FACHHOCHSCHULE
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ENGINEERING

Research Proposal for a Master Thesis

in Aerospace Engineering

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Date: 18.04.2021

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I. Working Title

“Conceptual Aircraft Design Using CEASIOMpy”

Keywords: Aircraft Design, CEASIOMpy, Conceptual Design, Software Testing, Workflow, Optimization

II. Central/Research Questions

The task of this thesis is to test and validate the software package CEASIOMpy [1], [2], which is an open source conceptual aircraft design environment, and the successor of CEASIOM (Computerized Environment for Aircraft Synthesis and Integrated Optimization Method) [3], [4]. To facilitate the understanding of the structure of CEASIOMpy, the Airbus A320 shall be used and modeled in CEASIOMpy. Consequently, the results obtained from CEASIOMpy have to be assessed and compared with the data provided for the A320 aircraft [5], [6], [7]. Question is, to what extend CEASIOMpy can support the conceptual design phase.

III. Research Context

In the conceptual design phase, the basic questions such as the configuration arrangement, the size and weight, and the performance are answered. It is a very dynamic process, since new ideas and problems emerge when the design is investigated. Topics are the determination of the gross weight, fuel weight, wing size, engine size and so on [8]. It is crucial to use optimization as early as possible in conceptual design for the sake of later design phases. The utilization of CEASIOMpy can be important in this process.

CEASIOMpy is an open source conceptual aircraft design environment. CEASIOMpy can be used to set up complex design and optimization workflows, both for conventional and

unconventional configurations. CEASIOMpy provides tools for various disciplines (modules) in aircraft design, amongst others:

- Geometry and meshes
- Weight and balance
- Aerodynamics
- Structures
- Mission analysis
- Stability analysis

CEASIOMpy uses the open-standard format CPACS (The Common Parametric Aircraft Configuration Schema) [9]. Workflows can be set up with the open-source environment RCE (helps engineers and scientists to analyze, optimize, and design complex systems like aircraft, ships, or satellites) [10]. Both CPACS and RCE are actively developed by the German Aerospace Center DLR.

The aircraft used as a model for this thesis is the Airbus A320. It is a subsonic aircraft with a capacity of 150 passengers and with two engines. With the help of the six modules of CEASIOMpy, the A320 should be analyzed and the outcome should be compared with reference data. Each module of CEASIOMpy has to be explained, and the final outcome would be a well structured text about all program modules.

IV. Proposed Thesis Outline/Table of content

Activity	Estimated time *
Literature review and familiarization with CEASIOMpy	continuously
Input of the XML files of the A320 with the help of CPACS	~ 2-4 weeks
Analysis of the A320 using the 6 modules presented before	~ 2-3 months
Verification of results obtained	
Documentation and discussion	~ 1 month

(*) Time estimates are considered as a guideline. They may change during the preparation time of the thesis.

V. Advisor

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VI. Literature Sources

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