The Goals: The goal of this project is to provide you with the opportunity to participate as a team member in the design and construction of a simple aircraft. In addition to exposing you to aircraft design in particular, I hope to stimulate your thinking about the design process in general, the role of mathematical analysis and experimentation in design, the interplay between design and manufacture, and the functioning of teams of engineers.

The Project: The project task is to design and build a glider aircraft, constrained by limited resources of materials and time. The design criterion for the glider is to maximize time aloft. That is, your goal is to design and build a glider that will stay aloft as long as possible. The following paragraphs provide more information on the project goals, organization, constraints, criteria, and logistics.

Teams: Gliders will be designed and built by nine (9) teams of two (2) students each. Team assignments are as follows:

<table>
<thead>
<tr>
<th>Team</th>
<th>Members</th>
</tr>
</thead>
</table>
| A    | Jessica Kozak, jkozak@stanford  
Admir Muzurovic, admirm@stanford |
| B    | Sam Newman, snewm@stanford  
James Nguyen, jpnguyen@stanford |
| C    | Emily Gustafson, emily.gustafson@stanford  
Vicki Lung, vlung@stanford |
| D    | Kari Lee, karilee@stanford  
Amrita Nath, anath@stanford |
| E    | Lara Peterson, larap@stanford  
Brandon Reed, cbrandon@stanford |
| F    | Carlos Cabrera, ccabrera@stanford  
Alex Chan, alexch@stanford |
| G    | Danny Tarlow, dtarlow@stanford  
Mike Zhang, mzhang24@stanford |
| H    | Ellen Gray, etgray@stanford  
Joanna Gubman, turtlegyrl@lycos.com |
| I    | Caitlin Quance, cquance@stanford  
Marisa Schottelkorb, marisas@stanford |

Design Process: Your glider design will proceed in two stages. During Stage 1, from Tuesday, Nov. 26 until Tuesday, Dec. 3, each team will design and build at least one experimental glider using the materials package.
provided (see below). The only constraints on this experimentation phase are that you may use only the materials provided and you may not use any outside information, i.e., no reference books, websites, professors, friends, parents—just your own ideas and experience. You should experiment—try out different configurations, different launch techniques, etc. But when you are out of wood, you are done! Bring your latest experimental craft to class on Tuesday, the 3rd, along with any leftover balsa, glue, and your knife (in case repairs are necessary).

During Stage 2, from Tuesday, Dec. 3 until Thursday, Dec. 5, you will design and build a new, final glider using a new package of materials. On the 3rd Prof. Ilan Kroo from Stanford’s Department of Aeronautics and Astronautics will join us to discuss aircraft design in general and glider design in particular. He will be anxious to see your experimental gliders and may be able to give you some specific feedback. He will introduce you to some basic aircraft design principles and show you a mathematical model-based design tool that you might find helpful. You will then develop your Stage 2 design, which might be a modification of your Stage 1 design or a completely redesigned glider, based on your experimentation during Stage 1, and the information and design tools provided in class on the 3rd. We will assess the success of your final design with in-class trials of time aloft on the 5th.

Materials: Each team will receive a packet of materials and tools for each stage, from which your gliders must be built. You may not use any additional materials in either of the two design stages. The Stage 1 packet contains:

- 2 1/32” x 3” x 36” sheets of balsa wood, for constructing the glider’s flight surfaces (wings and tail)
- 2 3/32” x 3” x 18” sheets of balsa wood, for constructing the glider body
- 1 commercial glider kit to use as a design baseline and in preliminary experimentation and testing. It also contains a useful nose weight for your glider. You may not use anything other than the nose weight from this kit in your glider.
- 1 bottle medium viscosity cyanoacrylate glue, for attaching glider components
- 1 razor knife, for cutting balsa wood
- 2 nitrile gloves to protect skin from glue

Also available to borrow are:

- Glue accelerator, to speed setting time of the glue. It is unlikely that you will need this, since the glue sets quite quickly.
- Solvent, to clean glue from skin and unwanted surfaces, also if necessary

Your package of materials for Stage 2 will contain the same amount of wood. You should have plenty of glue remaining from Stage 1.
Launching and Performance Assessment: Gliders will be launched by hand over a horizontal surface by one member of the design team, selected by the team. Time aloft will be measured in a series of trials by stopwatch as the elapsed time from the instant the glider leaves the hand of the launchperson until it lands, as determined by the chief judge and timer, Prof. Freyberg. The performance measure will be the average of the longest two out of three flights. You are strongly encouraged to practice your launching technique.