



WHITE PAPER



**Introducing the Pause and Learn (PaL) Process:
Adapting the Army After Action Review Process to the
NASA Project World at the Goddard Space Flight Center**

**Developed at the
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Summary

This paper introduces a concept for formalizing learning from NASA projects at Goddard that is modeled after the Army After Action Review (AAR) system. While the AAR was developed to learn from training exercises, the 25 years of experience, theoretical foundations and practical tools make it a valuable source of lessons for NASA. In addition, NASA has been faulted for ignoring lessons from successes and overly focusing on learning only from mistakes. Without a process for learning from every activity regardless of ultimate outcome, we risk missing out on the bulk of the learning from our projects and potentially not really knowing why we actually succeeded.

This new process is called “Pause and Learn” or PaL.¹ The idea is to create a learning event at the end of selected critical events in the life of a project. End of project reflections are good but are too infrequent for the organization to learn in a timely manner. Also much intermediate learning is lost between concept and launch. PaLs are integrated into the project life cycle at key points as natural parts of the process. Being facilitated and assembled by outsiders, the key project team members are only required to do a small marginal amount of additional effort. This means that PaLs have the potential to deliver a very high value for the requisite investment of time and effort made by the participants.

The Need to Be a Learning Organization

In order to meet the President’s challenging new vision, NASA needs to make a strong commitment to becoming the best learning organization it can be.

The United States will develop the innovative technologies, knowledge and infrastructures both to explore and support decisions about the destinations for human exploration.

President George W. Bush, **Vision for U.S. Space Exploration: A Renewed Spirit of Discovery**, delivered on January 14, 2004

Knowledge is central to our new vision. As the CAIB report pointed out, NASA has as many managerial limiting factors as it does technological constraints. Alan MacCormack (2004) of the Harvard Business School recently pointed out that NASA failed to learn from the Faster Better Cheaper (FBC) era because it conducted post-mortems *only on failed projects*. Thus NASA did not always know what worked or why.



The Challenge to Change

The Need for a Plan to Manage Knowledge and Build a Learning Organization at NASA has been highlighted in a number of official documents. Much of the post-Columbia discussion

¹ The PaL was originally called PFL for Pause for Learning. The PAL designation was further changed to PaL to reduce confusion with the PAL acronym usage meaning Process Asset Library, a concept used in the software process improvement world at Goddard.

of change has been about the need to change the culture at NASA. As Goddard looks ahead to play a significant role in the achievement of the new Vision, it would be good to revisit previous comments on the need for NASA to become a highly effective learning organization.

The President's Management Agenda

*The Administration will adopt information technology systems to capture some of the knowledge and skills of retiring employees. Knowledge management systems are just one part of **an effective strategy that will help generate, capture, and disseminate knowledge and information that is relevant to the organization's mission.***

NASA Integrated Action Team Report, Dec. 2000

*Although NASA's efforts so far are commendable, the Agency must go further. In the current environment, effective management and sharing of knowledge is more critical than ever. **The experience of prior managers is not uniformly well documented and made available for the benefit of newer or less experienced program and project managers to effectively utilize in their situations.***

US General Accounting Office GAO-02-195, 2002

*NASA needs to strengthen its lesson learning in the context of its overall efforts to develop and implement an effective knowledge management program. We recommend that the NASA administrator strengthen the agency's lessons learning process and systems by: **articulating the relationship between lessons learning and knowledge management through an implementation plan for knowledge management;** designating a lessons learned manager to lead and coordinate all agency lessons learning efforts; developing ways to broaden and implement mentoring and 'storytelling' as additional mechanisms for lessons learning; enhance the Lessons Learned Information System; and track and report on the effectiveness of the agency's lessons learning efforts using objective performance metrics.*

Columbia Accident Investigation Board (CAIB) Report Aug. 2003

*The Board concludes that NASA's current organization does not provide effective checks and balances, does not have an independent safety program, and **has not demonstrated the characteristics of a learning organization.** (p 12)*

Lessons from Goddard's Response to the Challenge

We must become a learning organization that by nature learns, evolves, creates and applies knowledge effectively and efficiently. PaLs are a foundational part of the process to take us to the new organizational structure, culture and processes that will enable Goddard to

The Goddard Plan is designed to overcome the previous Agency focus on IT as a KM driver with its over-emphasis on **capturing knowledge from workers** and instead focuses on **facilitating knowledge sharing among workers.**

continue to fulfill our unique mission for the American Public, NASA, and the scientific world who have placed their trust in us to explore the frontier of space.

A learning organization is able

to adapt and change and thereby address the challenges in its path towards the successful attainment of goals. It can do that because all of its members are learners who engage their full intellectual capabilities and have access to the collective organizational knowledge. Peter Senge laid out the need for an organization to not only be excellent at Personal Mastery, Mental Models, Shared Vision, and Team Learning but also to have a well developed Systems Thinking Capability throughout the organization. He called this thinking the ‘Fifth Discipline’.²

Future Goddard projects should never accept risk or experience failure because the organization did not apply its best own knowledge.

Senge’s model links the need for shared vision, mental models geared toward learning, personal mastery of required skills and team learning in order to truly achieve the level of systems thinking required to develop a learning organization. Clearly communication, culture (openness) and structure are also integral to building a learning organization. While the Senge model below calls for developing all four foundations of a learning organization the Diaz team’s NASA-wide actions resulting from the CAIB R-O-Fs require that NASA start by addressing training and learning technology on a comprehensive basis (R6.3.1) and addressing the management of agency knowledge more systematically for rapid and effective reapplication (F7.4-9)³.

Goddard has chosen to adopt this PaL process because we cannot effectively share what we ourselves have not effectively learned. The PaL process is designed to facilitate learning by the engineers, project leaders and team members actually involved in the work. Then and only then can lessons learned be effectively and efficiently shared across the agency.

Lessons from 25 Years of Army After Action Reviews

An AAR is “...a professional discussion of an event, focused on performance standards, that enables *soldiers to discover for themselves* what happened, why it happened, and how to sustain strengths and improve on weaknesses” [italics added]

A Leader’s Guide to After-Action Reviews, 1993 p 1.

The Army learned from years of experience with AAR that much of the value in the AAR exercise comes from several key design parameters. First, the focus of the AAR is specific to 1) What happened (events), 2) Why did it happen (cause), 3) How can we improve (action). Second, the AAR is a participant discussion. AARs replaced traditional top down lecture critiques. What was valuable about AARs was the voice of the team members themselves offering up their views and ideas. Third, the AAR is close to the action in time, space and personnel. Fourth, the AAR does not function as a career review. It is a non-attribution team review of what happened. The team members participate because they feel free to speak. Finally, the AAR is part of the overall process whether it be a training exercise, a simulation or a field operation. The action is not complete until the AAR has been conducted. The AAR is a fundamental part of the process built into the project. The AAR method replaced sterile

² Senge, Peter. (1990). *The Fifth Discipline*.

³ The R (recommendation) and F (finding) refer to the Diaz Report matrix.

lecture type critiques delivered by judges often some time after the end of the events. The participants were not energized and sometimes defensive about these reviews. While many teams and groups at NASA meet and discuss events after they happen, NASA has no formal process to guide meaningful learning in the way AAR's function.

Based on the AAR experience, a PaL at Goddard is designed to specifically focus on:

1. What happened – events, people, places
2. Why did it happen – cause, environments, expectations
3. What did we learn from this – insights, behavior, actions we can take

A PaL session at Goddard should be:

1. A non-attribution participant discussion
2. The voice of the team members offering views and ideas in a safe space
3. Close to the action in time, space, and personnel (conducted soon after events)
4. A fundamental part of every project, built into the project process and schedule
5. Available for disciplines as well as project teams, (engineering, safety & science)

Implementing the PaL Process at Goddard

The idea behind the PaL process is to create a learning event at selected critical events in the life of a project. End of project reflections are good but are too infrequent for the organization to learn in a timely manner. Also, much intermediate learning is lost between concept and launch. PaL meetings are intended to be integrated into the project life cycle at key points as a natural part of the process. PaL meetings are structured and facilitated by specialists who are not project members for two reasons: first, to intrude as little as possible into the time of the project team; second, to be objective and facilitate open communication.

1. Scheduling – A series of PaL meetings should be scheduled at key project events or milestones as part of the initial project planning and scheduling process. Though ad hoc PaL meetings can be effective, those that are planned in advance seem to be the most productive. Some administrative effort is required for planning, notification, and technical preparation.
2. Pre-meeting interviews – Prior to the PaL, the facilitator will meet briefly with project management and team members to make introductions, gather preliminary information, and establish the objectives for the PaL meeting. Initially, the objectives may be driven primarily by the project lead, but could be defined by any participant. Though insights often arise from discussions outside the scope of the objectives, the objectives provide a framework for discussion.
3. The PaL meeting – The substantive part of the PaL process is the meeting itself, where participants can develop networks and relationships, share information, communicate openly, and identify and magnify key learning opportunities. PaL meetings often explore:
 - Tasks and goals that were to be accomplished
 - What tasks and goals were actually accomplished
 - If it were done over again - what should be kept the same, what should be improved and how

4. The PaL Report – The product of the PaL meeting is a report prepared by the facilitator for the participants. Further and farther circulation of the PaL meeting report is determined by the participants. Components of the report include:
- A brief project synopsis
 - The project event or milestone that is the focus of the PaL meeting
 - The objectives of the PaL meeting specific to the project event
 - Preliminary data and assumptions
 - PaL meeting synopsis
 - Insights and recommendations
 - Actionable items and proposed follow-through if any

Conducting a PaL: Roles and Responsibilities

One of the key designs of the PAL is minimal intrusion into project work time. To maintain this, the roles of the participants and the supporting staff who conducts the PaL are clearly laid out here. The facilitator does not need to be from outside NASA but should be objective relative to the team holding the PaL. Outside facilitators seem to work well if they have sufficient technical expertise to follow the discussions. It is important that everyone understands their role and responsibility toward making PaLs successful and useful.

PaL Project Attendees Need to:	PaL Supporting Staff Need to:
<ul style="list-style-type: none"> • Show up to the event when scheduled despite the emails and phone messages waiting; <ul style="list-style-type: none"> ○ You may be asked to bring notes or supporting documentation, ○ You will be asked to re-state portions of an activity in your own words • Do not take this as a lecture or critique <ul style="list-style-type: none"> ○ Relate what happened from your own point of view ○ Explore alternative courses of action ○ Handle discovery of errors positively • Follow-up on needed actions that you have identified <i>for yourself</i> <ul style="list-style-type: none"> ○ The PaL is not intended as an action-assignment forum ○ The team may agree on an action or improvement for themselves ○ Likewise, you may have actions you identify for your own improvement 	<ul style="list-style-type: none"> • Gather attendees: some projects already hold debrief or talk down sessions which can be used for PaL sessions • Moderator reviews events <ul style="list-style-type: none"> ○ Encourage participation ○ Summarize key events • Have junior leaders re-state portions of their part of an activity • Do not lecture or critique <ul style="list-style-type: none"> ○ Ask why certain actions were taken ○ Ask how they reacted to situations ○ Ask when actions were initiated ○ Exchange “war stories” ○ Relate events to subsequent result ○ Explore alternative courses of action ○ Handle discovery of errors positively • Take notes during the PaL so all team participants can listen and learn • Prepare simple report of notes and submit back to the team for review

The PaL Pilot at Goddard

Goddard Space Flight Center conducted a pilot⁴ for the PaL process as a part of the Center's response to the CAIB and DIAZ reports during 2004. The key lessons from the pilot were:

1. While it is good to catch up on knowledge that is lying around, extraction methods are not a sustaining design for a learning organization.
 - a. Learning activities must be useful to the participants and not just future users of the information. NPR 7120.5c unfortunately focuses *only* on other users.
 - b. It must be clear how a PaL helps the current team carry on their work better
2. Project Managers who participated in a PaL endorsed the concept as valuable
 - a. 'First KM idea not built around a database' but about actual learning
 - b. 'The process is valuable for me and my team'
3. Needs program level support to be widely adopted
 - a. For time and funding support as needed
 - b. For collecting and sharing across similar projects within a program

Applicability to Building the NASA Learning Organization

The PaL concept is not new. It is based on many years of experience, organizational and behavioral research and practical insertion into project life cycles. NASA has been criticized for not taking learning seriously enough in its organizational systems. Adopting a PaL type of concept will not only build learning into the programs and projects undertaken but also help lead the change the Agency is trying accomplish towards becoming the best learning organization it can be.

NASA has embarked on a number of Lessons Learned initiatives to extract lessons from across the agency. While it is good to catch up on knowledge that is lying around, extraction methods are not a sustaining design for a learning organization. Fundamentally, learning activities must be useful to the participants and not just future users of the information. This is a critical design flaw copied over and over in corporate and government lessons learned processes that NASA needs to avoid. PaLs like AARs are designed to benefit the participant as much or more than future users. This is what makes the PaL an effective tool for establishing the learning culture that NASA needs now. When coupled with effective lessons learned, technical standards and safety reporting systems, PaLs can play a critical role in effective learning.

The PaL process is part of a suite of learning practices being implemented at Goddard as part of the Knowledge Learning Architecture (see figure below). For more information on the architecture see the website at: <http://missionsuccess.gsfc.nasa.gov> which includes a link to an ASK Magazine article on all six Goddard learning practices. While Goddard is moving ahead with implementation of the PaL process, NASA has the opportunity to embed a PaL concept in its projects and programs now to avoid the mistake of not capturing the project lessons as they unfold over the next decades. In fifteen or twenty years when we actually launch a human voyage to Mars, it will be because we have successfully applied all that we learned from our build up missions to the Moon and robotic trips to Mars.

⁴ The preliminary results of the pilot were reported in a paper and presentation at the IEEE Aerospace Conference in March of 2005. The paper is available as part of those proceedings or from the authors.

References:

Argyris, C. (1991). *Teaching Smart People How to Learn*, Harvard Business Review, May-June 1991, pp. 99-109.

Davenport, T. & Prusak, L. (1998). Working Knowledge, Harvard Business School Press, Boston, MA.

Morrison, J. & Meliza, L. (1999). *Foundations of the After Action Review Process*, United States Army Research Institute for the Behavioral and Social Sciences, Institute for Defense Analyses, Alexandria, VA.

MacCormack, A. (2004). *Management Lessons from Mars: Go ahead and raise the bar. Just don't make the same mistakes NASA did*, Harvard Business Review, May 2004, pp.18-19.

Meliza, L. (1998). *A Guide to Standardizing After Action Review (AAR) Aids*, United States Army Research Institute for the Behavioral and Social Sciences, Simulator Systems Research Unit, Alexandria, VA.

Rogers, E. (1998) *Enabling innovative thinking: Fostering the art of knowledge crafting*. International Journal of Technology Innovation, 16(1/2/3) pp. 11-22.

Rogers, E. & Milam, J. (2005). *Pausing for Learning*. IEEE Aerospace Conference Proceedings, March 7-12, 2005, Big Sky Montana.

Schein, E. (1993). *On Dialogue, Culture, and Organizational Learning*, Organizational Dynamics, Autumn 1993, pp 40-51.

U.S. Army Combined Command, (1993). *A Leader's Guide to After-Action Reviews*, Training Circular (TC) 25-20.

The Goddard Learning Architecture

