2D Airfoil

- Thrust
- Weight
- Lift
- Drag

- Angle of attack
- Leading edge
- Upper surface
- Camber
- Relative velocity
- Chord line
- Mean line
- Lower surface
- Trailing edge
- Downwash angle
Aside: Boundary Layers

Freestream Velocity

Boundary Layer

Zero Velocity at Solid Surface
Reynolds Number

\[ \text{Re} = \frac{\text{Inertia force}}{\text{Viscous force}} = \frac{\text{Fluid Velocity} \times \text{Length}}{\text{Viscosity}} \]

- Predication of laminar vs. turbulent flow
- Defines dynamic similarity

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Reynolds Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood flow in brain: ~100</td>
<td>Blood flow in aorta: ~1000</td>
</tr>
<tr>
<td>Blood flow in aorta: ~1000</td>
<td>Typical pitch in Major League Baseball: 200,000</td>
</tr>
<tr>
<td>Person swimming: 4000,000</td>
<td>Person swimming: 4000,000</td>
</tr>
<tr>
<td>Blue Whale: 300,000,000</td>
<td>Blue Whale: 300,000,000</td>
</tr>
<tr>
<td>A large ship: 5000,000,000</td>
<td>A large ship: 5000,000,000</td>
</tr>
</tbody>
</table>