

SPACE OPERATIONS SYMPOSIUM (B6)
Human Spaceflight Operations Concept (1)

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OPERATIONS CONSIDERATIONS IN PROJECT LIFECYCLE WITH REAL WORLD EXAMPLES

Abstract

Spacecraft development cycles tend to be framed in terms of performance criteria, and development and build cost. Little thought and less emphasis is given to the criteria of operations cost. It is said that launching spacecraft is a high performance game, yet few have ever accused it of being a high efficiency game. Some say that due to the low numbers involved, space launchers don't get sufficient practice to become efficient. Yet events as short lived as the Olympics have developed detailed operations strategies and have invested in a Logistics Command Center. The concept of Design for Operations is so new that an Amazon search does not bring up one title written on that topic. Yet the concept is crucial to achieving the more efficient space programs that available budgets seem to demand.

The operations cost of long running programs can be a significant factor in total program costs. Operations requirements are frequently under-treated early in the design cycle of many programs. Lack of attention to operations requirements early in the design cycle frequently leads to decisions which compromise operations efficiency in favor of optimizing performance, weight, power, schedule, etc. And then there is the lure of optimizing for development cost which may lead down the path of false economy.

This paper presents some real world examples where operations efficiency was compromised via vehicle design choices and also presents some potential solutions to address the systematic conundrum of operations vs. design trade-offs. Several factors are examined including program structure (who protects operations requirements?), vehicle design tools, vehicle design processes, integration challenges, and other factors. Ignoring operations considerations during the design cycle can result in inflexible sequencing of operations, repetitive and costly collateral damage to hardware, finicky assembly operations resulting in numerous failures and retests, and numerous other challenges. This paper attempts to influence the thinking of program managers and leaders in order to introduce the discipline of operations requirements early in the design cycle.

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