Memo

Deutsches Zentrum
für Luft- und Raumfahrt
German Aerospace Center

to
To whom it concern

from
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Master thesis of Laia Alcaraz Capsada

Mrs. Alcaraz Capsada worked for 6 month on her master thesis with the topic "Simulation of atmospheric effects with the DLR code TAU" at the DLR Institute of Aerodynamics and Flow Technology in the time from 2nd of January to 19th of June 2015.
The work was performed in the context of the DLR TAU-Code, a finite volume compressible Navier-Stokes solver heavily used within the European aerospace industry, and was concerned with

a. a detailed study of the accuracy of a gust modelling method in TAU:
   To predict gust loads accurately with high efficiency, the so called Disturbance Velocity Approach (DVA) has been implemented in the DLR TAU-code. This method allows predicting the influence of the gust on the aircrafts aerodynamic, but the feedback of the aircrafts aerodynamic on the shape of the gust is not captured. Therefore especially for gusts with small wavelength, prediction errors can be expected. To analyze the accuracy of the DVA, Mrs. Alcaraz Capsada performs a detailed comparison of the DVA with a highly accurate method, which is also part of TAU (Resolved Atmosphere Approach, RAA). The disadvantage of the RAA is the huge amount of computational resources required in comparison to the DVA. She performs a series of 2D as well as 3D analysis including mesh generation, simulations for different gust wave length on a high performance computer as well as the analysis of the results.
b. the improvement of the range of applicability of the methods for modelling atmospheric effects in TAU. So far it was only possible to use TAU for the simulation of gusts with "1-cos" shape, as it is required for the aircraft certification. The task was to modify the method such, that it can also be used for wake-vortex encounter studies. Therefore she implemented and tested different models for wake vortices in the context of the DVA. The validity of the implementation has been tested with a series of so called "equivalent test cases".

Mrs. Alcaraz Capsada is a bright individual. She very successfully carried out the ambitious work given to her. She was very quickly able to familiarize herself with the problem, the corresponding literature and the various software packages. The algorithmic developments as well as the simulations required for the study were done very largely without support of the Institute members.
As tutor I was very satisfied with the work of Mrs. Alcaraz Capsada. In a range between 0 (very bad) and 10 points (very good) I would suggest a value of 9.5.
I wish her all the best for her future career.

Dr.-Ing. Ralf Heinrich, head of Multidisciplinary Modelling group
Braunschweig, 19th of June, 2015