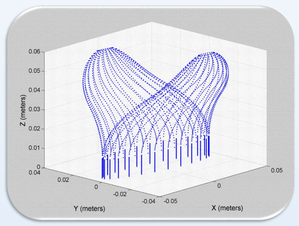
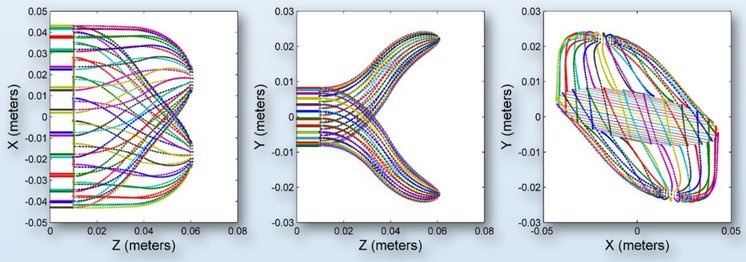
Research and Development of Hydrokinetic Wingtip Devices

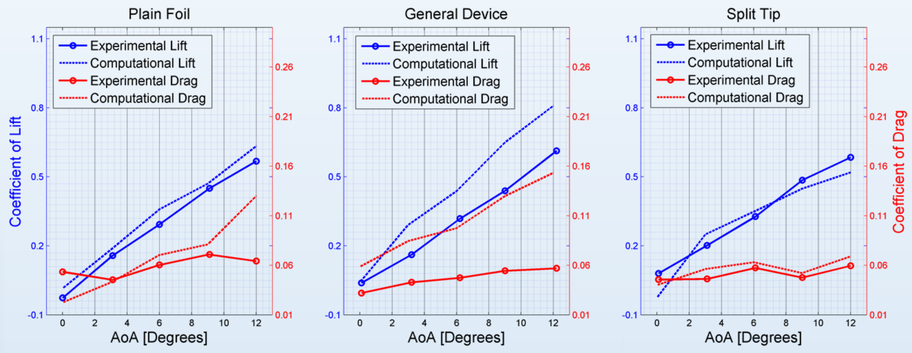
[John Brindley | Jesse Shull]

Octave Generated 3D.stl Geometry

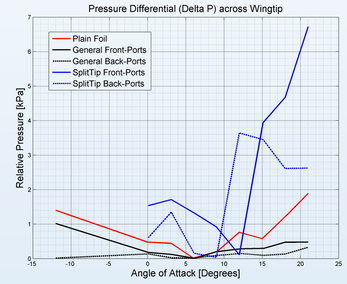


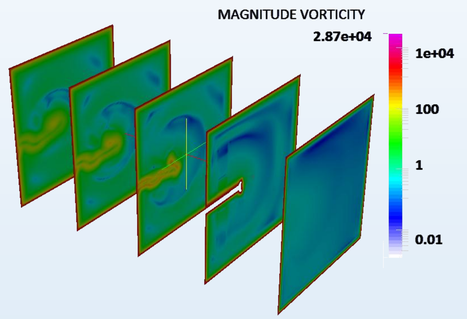
- Formation of Complex Geometry
- Generate X,Y,Z Point Clouds
- Surface Interpolation Schemes (.stl)
- Automated Optimization Studies
- Output to OpenFOAM C++ Toolbox



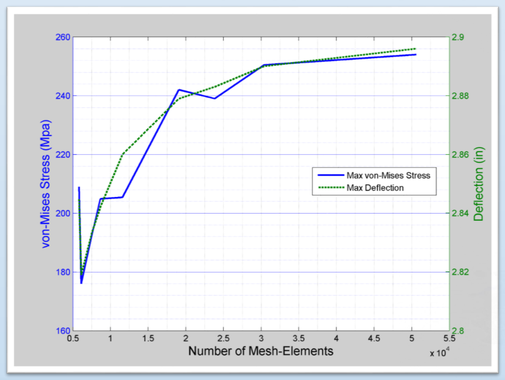


Comparison between numerical and experimental data. Lift and drag for all fabricated wingtip devices.





FEA MESH CONVERGENCE



12 deg. AOA – OpenFOAM rendered output colored by pressure (foils) and vorticity (streamlines).

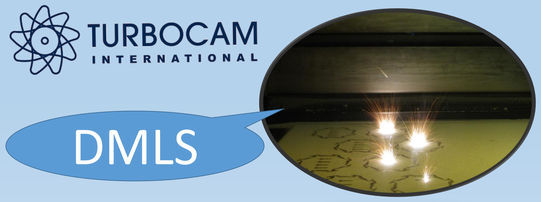
Open-Sourced Engineering

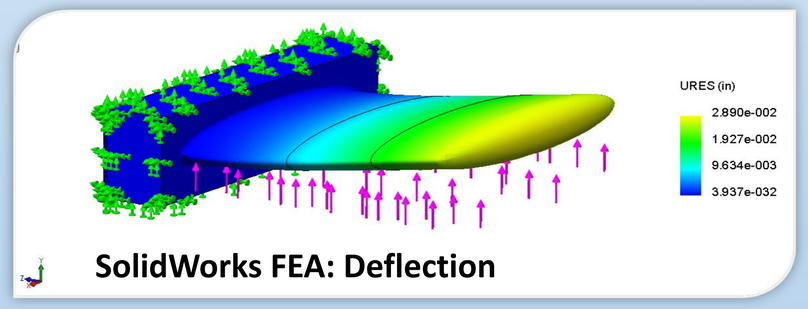
- Linux – It all starts here. Extremely productive OS
- OpenFoam – Computational Fluid Dynamics C++ Toolbox
- Meshlab – Geometry Viewer, some stl processing
- Paraview – OpenFOAM results viewer
- Blender – Results rendering
- Octave – Matlab replacement

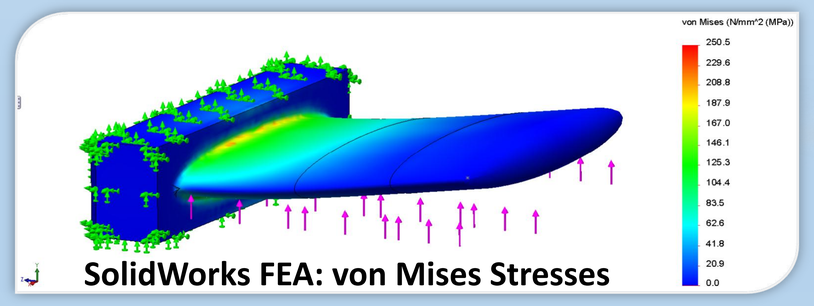
Direct Metal Laser Sintering

- Rapid Prototyping
  - Complex Geometry
  - Lower Production Cost
- High StrenƎŰK Super Alloys
  - Stainless Steel PH1
  - NickelAlloy IN718
- Laser Precision
  - 20 to 40 microns layer builds
  - Internal Features
- Special thanks to Turbocam for sponsoring DMLS production.

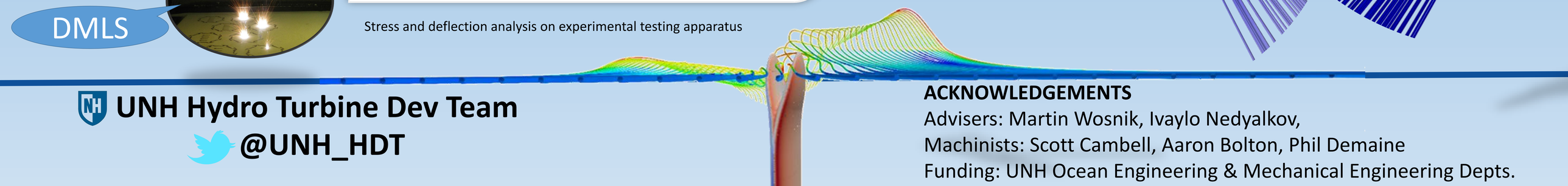
TURBOCAM INTERNATIONAL







Stress and deflection analysis on experimental testing apparatus



UNH Hydro Turbine Dev Team

@UNH_HDT

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