Hochschule für Angewandte Wissenschaften Hamburg
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FACHBEREICH FAHRZEUGTECHNIK UND FLUGZEUBAU

Direct Operating Costs of Aircraft Fuel Systems

Aufgabenstellung zur *Diplomarbeit* gemäß Prüfungsordnung

Background

Airline costs may be divided into Direct Operating Costs (DOC) and Indirect Operating Costs (IOC). DOC are costs that can be allocated to the aircraft whereas IOC are more generally caused by running the airline's business. DOC are made up of depreciation, fuel costs, maintenance costs and other cost elements depending on DOC definition. It is the aircraft manufacturer's task to design an aircraft in such a way that DOC are as low as possible. This goal can only be achieved if all parts of the aircraft are designed to low DOC. The thesis is limited to DOC considerations with respect to the aircraft fuel system. The calculations are made for a new twin aisle aircraft – a project aircraft named the Cost Efficient Aircraft. This project aircraft aims at reducing costs by simple technologies and thus low purchase costs resulting in low depreciation. DOC calculations have to a certain amount be based on in-service data. Experience with the Airbus long range aircraft can be used when it comes to component prices and maintenance costs. Fuel costs are calculated from Airbus long range aircraft component mass and other component and aircraft characteristics. DOC can be calculated with a method called DOCsys –Direct Operating Costs for Aircraft Systems. Since the collected input data includes many uncertainties, also the calculation results will have uncertainties. These uncertainties should be calculated as well, to support decision making based on the DOC results. Vanguard's software DecisionPro™ supports business decision analysis e.g. with decision trees and Monte Carlo simulation and shall be applied.

Task

The thesis should address tasks as follows:

- Describe concepts, strategies, mission and parameters of the Cost Efficient Aircraft.
- Describe the fuel system of an Airbus long range aircraft.
- Describe the principles of DOC calculations for aircraft systems.
- Collect data for DOC calculations of the aircraft fuel system:
    - Collect today's component prices based on Airbus procurement data (due to the nature of this information, component prices will only be shown in non-dimensional form in the thesis).

    - Collect component mass data and component maintenance data.
    - Collect information for the calculation of delay and cancellation costs – general practice and data related to the fuel system.
    - Collect today's Airbus standard data for DOC calculations (e.g. labour rate, fuel price, interest rate as given in the Airbus DOC method).
- Perform DOC calculations for the fuel system of the Cost Efficient Aircraft based on a simplified mission (consisting only of one flight phase i.e. cruise) for a broad range of input parameters.
- Perform DOC calculations with selected input parameters with the software DOCsys allowing for calculations of all flight phases during a non diverted flight.
- Perform DOC calculations based on a simple mission (see above) with DecisionPro™. Use the features of DecisionPro™ to calculate the uncertainties of the results depending on the uncertainties of the input parameters. Make use of the Monte Carlo Simulation.
- Identify those fuel system components (and functions) that contribute most to the fuel system DOC.
- Comment on possibilities to reduce fuel system DOC.

The thesis of the German HAW Hamburg has to be written following the regulations of the Department of Automotive and Aeronautical Engineering. Standards with respect to report writing as laid out in the DIN have to be followed.

The thesis is prepared at Airbus UK Limited, Future Projects Office. Industrial tutor is Phil Bradshaw, MEng.