Lab 7 – Detailed Wing Optimization
Unified Engineering
23 Mar 06

Learning Objectives

- Design work involving quantitative tradeoffs between competing objectives.
- Documentation of new wing design.
- Documentation of design approach or design process.

Procedure

- Perform design tradeoffs for the wing of your UE Flight Competition airplane in order to achieve maximum flight score. This will be a more detailed and more quantitative continuation of the exercises from Labs 1 and 4.
- Obtain low-speed and high-speed performance predictions. These should be by-products of the design tradeoff calculations.
- Document the new wing design as itemized below.
- Summarize the design process you used as itemized below.

Reporting

- Each team will turn in one report.
- Contents:

— Title, team number, team member names, date
— Brief introduction explaining purpose of report.
This is aimed at an outside reader who is not familiar with the UE Competition.
— Top-view drawing of your wing, to scale, with dimensions.
— Table of key aircraft parameters: area, span, aspect ratio, weight, etc. This can be placed on the wing drawing.
— State selected airfoil and thickness ratio τ.

- Performance Documentation

— Table of operating parameters in the duration and speed flight conditions.
V, C_L, P_{ele}, etc.
— Table of active constraints which influenced the design choice. (δ/b, etc)

- Design Process Documentation.

— List of design variables which were considered in the design.
— Describe the design procedure you used. Sample plots with informative captions are usually more effective than long prose. You may re-use material from Lab 4 if appropriate.

An effective order of reporting here is: results first, followed by development details. This is a "pyramid" format which is typical in newspaper articles. The key points are made early on, while supporting and detail information is added later on in the article. The reader can then either read just the early material to get a summary, or read the whole thing to also get the details and related information.