

## SPACE SYSTEMS SYMPOSIUM (D1)

Lessons Learned in Space Systems: Achievements, Challenges, Best Practices, Standards. (5)

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## A LEAN APPROACH TO THE CHALLENGES ENCOUNTERED IN BUILDING SPACE SYSTEMS AND ACCESS TO SPACE IN MEXICO

### Abstract

The development of space projects in Mexico must avoid costly delays and rework, and successfully achieve the collaboration of public and private institutions involved.

Space system developments involve many institutions collaborating together to accomplish a common goal or mission. The **Toyota Production System (TPS)** (or *Lean*) philosophy identifies seven types of waste that drive costs up and reduces the degree of success in a space mission:

1. Overproduction
2. Waiting
3. Transporting
4. Inappropriate processing
5. Unnecessary inventory
6. Excess motion
7. Defects

The Toyota Production System (TPS) methodology was used to identify the types of waste involved in the delays and cancellations in actual space projects in Mexico. This methods include tools such as:

- Level scheduling
- Just-In-Time (JIT)
- Kaizen (continuous improvement)
- Muda (waste)
- Root cause analysis
- Value stream mapping

Our research revealed that most of the time involved in developing a space project in Mexico is spent on activities that actually do not add value to the end product and service, and that insufficient attention to planning during the early phases of a project cause delays and severe rework. The effects of these forms of waste drive costs up significantly and often contribute to aborted projects.

A *lean* approach to space projects in Mexico will help minimize delays and late changes to the mission, while raising the odds of launching successfully and meeting all major objectives, thus increasing Mexico's capacities in the space sector.

The guidelines proposed in this paper for Mexican space projects will also be helpful to other developing countries with young space programs, and should promote a constructive dialog that improves this method. A possible side benefit expects bringing nations together for successful applications of space science and technology in the benefit of mankind.