

APPEL Forum with *Electricity de France*

Lesson Learning at JPL

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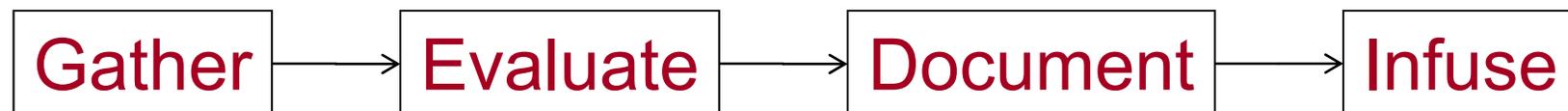
Lessons Learned as a “Contact Sport”



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- JPL has maintained a strong institutional commitment to lessons learned
 1. One-of-a-kind spacecraft, never flown before, high risk missions
 2. Repeated mistakes, or violation of known best practices, pose a risk that is potentially avoidable

JPL has instituted a formal Lessons Learned process

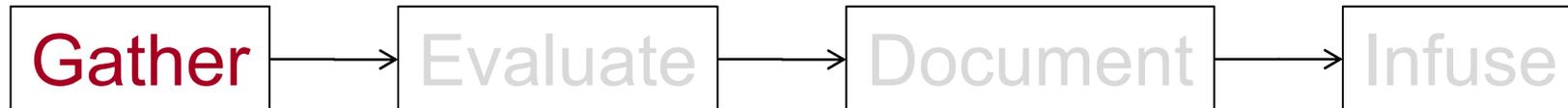




Elements of a Formal LL Process



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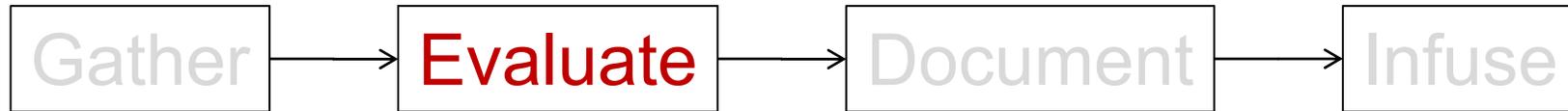
- Lessons are gathered from both project documentation and informal sources
 - Anomaly reports and mishap investigation reports
 - Informal office conversation
 - End-of-Mission reports
 - Design reviews
- No-prescreening of the data that is gathered
 - Pain factor: incidents with a major impact on JPL or on a spaceflight project are easily gathered
 - (Anomaly reports feature a Lesson Learned Candidate checkbox)



Elements of a Formal LL Process



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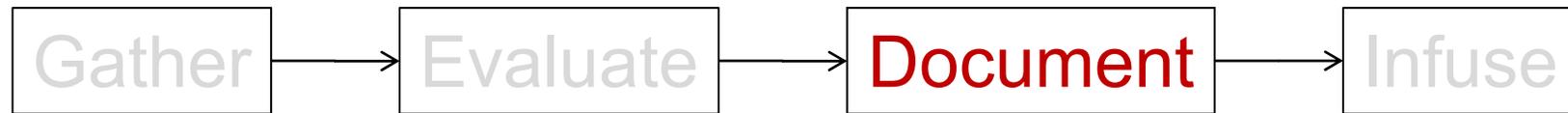
- JPL Lessons Learned Committee (LLC)
 - Meets every week
 - Evaluates incoming lesson learned candidates
 - Chaired by Office of the Chief Engineer
 - LLC includes representatives from the major technical organizations
- LLC validates each candidate against 3 criteria:
 1. Relevance to mission success
 2. Applicability to other spaceflight projects
 3. Topic does not duplicate existing lessons
- LLC prioritizes each lesson on a scale of “1” to “9”
 - Rating of “5” or lower typically does not get documented because higher priority topics arrive



Elements of a Formal LL Process



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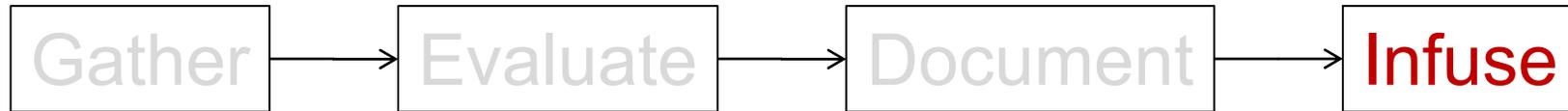
- LLC Chair usually drafts lesson*, and the LLC edits and approves it
 - *A best practice: the other NASA Field Centers depend on someone to send in a draft– hence, it never gets written!
- The varied LLC membership (reps from System Engrg Div., Mechanical Systems Div.) lends different perspectives to the draft
- Lesson Format: “Title,” “Description of Driving Event,” “References,” “Lesson Learned” statement, and “Recommendations,” plus related metadata
- Focus is on Recommendations that are “implementable”– not mere homilies that lack specifics



Elements of a Formal LL Process



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- LLC-approved lessons learned are disseminated
 - Summaries e-mailed to key project staff,
 - Publication in NASA lessons learned repository–<http://llis.nasa.gov>
 - Individuals can subscribe to automated notification of new lessons
- **Key industry-wide challenge:** assuring lessons learned actually get used
 1. At major project milestones, projects self-audit compliance with lessons learned recommendations
 2. Infused into JPL procedures and training



Tracking Effectiveness



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- Will readily available effectiveness metrics be informative?
- Assessing project compliance is labor intensive
 - NASA lessons learned repository has over 1500 lessons
 - Cannot assure the right person reads a key lesson at the right time
- Cross-referencing LLs to requirements in 2 key JPL standards provides closed-loop resolution



Summary



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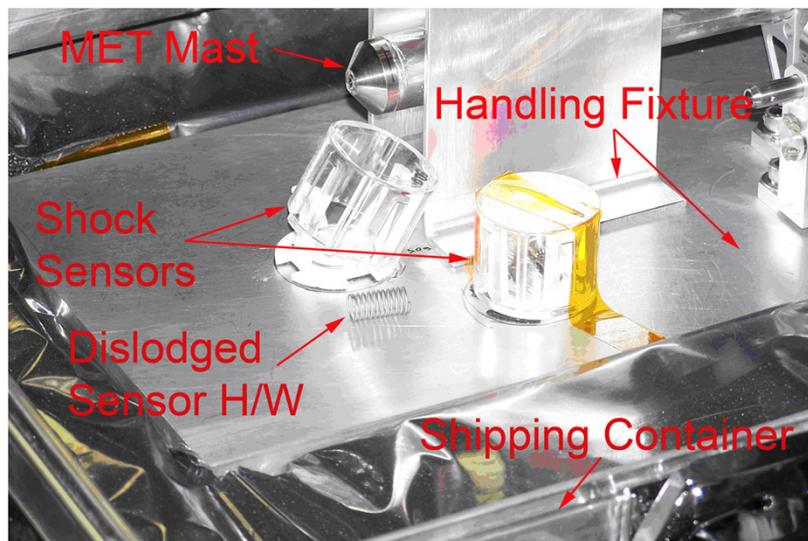
- A lessons learned system is a hallmark of a mature engineering organization
- A formal lessons learned process
 - Can help assure that valuable lessons get written and published, that they are well-written, and that the essential information is “infused” into institutional practice
 - Requires high-level institutional commitment, and everyone’s participation in gathering, disseminating, and using the lessons

Must assure that lessons learned are used and infused.



Recently Published Lessons

- **Exercise Strict Controls in the Packaging and Oversight of Critical Hardware Shipped by Third-Party Courier Services**
 - **Project:** Mars Phoenix **POC:** Ron Welch **Lesson Learned #:** 1849
 - **Abstract:** When Mars Phoenix spaceflight hardware was transported from the Jet Propulsion Laboratory using a third-party (independent) courier service, it was discovered at the destination that the shock sensors mounted to the hardware were all tripped. Other JPL projects have experienced problems with unescorted transportation of flight hardware. The design of packaging for shipment should be reviewed and pre-approved, a packaging inspection report prepared at the source and destination site, and a project Critical Hardware Handling Plan address how critical items are to be shipped.



MET Mast photographed in the aluminum shipping container (similar to a golf club hard case) following delivery. An outer cardboard box was badly damaged. It was not skid-mounted for protection during transport and handling, and the tripping (>50 Gs) and detachment of the shock sensors strongly suggests that the package was not fastened in place during transport. The shipped item was a bare mast without mounted science sensors.

Full text at:
http://www.nasa.gov/offices/oce/llis/imported_content/lesson_1849.html