Lab 10 – Detailed Wing Optimization
Unified Engineering
7 Apr 09

Learning Objectives
• Design work using more complex physical models.
• Quantitative tradeoffs between competing objectives.
• Documentation of design approach or design process.
• Documentation of new wing design.

Procedure
• First review the Lab 8 Notes and Appendices and decide how to best incorporate this new information into your optimization program. To receive full credit, you must incorporate some of this new information into a revised wing design. The more information you use, the better your wing is likely to be.
• Also review the assumptions you made in Lab 7, and adjust if appropriate for the new airplane.
• Perform design tradeoffs for the wing of your UE Flight Competition airplane in order to achieve maximum Mission Score. This will be a more detailed and more accurate continuation of the exercise from Lab 7.
• Document the new wing design as itemized below.
• Summarize the design process you used as itemized below.

Reporting
Each team will turn in one terse design 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.
• Design Process Documentation.
  — List of design variables which were considered in the design.
  — Give the objective function and constraints you used.
You may re-use material from Lab 7 if appropriate.
  — Describe the design procedure you used. Sample plots with informative captions are usually more effective than long prose.
• Design Documentation
  — Top-view drawing of your wing, to scale, with dimensions.
  — Table of key aircraft parameters: area, span, aspect ratio, empty weight, airfoil, etc. This can be placed on the wing drawing.
• Performance Documentation
  — Table of operating parameters for the maximum-payload case. $W_{pay}$, $V$, $C_L$, $C_L/C_D$, etc.
  — Table of operating parameters for the maximum-speed case. $V_{max}$, $C_{Lmin}$, etc.
  — Predicted Mission Score

The level of detail in the report should be such that someone could repeat your calculations from the information in the report alone.