

# CAD and CFD Wing Design Competition

The aim for this competition is to design and analyse half a wing (must be a symmetrical design) with dimensions less than (span x chord x thickness) 0.75m x 0.2m x 0.1m (half the wing must fit in a box of these dimensions, and we will CFD half the wing to get the results). You will assess the wing at an angle of attack of 0 deg and 15 deg. Both simulations will be with atmospheric air at 10m/s.

Watch the [CAD tutorial](#) to get started

Suggested steps: (Feel free to skip or add features to your wing, the only rule is it fits in the described box [see above].)

1. <http://airfoiltools.com/calculator/reynoldsnumber> go to this website and calculate the reynolds number for your design.
2. Use <http://airfoiltools.com/search/index> and sort by lift to drag at Reynolds number you just calculated.

## Airfoil database search

Search the 1638 airfoils available in the databases filtering by name, thickness and camber. Click on an airfoil image to display a larger preview picture. There are links to the original airfoil source and dat file and the details page with polar diagrams for a range of Reynolds numbers.

Text search	<input type="text"/>	Optional
Maximum thickness(%)	<input type="text"/>	Optional
Minimum thickness(%)	<input type="text"/>	Optional
Maximum camber(%)	<input type="text"/>	Optional. Symmetrical airfoils = 0
Minimum camber(%)	<input type="text"/>	Optional
Group	All	
Sort	Max Cl/Cd @ RE=200,000	

- Key (a to z)
- Key (z to a)
- Name (a to z)
- Name (z to a)
- Thickness (thin to thick)
- Thickness (thick to thin)
- Camber (small to large)
- Camber (large to small)
- Max Cl/Cd @ RE=50,000**
- Max Cl/Cd @ RE=100,000
- Max Cl/Cd @ RE=200,000
- Max Cl/Cd @ RE=500,000
- Max Cl/Cd @ RE=1,000,000
- Max Cl/Cd @ RE=2,000,000
- Max Cl/Cd @ RE=5,000,000

3. Use the onshape plugin shown in the youtube tutorial to import a wing cross section and extrude to form a wing

Watch the [CFD tutorial](#) to learn how to run the simulation

Compulsory steps: (make sure the simulation volume you use is big enough not to interfere with the flow around the wing)

4. Use [simscale.com](#) to import and simulate airflow at 0 deg and 15 deg AOA (angle of attack) at 10m/s. Use the tutorial below to help, as you are designing half a wing one side must be set to the symmetry condition all others must simulate a side open to the free stream of air.

 [External Aerodynamics of an Ahmed Body](#)

To have a valid entry:

- Two completed SimScale simulations must be completed, one at 0 deg. angle of attack and the other at 15 deg. Both with the free air speed set to 10m/s. All values must be left at default unless otherwise shown in the video. E.g. Reference Area must be left at 1.
- You must upload a onshape file of your design even if it was made using another CAD program, this can be done by importing the design.
- The wing must be judged to be of a reasonable size to the dimensions of the box [*dimensions less than (span x chord x thickness) 0.75m x 0.2m x 0.1m*] (no extremely small designs, minimum recommended span is 0.4m), although you are allowed to make as complex a design as you like extremely thin elements may be disqualified due to being unrealistic and exploiting the simulation (see Formula 1 car aero parts to understand the limit of manufacturing aerodynamic elements). Using small elements on a surface (e.g. to simulate roughness) are allowed.
- If any calculations of lift to drag ratio are incorrect it is your responsibility to contact [tag49@cam.ac.uk](mailto:tag49@cam.ac.uk) with the name you used on your entry to correct the issue.
- Make your submission using this link before the 25th August:  
[https://forms.office.com/Pages/ResponsePage.aspx?id=BHB\\_DPEnhE2\\_REEspHGgrVPBoAuhrypDjWhRo6AQbzZUQVIzSENVWkhUMlo1MkUxMDFBS1VXMVVCWi4u](https://forms.office.com/Pages/ResponsePage.aspx?id=BHB_DPEnhE2_REEspHGgrVPBoAuhrypDjWhRo6AQbzZUQVIzSENVWkhUMlo1MkUxMDFBS1VXMVVCWi4u)