

**Preliminary Design Review (PDR)**  
**Ground and Flight Control System**  
**AAE-451 Aircraft Design**

You should find the following items in the Aerospace Sciences Laboratory (They are in the locked cabinets and drawers in the brown wooden cabinet near the computerized router. There is additional materials in the locked metal cabinet under the clock.)

- Radio (Transmitter)
- Receiver (for same frequency as the transmitter)
- Servos (a sufficient number for your design) (servos may still be on the airframes from last spring's design course, remove them)
- Transmitter battery (should be in the transmitter)
- Receiver battery
- Receiver on/off switch
- Manual for operation of the radio gear
- Extra batteries for both receiver and transmitter

You should perform the following action items

- Charge all batteries
- Hook up all servos to the receiver
- Test the functionality of the transmitter-receiver-servo system
- Weigh all the devices to be flown
- Run the batteries through several charge/discharge cycles to get an indication of battery lifetime and to condition the batteries. Record your data.
- Familiarize yourself with the various modes of operation of the radio. Do you need control blending as for a V-tail or aileron-rudder interconnect?
- INVENTORY ALL TOOLS, EQUIPMENT, AND SUPPLIES IN THE WOOD AND METAL STORAGE CABINETS.** (You can split this job up among teams.)

Answer the following questions

Will the radio gear meet the needs of your team/group. If not, what so you plan to rectify the deficiency?

What is the lifetime of the transmitter battery?

What is the lifetime of the receiver battery for the number of servos you intend to run?

**A&AE -451**  
**Team Concept Selection Document and Presentation**

**Document:**

This one document describes team concept.

Your document must include a detailed “hand” (not computer) sketch of a three-view external drawing including internal equipment layout drawn with approximate scale. Dimensions must be included on the sketch.

Please also provide a table of physical properties of your vehicle as best you know them at this time.

Also included should be a two-page written concept description highlighting strengths and potential problems with the proposed concept. Key technical requirements must be identified.

**Presentation:**

Your team will make an integrated in-class presentation with no more than three speakers.

## **Vehicle Sizing Preliminary Design Review**

Using transparencies please provide the following design material.

Preliminary Weight Estimate:

1. Describe your method of weight estimation (e.g., the method of Roskam, Raymer, or other method).
2. Describe your data base of historical weight data and how it was compiled.

Preliminary Wing Loading and Power Loading Estimate:

1. Provide a constraint diagram with regions of feasible design space clearly denoted,
2. Show the equations for each constraint,
3. Discuss of each constraint with explanations of how each number was determined using sound engineering judgment.

Summarize your aircraft size:

weight estimate,  
wing area estimate,  
motor horsepower estimate.

Indicate who on your team were the major contributors to this effort.

**A&AE 451 Aircraft Design**  
**Propulsion Preliminary Design Review #1**

Each team makes a 20 minute viewgraph presentation of the propulsion system of their design. There will be two propulsion Preliminary Design Reviews. You may not have all the data requested below for the first Propulsion PDR.

Describe the geometric properties of your propeller (diameter, pitch thickness, airfoil section, twist distribution, chord distribution, shape (undercambered?), etc.). Is your propeller twist data theoretically calculated or experimentally measured?

Describe the aerodynamic properties of your propeller (thrust and power coefficient as a function of advance ratio ( $J=V/nD$ )). Present plots of  $C_T$ ,  $C_P$  and  $\eta$  as a function of  $J$ . Program gold.m can give this to you.

Describe the gearbox you intend to use (efficiency, gear ratio) and the speed controller.

Describe your electric motor you intend to use (rated horsepower, motor efficiency, motor constants, rated voltage, rated number of cells, manufacturer (if available)).

Describe your procedure for selecting this propeller, gearbox and motor.

Determine if the mission requirements can be met with the battery you intend to carry. This will require you to redo the mission analysis we did early in the semester using updated engine, drag, and flight condition information.

Turn in paper copies of all transparencies.