

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Launch Services, Missions, Operations, and Facilities (2)

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AN UPDATED MODEL FOR EXPENDABLE LAUNCH VEHICLES' COSTS ESTIMATION

Abstract

Despite numerous drawbacks, cost estimation relationships remain a key cost modeling tool utilized during early launch vehicle development project phases. Their ease of use is appealing, however existing relationships are based on obsolete models not considering recent advances in the fields of technology, management and manufacturing, adequately. This paper introduces a novel parametric cost prediction model for expendable launch vehicles, enabling more precise estimation of rocket construction and operational costs. The full formula, allowing its use during early design phases of new projects, is given. The paper contains a description of the selected methodology. Special attention is drawn to the distinction between launch costs and prices for both private and public space transportation systems. Mass properties, vehicle dimensions, as well as manufacturing issues and experience are considered by the introduction of seven basic parameters. The developed formula gives good results for various types of classic rocket configurations, independently of the propellant types and number of stages utilized. Example results and comparisons with data of existing and soon-to-be introduced launch vehicles are given. The ultimate aim is to enable conducting quick cost estimates of proposed launch vehicle configurations. The resulting formula had been used during launch vehicle studies during the authors earlier activities at the Institute of Aviation in Warsaw, Poland. The developed method proves to be useful for vehicle configuration analyses and can be easily implemented in preliminary design software. A possible life extension of parametric cost models is therefore shown.