



DEPARTMENT OF AUTOMOTIVE AND AERONAUTICAL ENGINEERING

A General View on Fuel Efficiency in Commercial Aviation

Background

New studies (e.g. **AGAPE 2010**) show that set goals for fuel efficiency and CO₂ reduction in aviation may not be reached as originally (**ACARE 2001**) planned. This perhaps painful insight should lead to a fundamental rethinking. Instead of getting bogged down in details of technology it is time to step back and remind ourselves what is truly important and to look at the bigger picture. We need not only a metric for climate impact of aviation, but first of all a fuel metric. One that is meaningful, based on publicly available information and understandable also for the air traveller. Each offered flight needs a label that clearly states what it contains comparable with Quantitative Ingredient Declarations for food as demanded by Food Labeling Regulations. Only with this information the passenger can make an informed selection among the different products offered. This could boost the revolution in air transport as initiated by air transport liberalization and growth of low fare airlines. Again, as with low fare airlines, it will “ensure continued competition, consumer choice ... lower fares” and will “contribute to the development of ... environmentally efficient travel” (**ELFAA 2004**).

Task

The tasks of this thesis is to follow the ideas as expressed under background and to take this general view on fuel efficiency in commercial aviation by looking at facts maybe not addressed sufficiently in the past. Subtasks of this thesis are (given here as a general guidance):

- Review: Literature / state of the art review including current fuel metrics (3 litres), traffic forecasts, and strategic goals in the aviation sector and limits to growth (World3).
- Aerodynamics: Extending concepts of estimating drag polars from simple geometric parameters especially considering induced drag.
- Flight Mechanics: Taking an extended look at the payload range diagram and the Breguet range equation. Proposing a metric for fuel efficiency.

- Aircraft Design and Aircraft Operation: Discussing (i.e.) the influence of speed, altitude and range on fuel efficiency and climate change.
- Air Travel: Investigating offered flights, routings through Europe, fuel efficiency, graphical representations, forms and effectiveness of compensation schemes, proposals for their improvement or replacement, “flight labelling” and booking support followed by a discussion of (political) measures for its introduction.

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

References

- ACARE 2001** ADVISORY COUNCIL FOR AERONAUTICS RESEARCH IN EUROPE: European Aeronautics : A Vision For 2020. Luxembourg : Office for Official Publications of the European Communities, 2001. – ISBN 92-894-0559-7, URL: <http://www.acare4europe.org/docs/Vision%202020.pdf> (2012-01-18)
- AGAPE 2010** MULLER, R.: AGAPE Project Final Report : Publishable Summary. Brussels : AeroSpace and Defence Industries Association of Europe, 2010. – URL: http://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/agape_final_report_summary.pdf (2012-04-16)
- ELFAA 2004** EUROPEAN LOW FARES AIRLINE ASSOCIATION: Liberalisation of European Air Transport : The Benefits of Low Fares Airlines to Consumers, Airports, Regions and the Environment. Brussels : ELFAA, 2004. – <http://www.elfaa.com/documents/ELFAABenefitsofLFAs2004.pdf> (2012-04-21)