



Langley Research Center

LPR 7120.6

Effective Date: December 22, 2010

Revised : March 8, 2011

Expiration Date: November 30, 2015

Lessons Learned Process for Sustained Process Improvements

National Aeronautics and Space Administration

Responsible Office: Safety and Mission Assurance Office**TABLE OF CONTENTS**

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PREFACE

P.1 PURPOSE

- a. This Langley Procedural Requirements (LPR) document sets forth the requirements for the National Aeronautics and Space Administration (NASA) Langley Research Center (LaRC) policy, procedures, and practices relative to lessons learned.
- b. The objective of the Lessons Learned Process is to capture and institutionalize the lessons learned at LaRC and incorporate them into practices, including but not limited to rules, policies, training, and workshops.
- c. The Lessons Learned System is a knowledge management solution for storing, retrieving, and reusing working knowledge.
 - (1) The system is intended to promote knowledge sharing and leveraging.
 - (2) Best practices and lessons learned, while related, are distinct. Best practices and lessons learned both need to be effectively captured and tracked for current and future project application.
 - (3) The Lessons Learned System sets forth a systematic process to identify, document, manage, and instill lessons learned and best practices.
 - (4) This LaRC Lessons Learned Process provides a method for Center-wide participation in proposing, vetting, disseminating, and using lessons learned.

P.2 APPLICABILITY

The requirements of this LPR are applicable to all LaRC managed programs, projects, and project elements.

P.3 AUTHORITY

- a. NPR 7120.5, "NASA Space Flight Program and Project Management Requirements."
- b. NPR 7120.6, "Lessons Learned Process."
- c. NPR 7120.7, "NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements."
- d. NPR 7120.8, "NASA Research and Technology Program and Project Management Requirements."

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P.4 APPLICABLE DOCUMENTS

LAPD 1150.2, "Councils, Boards, Panels, Committees, Teams and Groups"

P.5 MEASUREMENT/VERIFICATION

Compliance with this LPR shall be tracked by audit where appropriate, and measured by promoting use of lessons learned during technical reviews and throughout the program/project life cycle, and by overseeing the process of transforming candidate lesson learned material into complete, formatted, lessons learned ready for Headquarters Data Manager review and input into the Lessons Learned Information System.

P.6 CANCELLATION

None

Original signed on file

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Deputy Director

DISTRIBUTION

Approved for public release via the Langley Management System; distribution is unlimited.

1.0 Introduction

1.1 This document discusses the LaRC lessons learned processes associated with formalizing lessons learned entries into two knowledge systems.

1.1.1 The first system, the LaRC Knowledge Base System (KBS), is for lessons that are specifically relevant to individuals working at LaRC. This data archive is located on the LaRC NX system, and information concerning the specific location of the site can be obtained from the Lessons Learned Center Data Manager (LLCDM).

1.1.2 The second system, the Lessons Learned Information System (LLIS), is for lessons with Agency-wide applicability.

1.1.2.1 Information is submitted by LaRC employees into the LaRC KBS and then reviewed by the Lessons Learned Committee (LLC) prior to submission to the LLIS.

1.1.2.2 The LLIS may be found at <http://llis.nasa.gov/>.

1.2 The objective is to capture and institutionalize the lessons learned. Implementing lessons learned throughout the project life cycle reduces repeating problems and project risk.

1.3 The LaRC KBS 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 their:

- a. Significance in terms of actual or potential project impact, including effects on project success, cost, schedule, safety, public visibility, or management visibility.
- b. Importance to future LaRC activities. This may include events of non-LaRC origin.

2.0 Scope

2.1 This Lessons Learned Process has been established by LaRC to provide a formal record of lessons learned.

2.2 The scope of this process covers documentation of events that led to or could have led to adverse consequences.

2.2.1 The lessons also include activities that reduce or eliminate the potential for future similar events.

2.2.2 In addition, the converse (i.e., events that led to positive outcomes and activities that increase the potential for future similar events) is also within the scope of this process.

2.3 The following are potential sources of lessons for entry into the knowledge base:

- a. Memorandums that give a brief synopsis of information deemed useful. This is to communicate internally when important information is to be disseminated. These may not be significant to the general public.
- b. Mishap board reports. These may or may not be significant to all NASA Centers.
- c. Notes from a presentation or a review at the Center. These may or may not be significant to all NASA Centers.

2.4 Lessons may be learned in almost any endeavor. The following list is illustrative only and is not intended to limit the situations that may give rise to lessons learned:

- a. engineering
- b. technical
- c. science
- d. operations
- e. administrative
- f. procurement
- g. management
- h. safety
- i. maintenance
- j. training
- k. flight or ground-based systems
- l. facilities
- m. medical

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n. other activities

3.0 Organization

3.1 The LaRC lessons learned process is supported by an LLC consisting of:

- a. Deputy or Associate Directors for each LaRC Product Unit
- b. Deputy or Associate Directors for each LaRC Core Resource Unit
- c. Deputy Director from the Safety and Mission Assurance Office (SMAO)
- d. Lessons Learned Center Data Manager

3.1.1 Representatives from other groups are invited to LLC meetings when specific lesson submittals would benefit from their expertise.

3.1.2 Each member shall designate a named alternate to attend in their absence. This may or may not be organizational level Chief Engineers.

3.1.3 Representatives from other groups are invited to join as permanent members when deemed appropriate by the LLC Chair.

3.1.4 The LLC relies on the Center Export Administrator, Patent Counsel, Legal, Safety, and Security Offices to review submittals and to determine if any issues exist related to widespread dissemination of the submittal should it be recommended as a lesson learned.

3.1.5 The LLC reviews significant events and ensures that lessons learned are documented and distributed.

3.2 The LLC meets quarterly, or as needed, to review and approve draft lessons submittals.

3.2.1 The LLC may also identify additional candidate lessons, assign action items and review the action item status.

3.3 The roles of the organizations supporting the LLC are to:

- a. Designate a representative of their organization as an LLC member.
- b. Submit candidate significant events within their cognizance.
- c. Promote the use of the LaRC KBS and the LLIS in the course of performing technical work and during technical reviews.

3.4 The NASA Headquarters Office of Chief Engineer (OCE) manages the LLIS to facilitate the early incorporation of safety, reliability, maintainability, and quality into the design of flight- and ground-support hardware, software, facilities, tests, and procedures throughout NASA.

3.4.1 A NASA Lessons Learned Steering Committee (LLSC) is responsible for coordination of all lessons learned activities among the NASA Centers.

3.4.2 The LaRC Lessons Learned CDM is a member of the NASA LLSC.

4.0 Solicitation of Candidate Lessons

4.1 Potential topics for lessons learned are drawn from the full range of LaRC activities and business practices.

4.1.1 The full range of LaRC activities and business practices includes all project phases—from conceptual development to flight operations—as well as development of analog mock-ups, general research, and institutional and facility issues not associated with a flight project.

4.2 Informal communications are an important source of lessons learned material.

4.2.1 Frequently, significant events occur that are resolved outside the failure reporting and corrective action process and are not documented on nonconformance failure reports. In such cases, informal communications are an important adjunct to the formal information flow because of the occasional reluctance of people to emphasize negative developments or advertise their mistakes or successes.

4.2.2 All LaRC employees, both civil servants and contractors, are encouraged to submit candidate lessons. These candidate lessons can be sent to the LLCDM or directly to the LLC committee through their organization's LLC representative.

4.2.3 An LLC member who receives a proposed lesson learned from any source other than the LLCDM shall deliver the lesson directly to the LLCDM for processing.

4.2.4 Candidate topics may arise as a memorandum or mishap report, or a LaRC manager may ask to schedule a formal presentation to the LLC, supported by such detailed documentation as problem/failure reports or failure review board findings.

4.2.5 A common method of identifying promising topics is by scheduled roundtable discussions of recent events by LLC members during the LLC meetings.

4.2.6 The LLCDM accepts the candidate lesson and routes it to the Export Control Administrator, the Patent Council, Legal, Safety and the Security Offices for review. These offices determine if widespread dissemination is feasible.

4.2.7 If the candidate lessons learned is acceptable to these offices (4.2.6), then the LLCDM submits the Lessons Learned to the LLC for discussion and deliberation.

5.0 Initiating Candidate Lessons

5.1 Any of the following procedures are acceptable for initiating the process of lesson learned documentation and approval:

- a. Prepare a draft candidate lesson learned as an interoffice memorandum addressed to a representative of the LLC or the LLCDM.
- b. Prepare a draft candidate lesson learned as a document that is a collection of lessons learned after a project ends.
- c. Prepare a draft candidate lesson learned as a mishap report or findings.
- d. Prepare a draft candidate lesson learned after a debriefing or at the end of a review.

5.2 This information is then submitted to the LLC. A link from the @LaRC Web site describes the LaRC LLC and CDM, their names, and e-mail addresses.

6.0 Review and Selection of Candidate Lessons

6.1 Candidate lesson topics are received by the LLC and assessed against the lessons learned criteria, including the potential for duplication of existing lessons.

6.1.2 During the LLC meeting, the members evaluate each incoming item.

6.1.2.1 If an item falls within the scope of the lessons learned process, it is accepted with or without change.

6.1.2.2 If the lesson needs some modifications, the LLCDM sends the lesson to the submitter with an explanation of what has been modified.

6.1.2.3 The submitter then concurs with the modification or explains why the modification is not correct or how it can be further improved.

6.1.2.4 The LLC reviews the submittal as modified or the explanation of why a proposed modification is not correct and either accepts or rejects the lesson.

6.1.2.5 Upon acceptance or rejection, the personnel submitting the lessons learned for consideration shall be notified of the ultimate disposition and rationale for accepting or rejecting their submittal.

7.0 Lesson Review and Approval

7.1 When a draft lesson learned is presented to the LLC during a meeting, the group reviews it for its suitability as a submittal to the Agency LLIS and/or to the LaRC KBS.

7.1.1 Lessons to be included in the Agency LLIS need to have broader applicability than those lessons that will only be included in the LaRC KBS.

7.1.2 The principal LLC considerations in reviewing the draft are to:

- a. Verify that the draft, where necessary, has been reviewed by qualified technical experts who determined that the event description is accurate and the conclusions valid.
- b. Employ the amassed knowledge of the LLC to corroborate this determination.
- c. Identify controversial issues and ensure that the positive contribution achieved by lesson publication exceeds any potential damage to working relationships and poses no legal liabilities.

7.2 Although minor modifications may be made to draft lessons at the LLC meeting, in general, editorial or other modifications are implemented by the LLCDM working with the appropriate LLC member and the original submitter of the lesson under consideration.

7.2.1 The revised lesson is reconsidered at a subsequent LLC meeting, or in instances where the changes are largely editorial, may be approved by e-mail by the LLC.

7.2.2 When the LLC achieves a consensus on the adequacy of the draft, the lesson is approved and signed by the committee chair.

7.2.3 Each approved lesson is entered into the LaRC KBS and, if appropriate, the LLIS.

8.0 Lessons Learned Documentation for LaRC Knowledge

8.1 The documentation should follow a free format. It is recommended to have the following key elements:

- a. *Submitted by* information includes first name, last name, phone number, and e-mail address.
- b. Point of contact (if different from submitter).
- c. Clear, concise title that summarizes the significant event or lesson.

- d. An abstract consisting of an abbreviated summary of the lesson learned subject.
- e. The lesson(s) learned is (are) knowledge or understanding gained by experience.
- f. Recommendations are posed as actions to be taken by line or project management to assure adverse lessons learned are precluded, or positive lessons are performed, in future activities.
- g. Additional key phrases, if appropriate, to facilitate electronic searching of the data base.

9.0 Lessons Learned Documentation for Agency LLIS

9.1 When creating a lesson in the LLIS, the following mandatory elements shall be entered if available and/or applicable:

- a. Title – The title accurately reflects and summarizes the subject of the lesson learned. A unique title is preferred but not mandatory.
- b. Description of driving event – A brief description of the event or problem that resulted in the lesson being learned.
- c. Lesson(s) learned – The knowledge or understanding gained by experience. The experience may be positive, as in a successful test or mission, or negative, as in a mishap or failure (see appendix A for a full definition).
- d. Recommendation – A single, positive recommendation that is taken to mitigate or eliminate the risk described in the lessons learned, or a positive lesson to be performed in future activities to achieve a desirable outcome.
- e. Organization.
- f. The project or program to which the lesson learned relates.
- g. Lesson date – The lesson date is the date the lesson learned was written.

9.2 When creating a lesson in the LLIS, the following elements shall be entered if available and/or applicable:

- a. *Submitted by* information includes first name, last name, phone number, and e-mail address.
- b. Point of contact (if different from submitter).
- c. Abstract – The abstract should be a short concise summary of the lesson, preferably no more than a short paragraph or two in length.

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- d. Evidence of recurrence control effectiveness – A brief description of the evidence that shows that the recommendation is effective in controlling recurrence of the driving event.
- e. Any safety issue (system or personnel) the lesson addresses.
- f. Supporting documentation – Upload a file. The size of the file should be less than 100 MB.
- g. Privacy preference.
- h. The program or project phase from which the lesson learned was captured.
- i. The submitter's role or position in the project or program from which the lesson learned was captured.
- j. Category(ies) that best describes the functional area to which the lesson learned applies. The following are the categories that have multiple sub-categories:
 - (1) Program Management.
 - (2) Mission and Systems Requirements Definition.
 - (3) Systems Engineering and Analysis.
 - (4) Engineering Design (Phase C/D).
 - (5) Manufacturing and Assembly.
 - (6) Integration and Testing.
 - (7) Mission Operations and Ground Support Systems.
 - (8) Safety and Mission Assurance.
 - (9) Additional Categories.
- k. Additional key words – Lessons learned can be categorized according to one or more key phrases that are most associated and help users identify with the events that lead to the lesson being learned.
- l. The NASA mission directorate(s) to which the lesson should be applied.
- m. If the lesson learned has previously been documented.
- n. Any restrictions on the data contained in the submission.
- o. Any relationship the lesson has to a particular NASA policy, standard, handbook, procedure, or other rules-based document.

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- p. Supporting image(s).
- q. Year of occurrence.
- r. Message for reviewer – This field may be used to convey any message/comments regarding the lesson.

APPENDIX A

DEFINITIONS

- A.1 *Best Practices:*** A **best practice** is a technique, method, process, activity, incentive, or reward which is regarded as more effective at producing a desirable outcome than any other technique, method, process, etc. when applied to a particular situation.
- A.2 *Debrief:*** Knowledge sharing presentation after an event or a review.
- A.3 *Findings:*** A free format document written to record or report from experience or investigation.
- A.4 *Headquarters Data Manager (HDM):*** An individual appointed by the Associate Administrator for Safety and Mission Assurance to assume responsibility for final approval of lessons that are entered into the database. HDM serves as the chair of the Lessons Learned Steering Committee (LLSC).
- A.5 *LaRC Knowledge Base System:*** A locally maintained database that serves as a repository for lessons learned that have been learned locally or that have local importance.
- A.6 *Lesson Learned (LL):*** A Lesson Learned is knowledge or understanding gained by experience. The experience may be positive, as in a successful test or mission, or negative as in a mishap or failure. Successes are also considered sources of lessons learned. A lesson is significant in that it has a real or assumed impact on operations; valid in that it is factually and technically correct; and applicable in that it identifies a specific design, process, or decision that reduces or eliminates the potential for failures and mishaps or that reinforces a positive result.
- A.7 *Lessons Learned Center Data Manager (LLCDM):*** An individual appointed by the Director of Safety and Mission Assurance to assume responsibilities for assuring lessons are thorough, clear and accurate, and that they comply with applicable information security and other guidelines.
- A.8 *Lessons Learned Committee (LLC):*** A LaRC committee comprising individuals who evaluate submitted lessons learned and recommend various actions be taken. The actions may include such things as submitting lessons learned records to the Agency LLIS or placing lessons learned in the LaRC Knowledge Base System
- A.9 *Lessons Learned Information System (LLIS) Database:*** An Agency-wide database that serves as a repository for lessons learned records.
- A.10 *Lessons Learned Steering Committee (LLSC):*** An Agency-level committee that includes the HDM and each LLCDM. The committee assumes the responsibility to coordinate special lessons learned studies, reviews, and evaluations. It also participates

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in the development of Agency-level lessons learned policy. It facilitates lessons learned knowledge and promotes the use of LLIS.

A.11 Memorandum: A written record or communication about a single idea, subject, or report. It has a definite structure including some or all of the following elements/sections:

From: The person writing the memorandum.

To: The person receiving the memorandum.

Date: Date of the memorandum.

Subject: Topic of the discussion and reason why it has been written.

Body: Discussion of the topic in detail.

Conclusion/Recommendation: Explanation of what happens next.

A.12 Submitter: An individual who submits a lesson to the LaRC KBS entry screens. This individual may be appointed by the program/project/Project Element Manager to enter one or more lessons on behalf of that program/project. Further, all civil servants and contractors at LaRC are encouraged to enter lessons.