



DEPARTMENT OF AUTOMOTIVE AND AERONAUTICAL ENGINEERING

Flight Dynamics Analysis of a Medium Range Box Wing Aircraft

Task for a *Master Thesis* at Warsaw University of Technology

Background

Within the framework of the research project Airport 2030 (**Airport 2030**) a medium range box wing aircraft is analyzed. The conceptual design of the first version was carried out in **Schiktanz 2011**. Concerning flight mechanics it only takes account of flight performance and the requirements according to static stability and controllability. The next step is to consider dynamic stability and controllability in order to assess the flying and handling qualities of the aircraft.

Task

The flying qualities of the medium range box wing aircraft shall be examined. For this it is necessary to determine the stability and control derivatives of the aircraft. This can be done with the help of several tools. One of them is the software suite CEASIOM (**CEASIOM 2011**). However, from **Seeckt 2011** it can be understood that an automatic workflow for analysing aircraft with multiple wings is not possible within CEASIOM. Nevertheless it is possible to use the included aerodynamic modules as stand alone applications (Digital DATCOM, Tornado, Edge Euler). Once the derivatives are known, the flying and handling qualities of the aircraft can be examined. In detail the task consists of the following steps:

- Research on the needed derivatives and their determination (see **Scholz 2008** based on **McLean 1990**)
- Determination of the derivatives through handbook methods (when applicable) and with the help of suitable software
- Analysis of the flying and handling qualities based on the derivatives. This could be done either with the SDSA module of CEASIOM or distinct software provided at the Aircraft Design and Systems Group
- Discussion of the results including a critical examination of the current box wing configuration

The report has to be written in English based on German or international standards on report writing.

References

- Airport 2030** URL: <http://Airport2030.ProfScholz.de> (2011-09-19)
- CEASIOM 2011** URL: <http://www.ceasiom.com> (2011-10-12)
- McLean 1990** MCLEAN, Donald: *Automatic Flight Control Systems*. New York : Prentice Hall, 1990.
- Schiktanz 2011** SCHIKTANZ, Daniel: *Conceptual Design of a Medium Range Box Wing Aircraft*. Hamburg, Hochschule für Angewandte Wissenschaften Hamburg, Department Fahrzeugtechnik und Flugzeugbau, Master Thesis, 2011.
- Scholz 2008** SCHOLZ Dieter: *Flugmechanik 2 : Flugdynamik und Flugregelung*. Hamburg, Hochschule für Angewandte Wissenschaften Hamburg, Department Fahrzeugtechnik und Flugzeugbau, Lecture Notes, 2008.
- Seeckt 2011** SEECKT, Kolja: *Application of PreSTo: Aircraft Preliminary Sizing and Data Export to CEASIOM*. Stockholm, Kungliga Tekniska Högskolan (KTH, Royal Institute of Technology), Stockholm, Department of Aeronautics, Report, 2011