Comparison of NEAR Costs with a Small-Spacecraft Cost Model

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Cost-estimating relationships for small spacecraft have been shown to be significantly different from those derived from larger populations including major civil and military programs. Recent papers have attributed these differences to efficiencies of small teams, reduced government oversight, and short development periods. The Aerospace Corporation recently developed the Small-Satellite Subsystem Cost Model (SSSCM) based on several programs that were managed in this streamlined fashion.

In February, 1996, The Applied Physics Laboratory successfully completed the development and launch phase of the Near Earth Asteroid Rendezvous (NEAR) program, the first of NASA's low-cost Discovery Missions. NEAR costs have been compared with estimates generated by other traditional cost-estimating models and found to be lower by nearly a factor of two. This data can now be compared with the SSSCM and incorporated in it, and the regression residuals can be examined for further insight about cost drivers for low-cost space missions.

The original incentive to develop formal cost models and cost-estimating relationships (CERs) was largely to provide independent assessment of the credibility of proposed program costs. The principle that these costs are predictable from characteristics of the product alone has by now largely been abandoned. Wertz and Larson (Space Mission Analysis and Design, 1991) published a traditional model that includes a multiplicative factor of 0.8 to recognize the increased efficiency of commercial customers over government customers, presumably related to stability of requirements. This concept could be extended to include the management and organizational culture of the contractor. In this light, cost models can take on a different role, that of assessing the cost-efficiency of a performing organization or of a customer agency.

In this paper we will examine the NEAR incurred costs and look at how they conform to the SSSCM. Small spacecraft programs and low-cost missions are quite amenable to design-to-cost and control-to-cost management decision-making, and therefore some cost elements can be quite predictable given the ability and motivation of an organization to perform to its promises. The consistency and sufficiency of the CERs will be analyzed for sensitivity to these influences.

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