

Examples Week 7 Outline

The methods of tradespace exploration will now be reviewed and demonstrated by consideration of specific examples. The architectures which have been analyzed in this manner are discussed in the New Methods paper – you will find much of its contents familiar from the SSPARC book sections.

The architecture called ATOS is described in detail in the Advanced Architectures paper.
The architecture called BTOS is described in detail in the BTOS paper.
The architecture called XTOS is described in detail in the XTOS paper.

Further examples may be found in the readings for other weeks:

The architecture called SpaceTug is described in the spacetug paper (wk 3).
The Terrestrial Planet Finder architecture is described in the TPF papers (wk 8).
The Techsat and Broadband architectures are described in the last paper (wk 9).

The detailed XTOS and Spacetug tradespace simulations (as Matlab files) can be found in the appropriate folders. One can see that using the tradespace as a aid to design enables a designer to understand the choices that need to be made. This is particularly clear in the spacetug case where the effect of a nuclear choice or a choice of an electric system is very clear in the tradespace.

Required Reading:

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

ATOS: McManus, H. L., and Warmkessel, J. M., “Creating Advanced Architectures for Space Systems: Emergent Lessons from New Processes,” *Journal of Spacecraft and Rockets*, Vol. 41, No. 1., Jan.-Feb. 2004, pp. 69-74.

BTOS: Weigel, A. L., and Hastings, D. E., “Measuring the Value of Designing for Uncertain Future Downward Budget Instabilities,” *Journal of Spacecraft and Rockets*, Vol. 41, No. 1., Jan.-Feb. 2004, pp. 111-119.

XTOS: Ross, A. M., Diller, N. P., Hastings, D. E., and Warmkessel, J. M., “Multi-Attribute Tradespace Exploration as a Front-End for Effective Space System Design,” *Journal of Spacecraft and Rockets*, Vol. 41, No. 1., Jan.-Feb. 2004, pp. 20-28.

Suggested Reading:

Spacetug (wk 3): McManus, H. L. and Schuman, T. E., "Understanding the Orbital Transfer Vehicle Trade Space," AIAA Paper 2003-6370, Sept. 2003.

TPF (wk 8): Jilla, C. D., Miller, D. W., and Sedwick, R. J., "Application of Multidisciplinary Design Optimization Techniques to Distributed Satellite systems," *Journal of Spacecraft and Rockets*, Vol. 37, No. 4, 2000, pp. 481-490
and Jilla, C. D., and Miller, D. W., "A Multiobjective, Multidisciplinary Design Optimization Methodology for Distributed Satellite Systems," *Journal of Spacecraft and Rockets*, Vol. 41, No. 1., Jan.-Feb. 2004, pp. 39-50.

TechSat and Broadband (wk 9): Walton, M. A, and Hastings, D. E., "Applications of Uncertainty Analysis Applied to Architecture Selection of Satellite Systems," *Journal of Spacecraft and Rockets*, Vol. 41, No. 1., Jan.-Feb. 2004, pp. 75-84.