



## DEPARTMENT OF AUTOMOTIVE AND AERONAUTICAL ENGINEERING

# Flight Test Planning and Data Extraction

Task definition for *Diplomarbeit* at HAW Hamburg

## Background

A research project on subscale flight testing is being carried out at the Linköping University. The project is exploring the possibilities of using radio controlled scale models for aerodynamic evaluation and in particular for studying dynamic effects that can not be measured in a wind tunnel. For this purpose the *Raven*, a dynamically scaled model of a business jet design, has been built by the Department of Mechanical Engineering and is scheduled for flight testing during 2008.

## Objective

The thesis work consists of planning the flight tests with the *Raven* aircraft and preparing the data extraction methods. In particular, the objective is to decide how to perform the test flights in order to identify essential aerodynamic and flight mechanical parameters. For each parameter a particular flight test technique shall be chosen and means to extract the useful data shall be prepared. This may imply that for some parameters accurate models of the aircraft or components of the aircraft, for example a thrust model of the turbine, need to be derived. Since during flight testing a huge amount of data is recorded, data reduction may be necessary. MATLAB has to be used for data reduction. Task breakdown:

- Investigation of various calibration methods for flight instruments and suggestions of their application in the *Raven* aircraft flight testing by taking into account available instrumentation.
- Determination of a suitable thrust model of the aircraft's turbines giving the thrust as a function of velocity for different altitudes and engine speeds.
- Selection of the appropriate flight test techniques to obtain lift, drag and pitching moment coefficients as a function of angle of attack. Furthermore, the static stability of the test aircraft shall be investigated.
- Selection of the appropriate flight test techniques to obtain side force coefficients as a function of sideslip angle.
- Selection of the appropriate flight test techniques to investigate the dynamic stability of the aircraft. Methods to obtain frequency and damping terms for short period, Dutch roll, spiral and roll mode from flight test data shall be presented.
- The candidate shall prepare MATLAB code for data handling and flight test evaluation.

The results have to be documented in a report. The report has to be written in a form up to internationally excepted scientific standards. The application of the German DIN standards is one excepted method to achieve the required scientific format.



The thesis is prepared at Linköping University, Department of Mechanical Engineering. Supervisors are Dr. Christopher Jouannet and PhD student David Lundström.

# Declaration

I declare that this diploma thesis is entirely my work. Where use has been made of the work of others, it has been fully acknowledged and referenced.

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Date

Signature