

# Lab 8 – Basic Airplane Configuration Design

## Unified Engineering

6 Apr 06

### Learning Objectives

- Sizing of tail surfaces and dihedral to meet stability and control criteria.
- Design of aircraft layout.
- 3-View and table documentation of aircraft configuration.

### Procedure

- Correct any calculation errors which occurred in the wing design in Lab 7.
- Choose a specific wing design. This may differ somewhat from what you submitted for Lab 7, even if that was correct.
- Optional “field research”: Measure Plane Vanilla, and compute its stability and control parameters:  $S.M.$ ,  $V_h$ ,  $V_v$ ,  $B$
- Choose suitable stability and control parameter values for your airplane, and design an aircraft configuration to match. This will involve selecting  $AR_h$ ,  $S_h$ ,  $S_v$ ,  $\ell_h$ , stylish tail surface planforms, etc. Iterate if necessary. Sketching a top-view of the airplane during this procedure may be helpful. Determine the NP and CG locations for your airplane.
- Draw a dimensionally-accurate 3-view. Draw and label the NP and CG locations on the side view and/or top view. It’s traditional to also add a summary table of key airplane info to the 3-view drawing: Catchy name,  $S$ ,  $b$ ,  $W$ , motor, battery. Also include your team number on the 3-view, so it’s a stand-alone document.
- Also make up a separate and more complete table of all the significant parameters describing your airplane:  $b$ ,  $S$ ,  $AR$ ,  $W$ ,  $\lambda$ ,  $\tau$ ,  $CDA_0$ ,  $S.M.$ ,  $V_h$ , etc. This table must also include the key performance parameters:  $P_{min}$ ,  $V_{max}$ ,  $t$ . Include your team number in the table caption, so it’s a stand-alone document.

### Reporting

- Each team will turn in one report.
- Contents:
  - Title, team number, team member names, date.
  - Brief introduction explaining purpose of the report, aimed at an outside reader.
  - Briefly explain any fixes and/or design changes made since Lab 7.
  - Table of stability and control parameter values that you chose for your airplane. One or two sentences explaining how you arrived at each choice.
  - 3-view of your airplane. A neat pencil drawing is perfectly adequate, but in this case you should submit a printed scan or a Xerox copy (save your original in a safe place).
  - Parameter table for your airplane.

Each team should maintain an up-to-date 3-view and parameter table for the remainder of the term. You will be required to re-submit updated versions of these for each of the next several labs, even if no changes were made.