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## Adjusting empirical relationships in a turbulence model

*Wednesday, 6 December 2017 14:30 (20 minutes)*

This talk focuses on the methodology taken in adjusting turbulence model coefficients based on historical data. The problem background as to why the turbulence model needed to be adjusted and how the HPC was able to generate data for surrogate model optimization.

The SST transition model as 1st described by Menter in 2001, makes use of empirical relationships to capture the effect of transitional flow in CFD. These relationships were made public in 2006, for a variety of geometries. The determination of these relationships were based on experimental data and aimed to ensure the correct flow effects, but do not capture the physics of the flow. While the model has been in use for some time and proven accurate in both academic and industry applications, the specific relationships remain proprietary in commercial codes (such as ANSYS). The open source software openFOAM was selected to perform CFD simulations in an effort to identify relationships specific to airfoil geometries. Without performing experimental tests on an airfoil, historic experimental data was used as the test case. In particular the NACA0012 foil was selected for its extensive collection of published experimental data.

### **HPC content**

Open source CFD code, openFOAM was used. Simulations with around 300000 cells, on a single node using 24 processors were performed with more than 600 simulations completed to date

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