Design Notes

- Design is synthesis, and open-ended. There is no single right answer and no general method of specifying the best path to the best answer. A design is very different from a homework problem!

- Some designs are still better than others!

- Every design is judged by some person or group. The design judge usually prefers an innovative design, but will also subject such designs to greater scrutiny. The judge’s characteristics are part of the design space.

- Design is creative, not analytic.

- Engineering design is a combination of art and science.

- A design is evaluated using analytical tools to determine its quality or performance. These analytical tools must be understood and justified.

- Preliminary designs are evaluated using simple analytical tools which must nevertheless give correct trends.

- A design based on erroneous analysis is worthless, unless the errors can be shown to be small or limited.

- Design decisions should be justified by trade studies or other reasoning (if only that ‘we didn’t have time to pursue this further...’). This reasoning is an important part of the design history, which is an important part of a preliminary design, since a preliminary design will be reworked later.
• Resources are always limited; both time (schedule) and money (budget). The designer’s job is to make the best use of available resources.

**Design by Klein: Maj. Klein’s Design Maxims**

Dr. A.L. (Maj.) Klein was a Professor of Aeronautics at Caltech from 1927 to 1968. He played a significant role in the design of the Douglas DC-3, and was employed by Donald Douglas as a roving design consultant. The following maxims were recorded by Prof. H.W. Liepmann at Caltech (1939 to 1986), a recipient of the National Medals of Science and Engineering.

• If you try to do fancy things you fall flat on your face. (This is also known as the KISS principle – Keep It Simple, Stupid.)

• 50% of designers have no reason at all for design decisions.

• Don’t ever invent anything unless you have to.