# Introduction to MATE-CON
# Week 3 Outline

## Required Reading:

McManus, H. L., SSPARC Book Material for Lecture 3.

Simple trade space analyses:

Spaulding, T., "MATEing: Exploring the Wedding Tradespace"

McManus, H. L. and Schuman, T. E., "Understanding the Orbital Transfer Vehicle Trade Space," AIAA Paper 2003-6370, Sept. 2003.

## Suggested Reading:

Supplements to the SSPARC Book Material:

Ross, A. M. and Diller, N. P., Multi-Attribute Trade Space with Concurrent Design MATE-CON: The MATE Short Book, unpublished.

*INCOSE Systems Engineering Handbook: A "How To" Guide for All Engineers*, 2nd ed., International Council on Systems Engineering, Seattle, WA, 2002, Appendix A, pp. 310-313.

The following will be required later in the course, but skimming them now would be useful:

Hugh L. McManus, Daniel E. Hastings, and Joyce M. Warmkessel, "New Methods for Rapid Architecture Selection and Conceptual Design," *Journal of Spacecraft and Rockets,* Vol. 41. No. 1, Jan./Feb. 2004, pp.10-19.

Daniel E. Hastings, Annalisa L. Weigel, Myles A. Walton, "Incorporating uncertainty into conceptual design of space system architectures," MIT Engineering Systems Division & Department of Aeronautics and Astronautic, unpublished.

## Review Slides:

Lecture 3

## Problem:

Create a simple tradespace analysis of a problem you are familiar with. It can be a personal decision (see "MATEing;" car and house buying are also examples that SSPARC people have analyzed) or a technical problem that is not too complex to analyze.

1) Bound and Scope the problem
2) Create a list of attributes, and draw single attribute utility curves for them
3) Create a design vector
4) Model the relation between the design vector and the attributes
5) Evaluate the relationship for a range of designs, and use the utility curves to find the single attribute utilities for the designs. You may wish to use a weighted sum to find a multi-attribute utility.
6) Present the results graphically in any way that makes sense. Classic is the multi-attribute utility vs. cost, but your problem may not have a cash cost, or may have only a few attributes, presenting other possibilities.
7) Discuss the results. What implications do they have for the handling of the problem that you proposed to study?

Keep it simple – the point is to complete a tradespace exercise. Try to find a problem with only a few attributes and design variables, and keep the modeled relationship as simple as possible. Please explain simplifications, but do not feel you have to extensively justify them.