

# Reinventing Space: The Design of Low-Cost Space Missions

At Microcosm  
Near LAX in LA

5-Day Short Course

Feb. 13–17,  
2012

Taught by Dr. James Wertz

*Dr. James Wertz, creator of the original SMAD course and initiator of much of the current interest in Reinventing Space, takes you step-by-step through the complete process of creating dramatically lower cost space missions.*

## TECHNICAL DESCRIPTION

**Reinventing Space** is intended primarily for people who already understand Space Mission Engineering (SME) or have had 1 or more courses in SME or SMAD and need to seriously address the most critical problem facing space organizations today—driving down the cost of space missions. This 5-day course is highly interactive and intended to get at specific approaches that will work within the environment of the participant's existing organization. To truly drive down cost, we need to change both the technology and the way we do business. Most changes, while well-intentioned, have the potential to drive cost either up or down. This course gets at real space experience that has worked in practice and why it works. An absolutely critical course for new space missions or for organizations that must reduce mission cost in order to adapt to the new reality of how we do business in space.

This is by far the most comprehensive course available in looking at ways to dramatically drive down space mission cost. (See list of topics on back.) It is based on over 20 years of looking at cost reduction approaches that have worked and that haven't worked in all types of space programs and why they have or haven't worked. Microcosm has been a part of several of the programs used as case studies and understands the practical realities of space system development.

There are no easy answers to reducing cost. The processes and rules that we have put in place are all there for good reasons, based on expensive mistakes throughout the history of space exploration. Yet, collectively, these processes and rules have created a space program that we cannot afford and that often fails to meet the needs of the end user in a timely and cost effective way. Understanding this problem and finding ways to overcome it are imperative for those who want to lead the design and development of future space systems.

## WHO SHOULD ATTEND?

This course is intended primarily for people involved with defining, developing, or evaluating new space missions or who are, or want to be, involved with the overall problem of how to do more with less money. It is particularly important for people who are now making decisions about how to

allocate scarce resources and for young professionals who will shape the space program of the future and will almost certainly have to do so for a lot less money. It is helpful if participants have some experience in space systems design and development in order to better understand how system development currently works and many of the practical problems that we all face. If your organization is concerned about how to do more for less, you should attend this course.

## INSTRUCTOR

Dr. James Wertz is an internationally recognized authority in space mission engineering, sensor measurement theory, orbit and attitude determination and control, autonomy, launch system development, and methods for achieving dramatic cost reduction. His experience includes virtually all mission phases: concept exploration, hardware design and development (both at spacecraft and component levels), spacecraft integration and test, launch support, and mission operations. He is an Adjunct Professor of Astronautics at USC, where he has taught "Design of Low-Cost Space Missions" for over a decade, a Fellow of both the AIAA and the British Interplanetary Society, and a member of International Academy of Astronautics. He is largely responsible for much of the current interest in Reinventing Space and has been the general chairman of the Responsive Space Conference (now the Reinventing Space Conference) since its inception in 2003. He holds 8 patents in various aspects of space systems, and has created some of the most widely used academic and reference books in astronautics, including:

- *Space Mission Engineering—The New SMAD*
- *Space Mission Analysis and Design = SMAD* (1st, 2nd, and 3rd editions)
- *Reducing Space Mission Cost*
- *Orbit and Constellation Design and Management*
- *Spacecraft Attitude Determination and Control*

Dr. Wertz has taught courses to over 3000 professional and graduate student participants in the US, Canada, Europe, Asia and South America.



For more information please contact the Course Administrator, Julie Jackson.

4940 W. 147th Street, Hawthorne, California 90250

Ph: (310) 219-2700 • Fax: (310) 219-2710 • [jjackson@microcosminc.com](mailto:jjackson@microcosminc.com) • [www.microcosminc.com](http://www.microcosminc.com)

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# **Reinventing Space:**

## **The Design of Low-Cost Space Missions**

### **5-Day Short Course List of Topics**

*Note: This course assumes that participants are working in space technology or are broadly familiar with the material contained in the traditional Space Mission Analysis and Design (SMAD) course.*

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#### **Why Do We Need to Reinvent Space?**

- What is the problem we're trying to solve?
- Can it be solved? Why is it hard?
- "Faster, Better, Cheaper—pick any two"—an excuse to not deal with the problem

#### **Background**

- History of small, low-cost missions
- The range of cost options
- Cost vs. reliability

#### **Process Changes to Reduce Cost**

- The government perspective
- Radical techniques
- People, processes, and programmatic methods

#### **Technology for Reduced Cost— Hardware, Software, and Autonomy**

#### **Reducing Mission Cost**

- Mission and systems engineering
- Spacecraft—hosted payloads
- Ground segment and operations

#### **Cost Modeling, Reliability and Case Study Experience**

#### **Responsive Space and Reinventing Space**

#### **Cost and Schedule Overruns**

- Traditional solutions (that may or may not work);
- Radical solutions

#### **Money**

- Inflation, the time value of money, amortization, learning curves

#### **Reducing Launch Cost**

- Methods for reducing launch system cost
- Reusable vs. expendable launch vehicles

#### **Reducing the Cost of Large Space Missions**

#### **Implementation Strategies and Problems**

- Reducing cost in ongoing programs
- Problem areas in implementation—overcoming culture and skepticism

