

ABSTRACT

The JPL Lessons Learned Process: An Effective Countermeasure Against Avoidable Risk

The engineering and operation of extremely complex systems is naturally prone to error. No single person can maintain cognizance over the design of all system elements under development, nor over all components, materials, and processes inherited from prior programs.

The potential for errors in engineering judgment arguably presents the highest level of risk when applied to interplanetary spaceflight, with the very limited opportunities for redesign or corrective maintenance after deployment. Through robust design, the Jet Propulsion Laboratory (JPL) succeeds in deploying reliable systems despite severe operating environments. However, the organization is heavily dependent on its experience base to identify necessary design margins and resolve latent defects. JPL has refined the lessons learned process to optimize the collection and transfer of critical success factors applicable to current and future spaceflight projects.

A formal lessons learned process has been established by JPL to capture and disseminate key lessons while maintaining accuracy, consistent format, and ease of use. The objective is to advance JPL missions by exposing personnel to significant events from which important "lessons" can be drawn which have applicability beyond the original event. Although these lessons may be incorporated into JPL and NASA standards, they are retained and widely circulated by means of the NASA-wide Lessons Learned Information System (LLIS).

The scope of this effort is limited to documenting events arising out of, or related to, the implementation and operation of flight and related support equipment. To this end, the process is designed to use established problem/failure and discrepancy reporting systems to identify and document lessons. Events are evaluated for their suitability as lessons based on the:

1. Significance in terms of actual or potential project impact, including effects on project success, cost, schedule, safety, public visibility, or management visibility.
2. Importance to future JPL activities. This may include events of non-JPL origin, and
3. Lack of prior coverage of the event or underlying issue(s) in previously approved lessons or other closed loop alert processes.

Events suitable for documentation as lessons are not limited to mistakes that negatively impacted missions, but include measures that proved successful on recent projects.

In response to calls for JPL to innovate at an increased pace and to better quantify levels of mission risk, the organization has renewed its commitment to maintaining and augmenting its corporate knowledge base. JPL is presently researching lessons learned system enhancements for:

1. Improving the capture of vital lessons as individual flight projects wind down.
2. Assuring that lesson information is conveyed to key personnel when it can be used most effectively.

3. Integrating the LLIS with other compatible information transfer systems, and possibly with integrated engineering tools used in the model-based concurrent design environment.

The product of the lessons learned process is a key knowledge management tool-- a searchable collection of discrete lessons judged applicable to current and future NASA missions. Prior to implementation of this system, information on critical success factors was communicated informally on a hit-or-miss basis. Although aerospace and other industries must assume the high level of risk associated with novel technologies and missions, they cannot afford a failure to learn the lessons of their own history. The efficient identification, documentation, dissemination, and use of lessons learned can provide an effective countermeasure against reasonably avoidable risks.

This paper will identify success factors in the design and implementation of an effective lessons learned process. It will also summarize completed research, and research presently in progress, directed at facilitating the enterprise-wide use of this resource. The LLIS must be a dynamic resource: it should not become a "data morgue."

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