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2.007 Design and Manufacturing I
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UA Lecture #1: FRDPARRC

As your work with your peer groups has probably already shown you, an organized notebook is easier to read than one in which thoughts are randomly jotted down. Have you already tried to remember which page you wrote something down on, but could not find that one calculation you needed to remember? Whether you are designing a 2.007 robot or a part for a deep space satellite, there are certain things in the design process that you need to keep track of in an organized manner.

There are six categories of thought that comprise any design project, and together they make the six columns of FRDPARRC (pronounced fred park). FRDPARRC is usually recorded in table form in your notebook, with a column for each for:

- Functional Requirements
- Design Parameters
- Analysis
- References
- Risks
- Countermeasures

Functional Requirements (FR's) are the independent things that the design must do. Making the FR's independent from each other allows you to design in a modular form. They are typically expressed in words, for example "Picking up a can" and "stacking bales."

There should be at least one Design Parameter (DP) for every FR. The DPs are ideas for how to achieve the FR's. They can be expressed as word or sketches, for example "a claw to pick up the can" or "an elevator for stacking bales."

Analysis (A) provides the physical and mathematical justifications for each DP. First express in word the governing physical phenomenon for each DP, then dive into equations. The Analysis can be simple, as easy as finding the force required to lift the bale at the acceleration available, or complex. Make sure that the calculations can be explained to show how they are relevant to the DP, as this makes your notebook more organized.

The References section lists the ideas, people, websites, books, etc. that you referenced in your analysis or concepts. This section can include photos of past robots, or simply say "Joe the shop guy helped me measure the force to crush a can using the spring scale."

In the Risks section you record what could go wrong with each DP. Try to anticipate possible shortcomings and write them down, so that you can try to overcome these potential problems. For example, a risk might include "the claw might slip on the can and not pick it up."

Countermeasures are actions you plan to take to deal with the Risks mentioned above, even thinking about what to do if the DP is too risky and must be abandoned. This section is critical to stay on schedule and end up with a working robot at the end! For example, a countermeasure for a claw that slips would be to add rubber to the grippers of the claw to increase friction.

Check out the 2.007 website for FUNdaMENTALS of Design by Prof. Slocum. Topic 1 discusses FRDPARRC and other strategies to begin the design process in an organized manner.