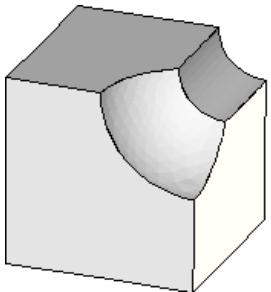
CFD ANALYSIS

GEOMETRY

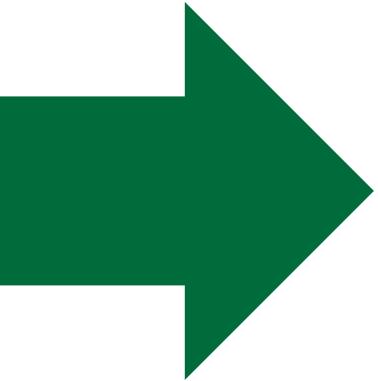
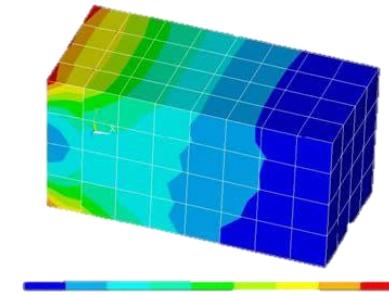
MESH

SOLVER

POST
- PROCESOR



ANSYS
FLUENT®



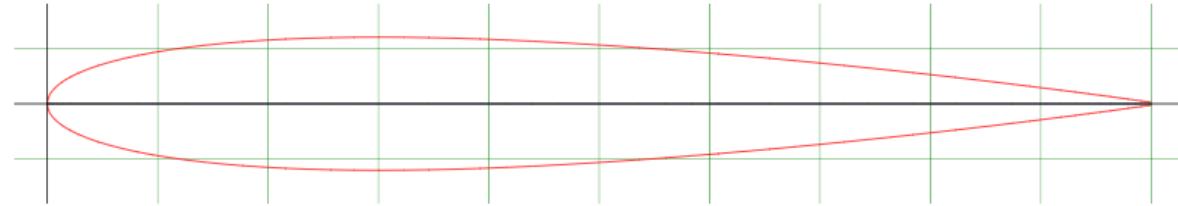


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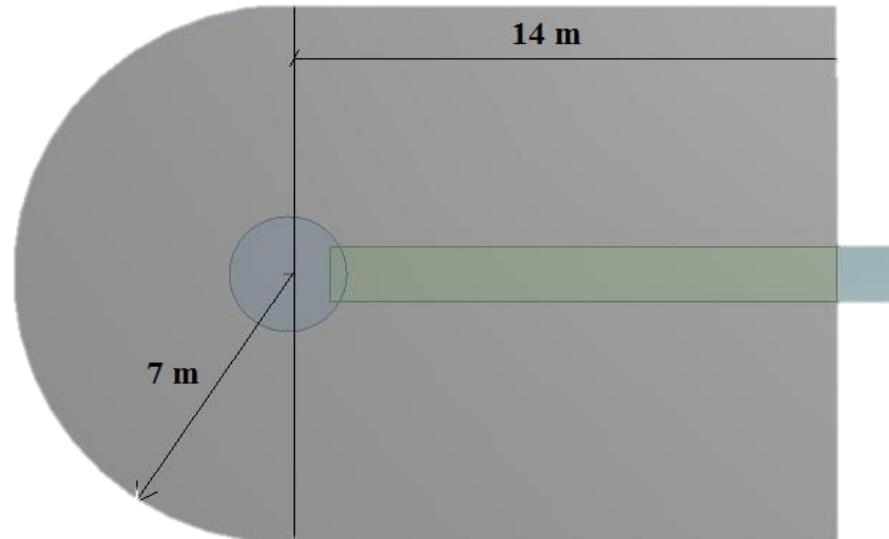
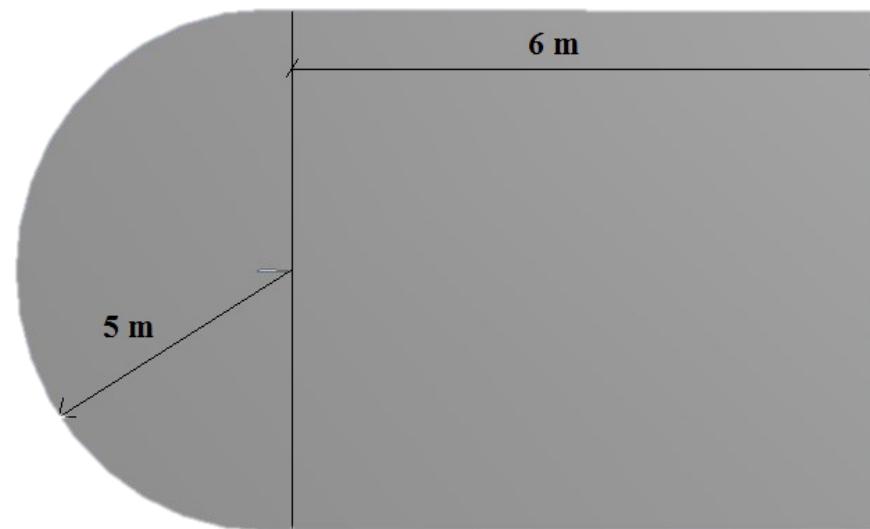
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SOLAR
PLANE

THE FIRST model

AIRFOIL GEOMETRY



AG35



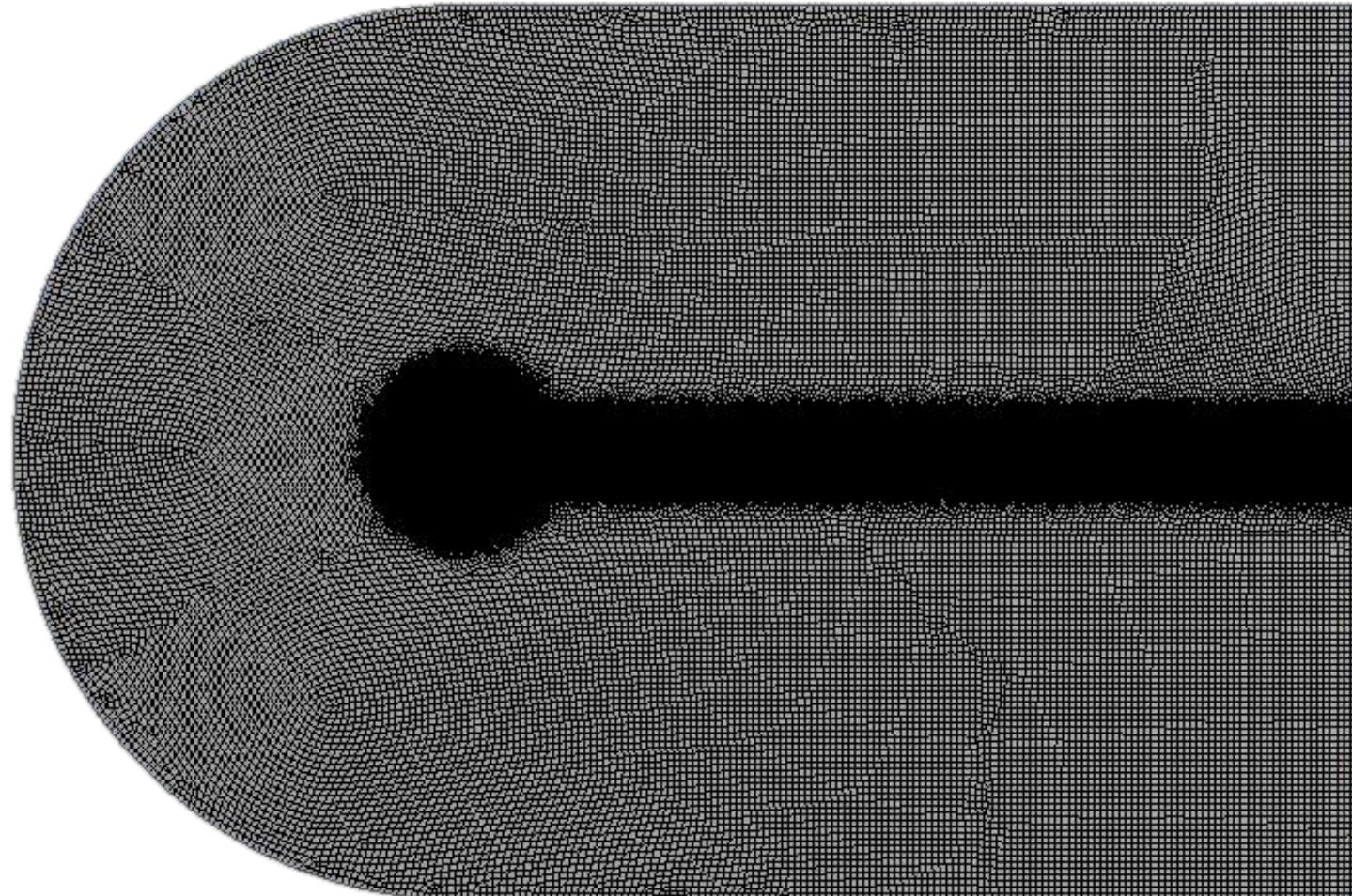


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THE FIRST model

AIRFOIL
MESH



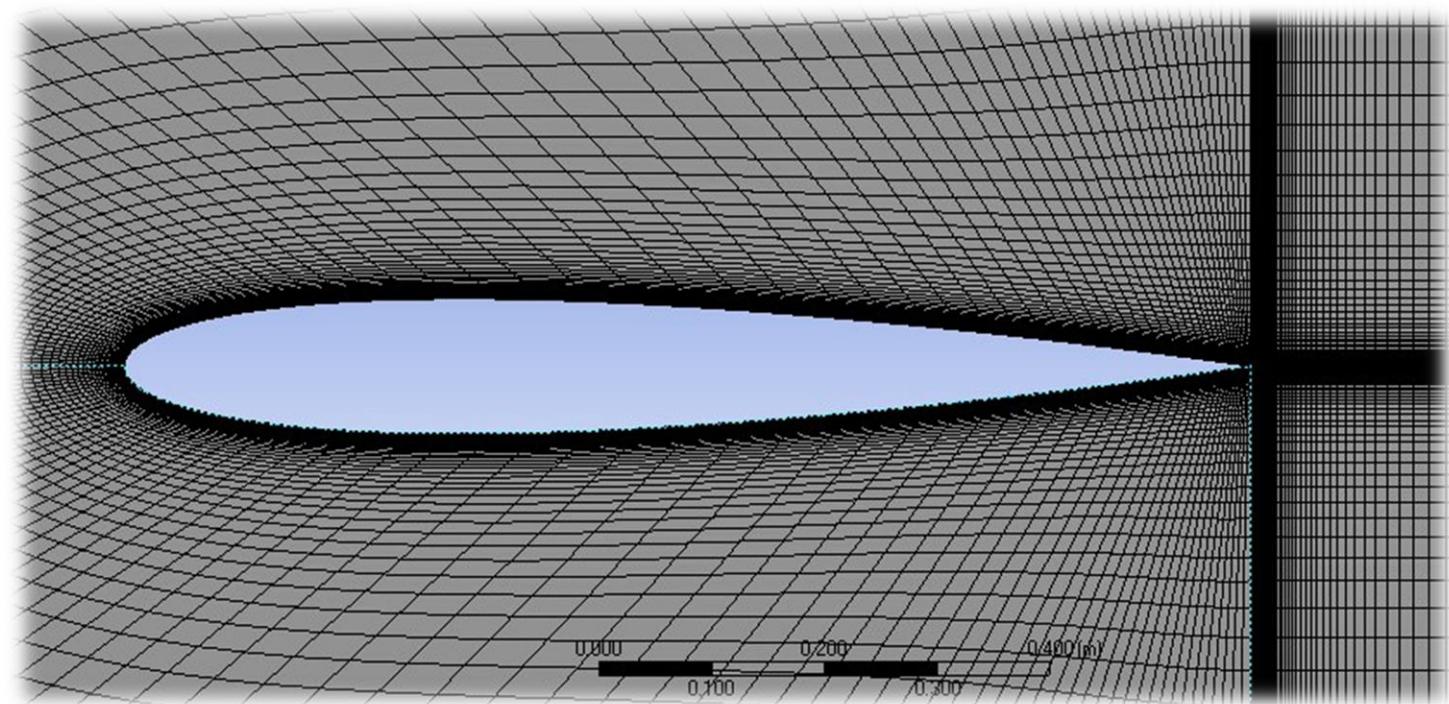


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AIRFOIL
MESH

THE FIRST model



$y^+ > 40$



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THE FIRST model

AIRFOIL

VELOCITY CNTOURS

$Re = 200\,000$

AOA



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THE FIRST model

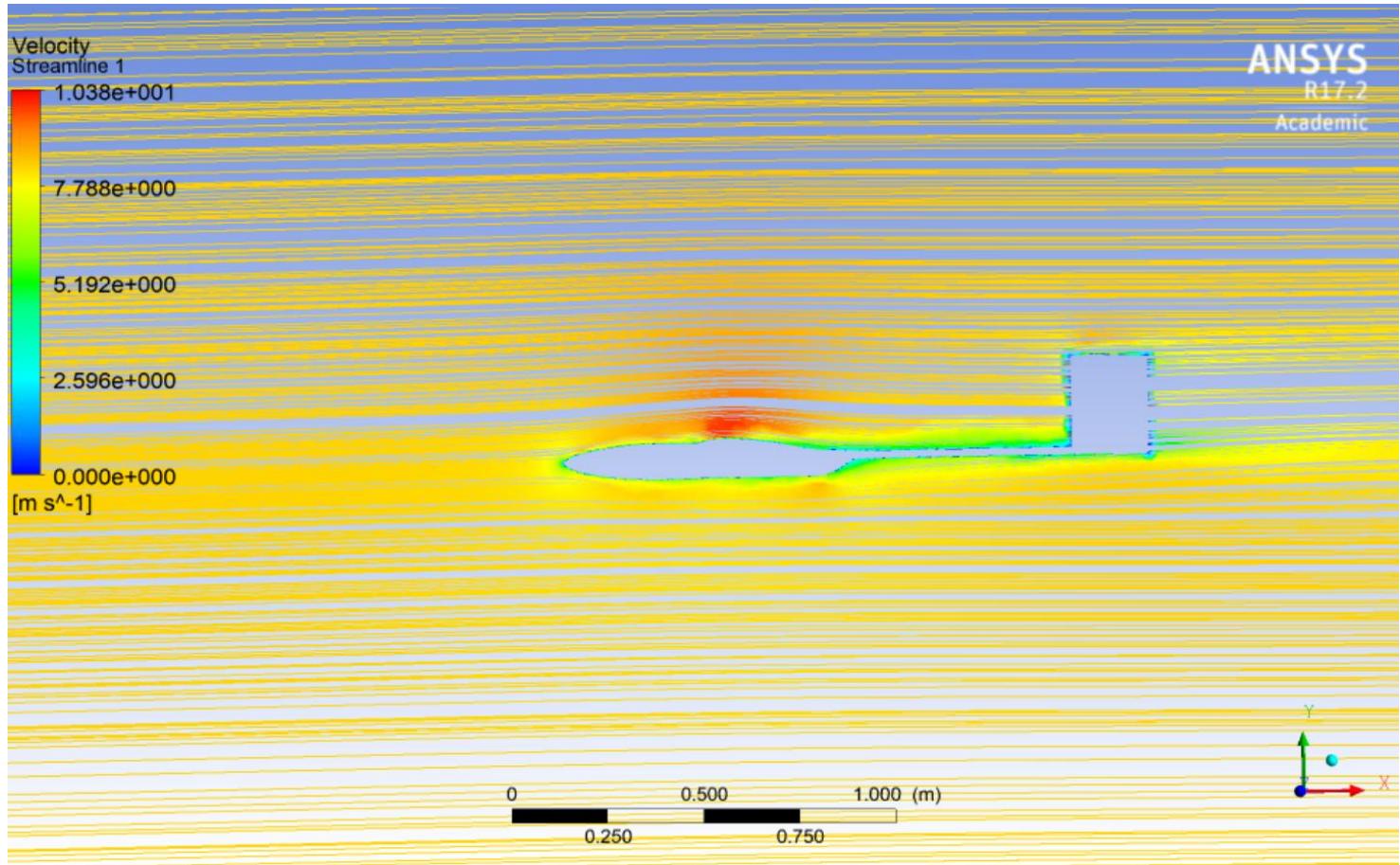


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PLANE

SOLAR PLANE

THE FIRST model





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THE SECOND model

2D AIRFOIL

CLARK Y



FX60-100



TWO BASIC
MODELS

and

4 modifications

*partially flat
surfaces*



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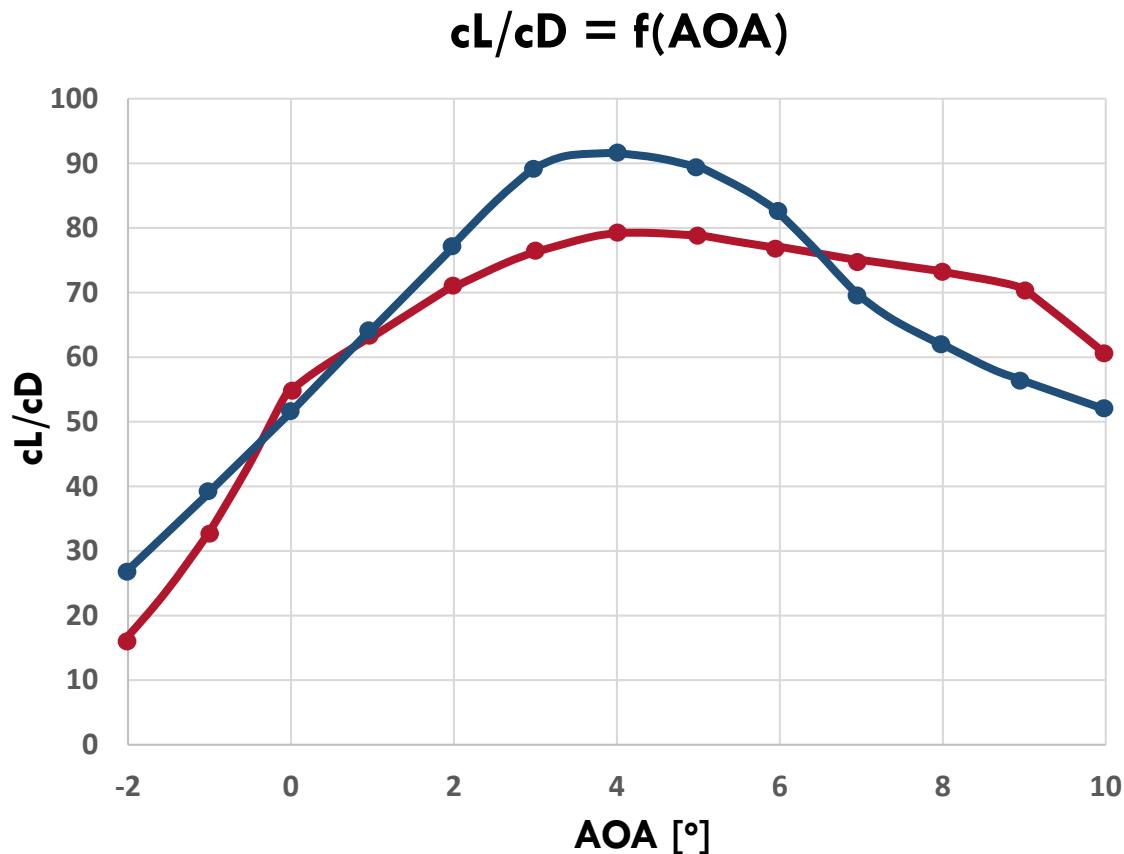
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THE SECOND model

2D AIRFOIL

BASIC MODELS

$v = 30 \text{ km/h}$



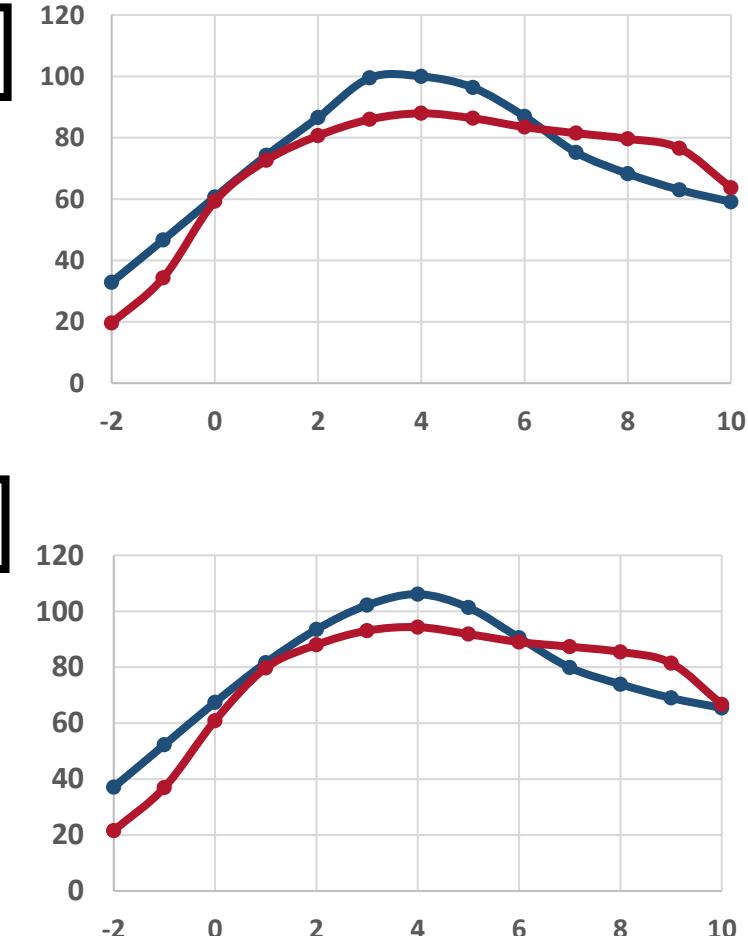
FX60-100

vs

CLARK Y

$v = 40 \text{ km/h}$

$v = 50 \text{ km/h}$





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THE SECOND model

FX60-100

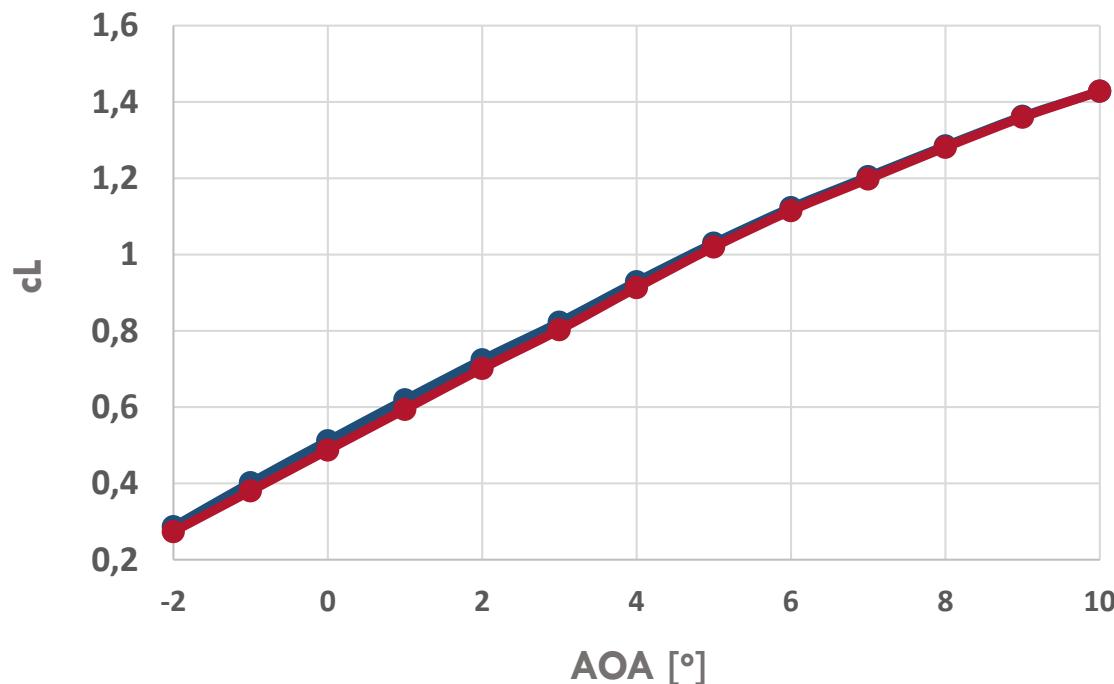
MODIFIED
MODEL

vs

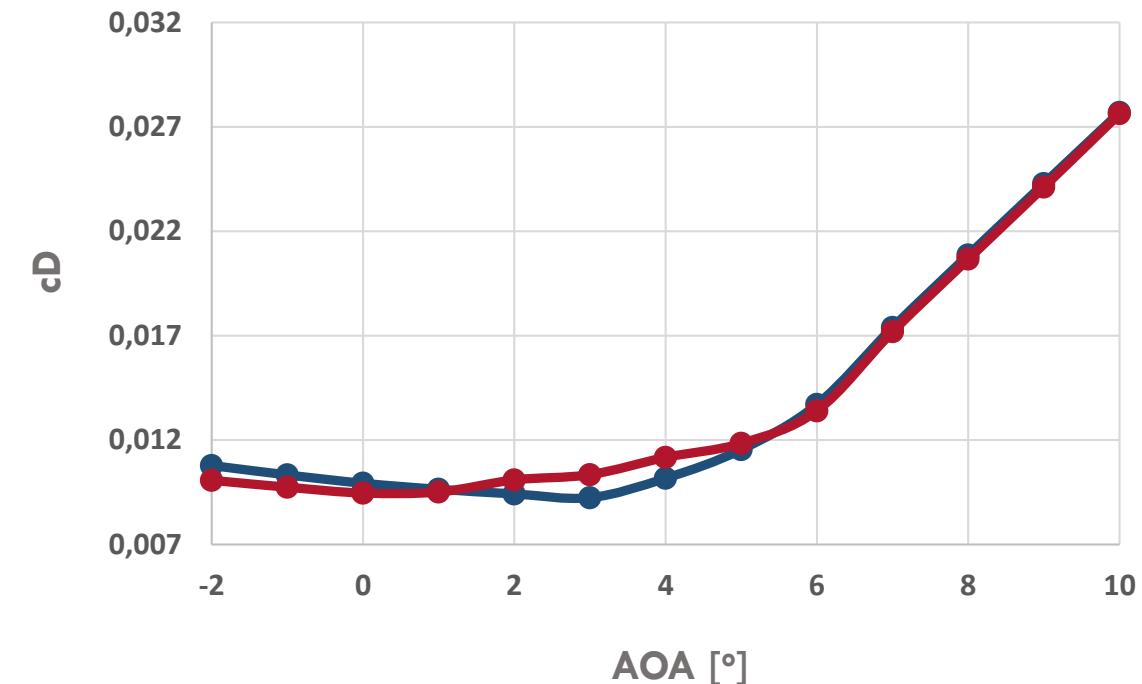
BASIC
MODEL

2D AIRFOIL

LIFT COEFFICIENT = F(AOA)



DRAG COEFFICIENT = F(AOA)





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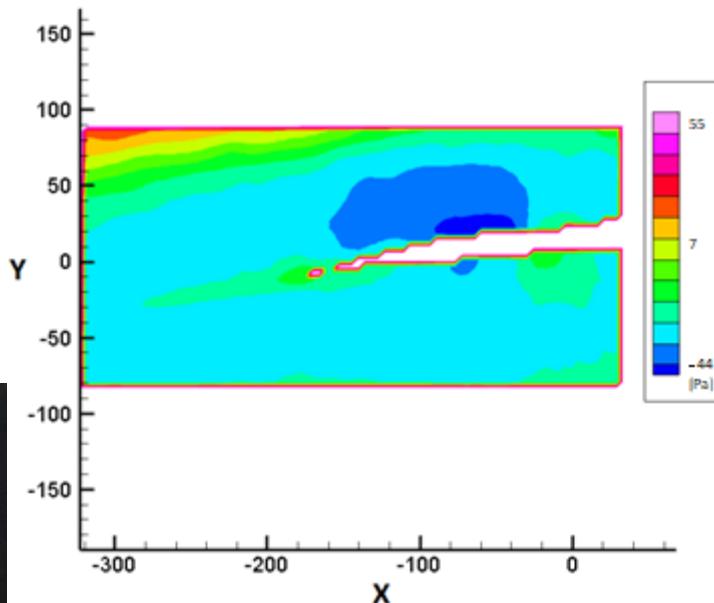
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THE SECOND model

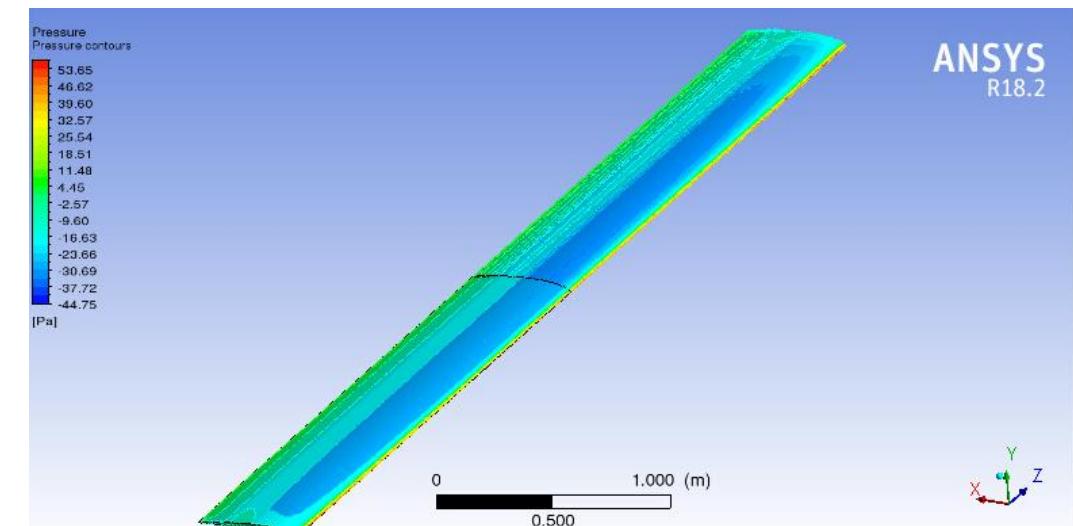
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3D AIRFOIL

AERODYNAMIC TUNNEL



ANSYS CFD





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THE SECOND model

.....

OLD
version

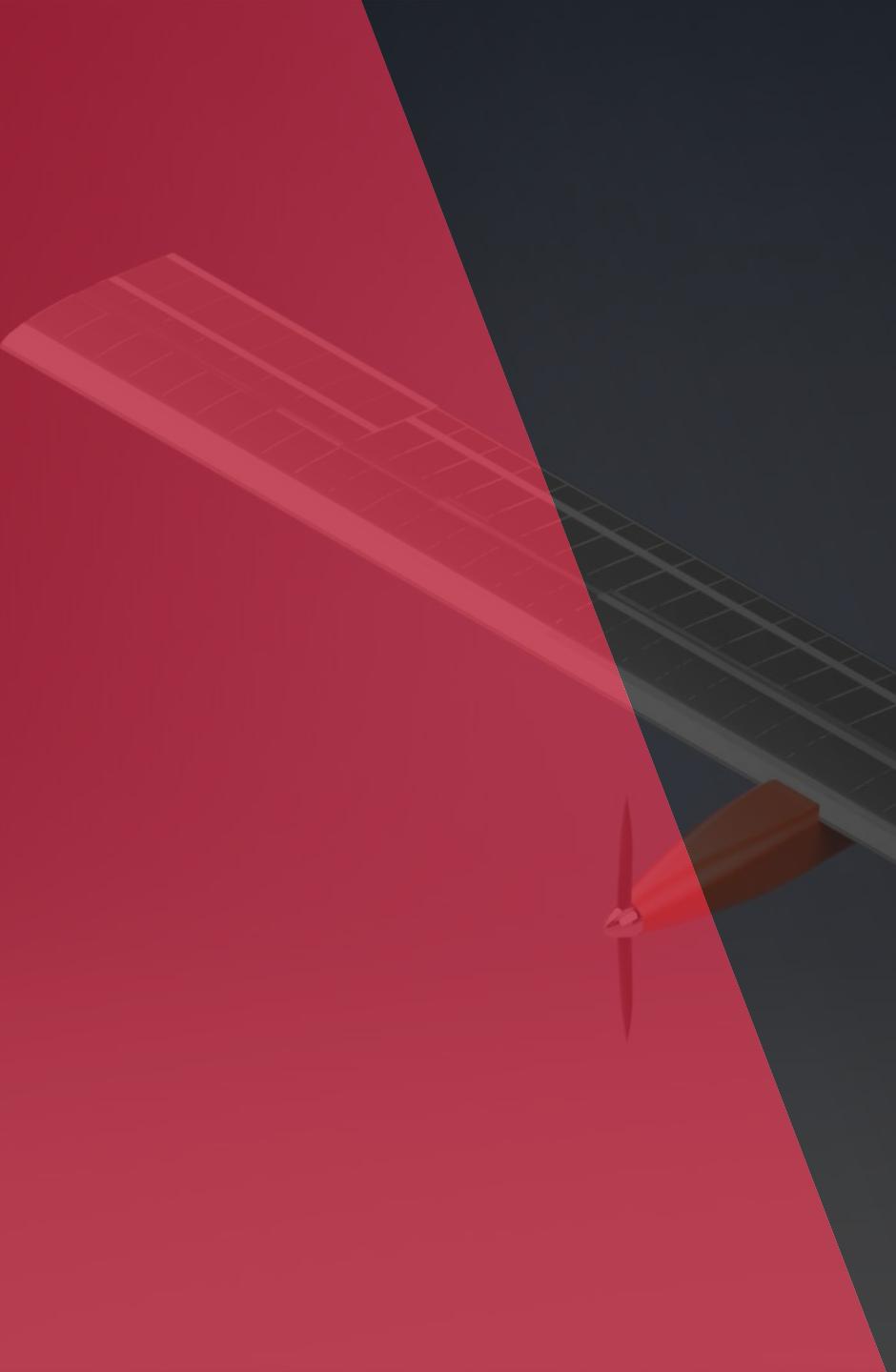


THE FUSELAGE

.....

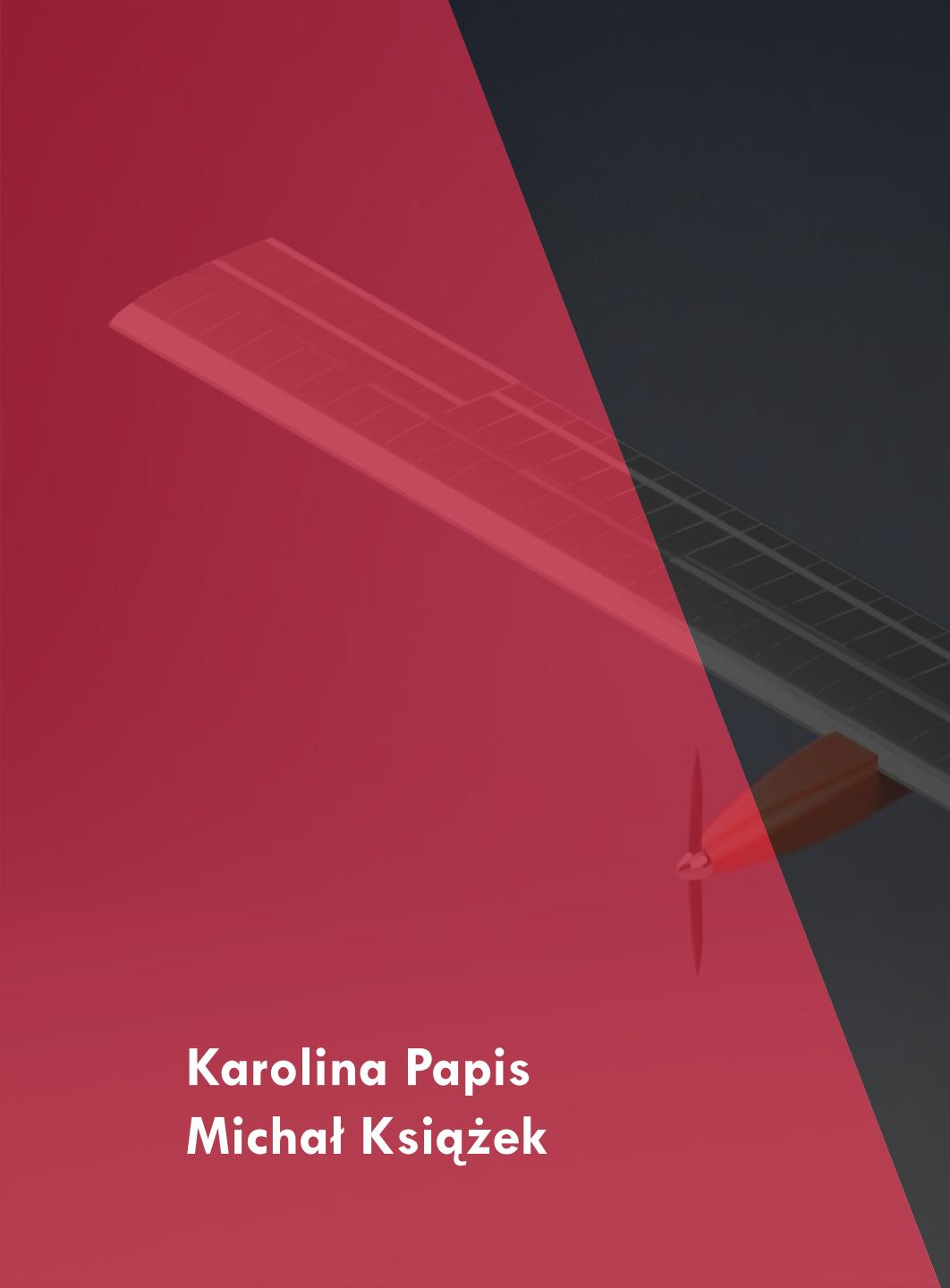
NEW
version





SUMMARIZING A POINT





Karolina Papis
Michał Książek



**THANK YOU
for
YOUR
ATTENTION**



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WE are

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