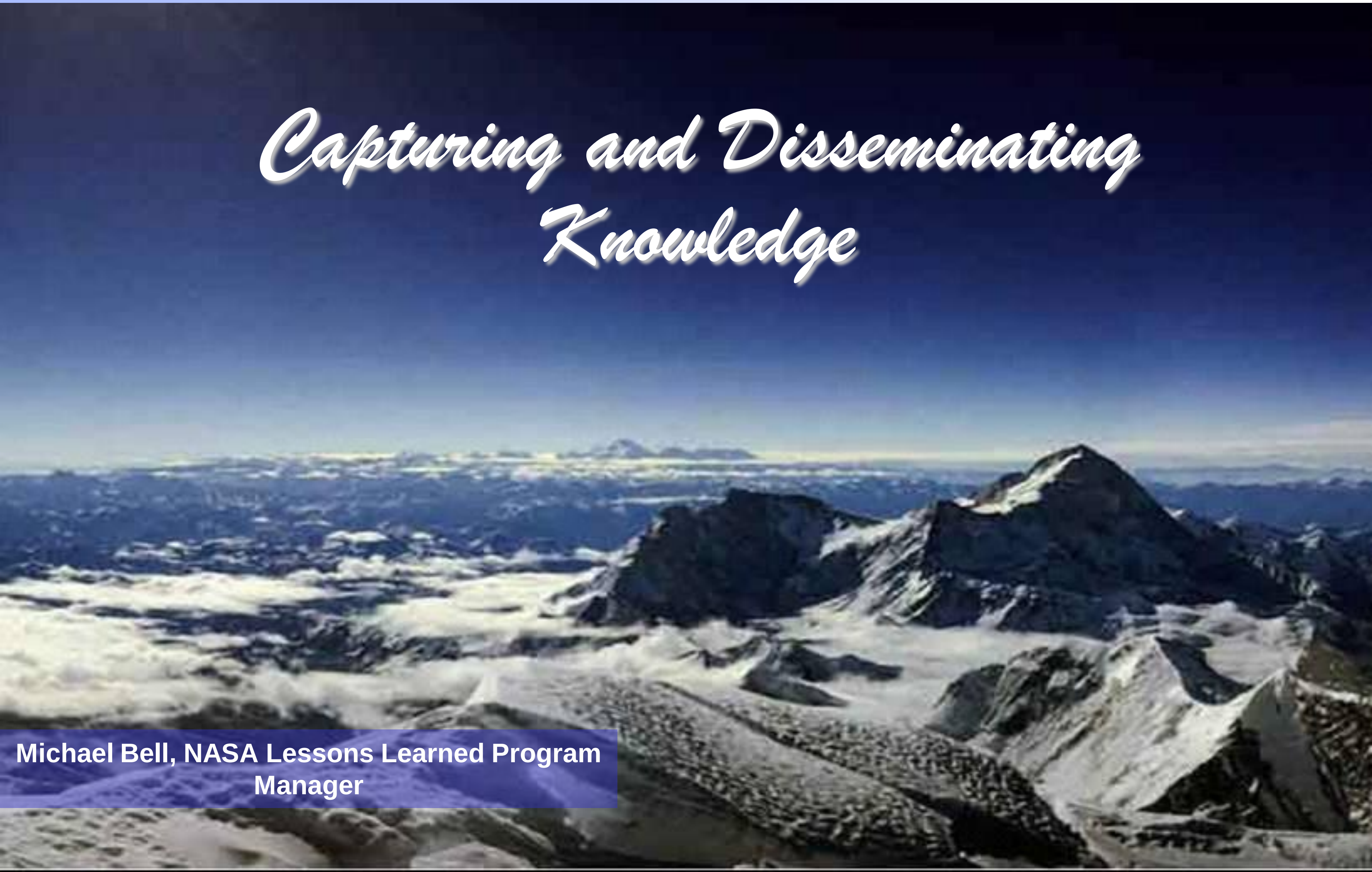
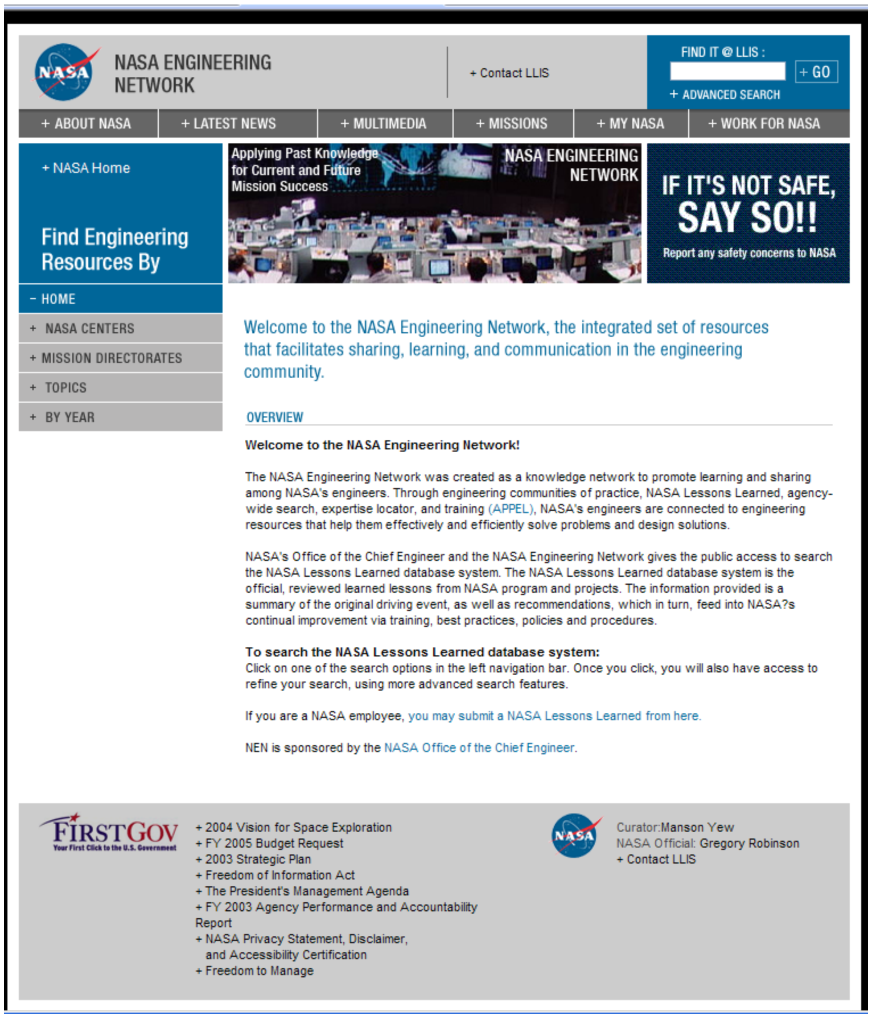
NASA Lessons Learned Program

Capturing and Disseminating Knowledge

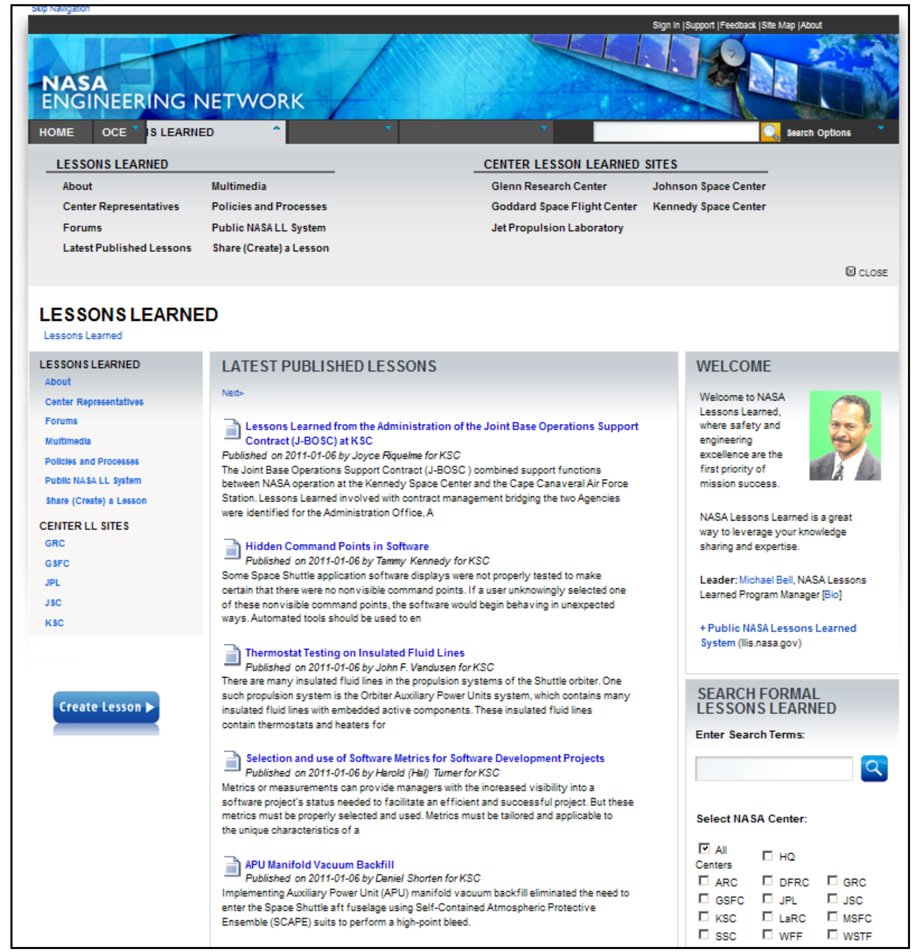


Michael Bell, NASA Lessons Learned Program Manager

Lessons are available through the public system and internal system



http://llis.nasa.gov/

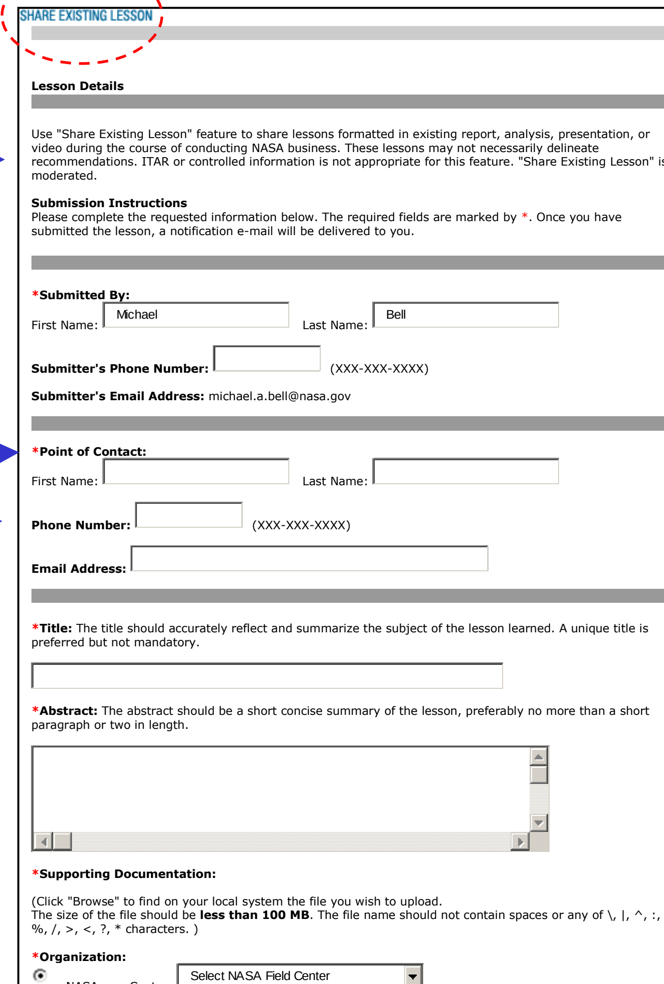


http://nen.nasa.gov/portal/site/llis/LL

Internal LL Page (2nd Q 2010) = 3,491
Internal LL Page (3rd Q 2010) = 3,319

Lesson Capture

A lesson learned is knowledge or understanding gained by experience---either a successful mission, project or failure.


SHARE EXISTING LESSON

Lesson Details

Use "Share Existing Lesson" feature to share lessons formatted in existing report, analysis, presentation, or video during the course of conducting NASA business. These lessons may not necessarily delineate recommendations. ITAR or controlled information is not appropriate for this feature. "Share Existing Lesson" is moderated.

Submission Instructions
Please complete the requested information below. The required fields are marked by *. Once you have submitted the lesson, a notification e-mail will be delivered to you.

***Submitted By:**
First Name: Michael Last Name: Bell

Submitter's Phone Number: (XXX-XXX-XXXX)

Submitter's Email Address: michael.a.bell@nasa.gov

***Point of Contact:**
First Name: Last Name:

Phone Number: (XXX-XXX-XXXX)

Email Address:

***Title:** The title should accurately reflect and summarize the subject of the lesson learned. A unique title is preferred but not mandatory.

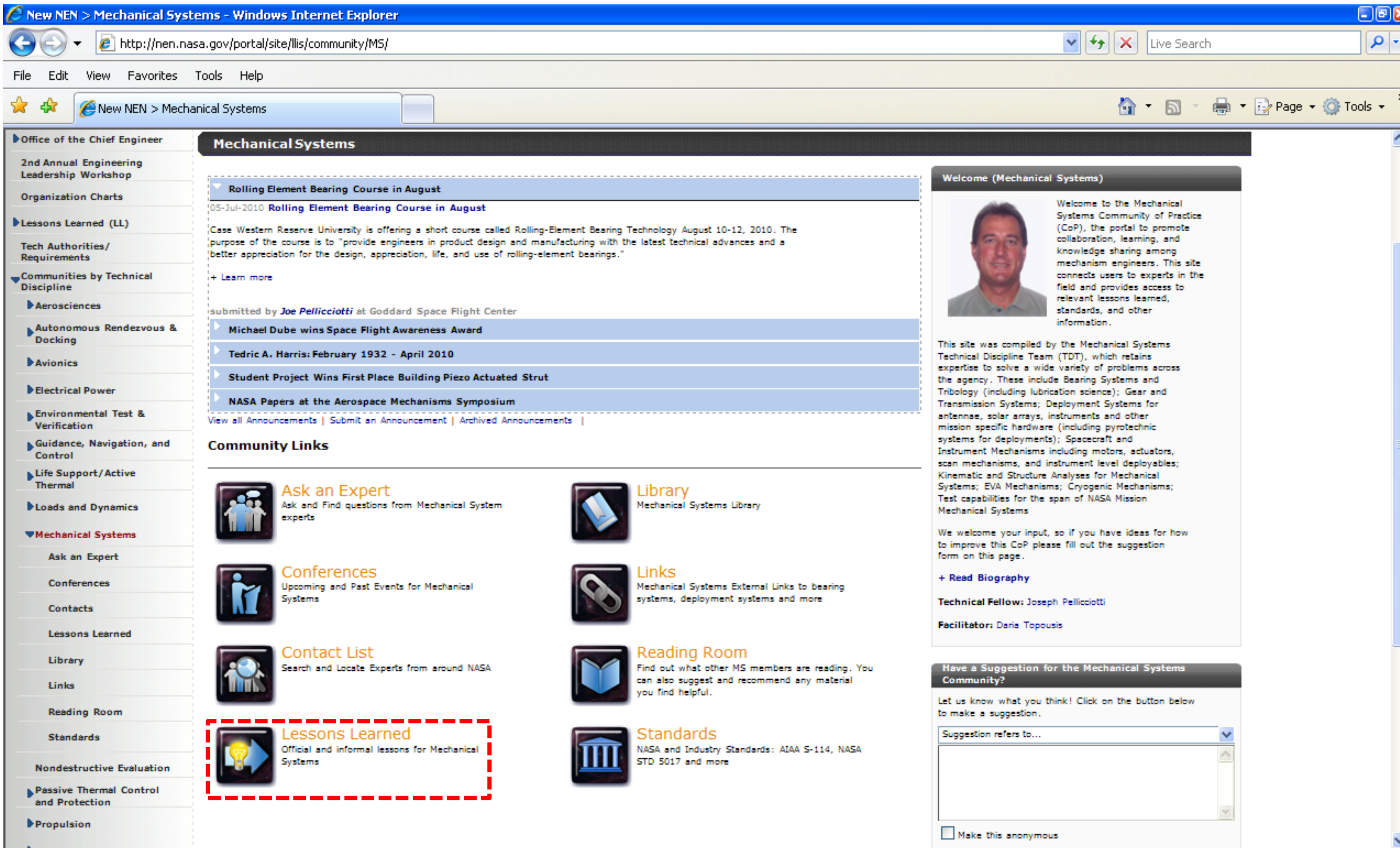
***Abstract:** The abstract should be a short concise summary of the lesson, preferably no more than a short paragraph or two in length.

***Supporting Documentation:**

(Click "Browse" to find on your local system the file you wish to upload.
The size of the file should be **less than 100 MB**. The file name should not contain spaces or any of \, |, ^, :, ", %, /, >, <, ?, * characters.)

***Organization:**
NASA --- Center: Select NASA Field Center

NEN CoPs - Enabling Collaboration & Lessons Learned



Collecting lessons learned - Facilitated Pause and Learn Session

Lessons Learned Workshop Agenda
December 19, 2008
HQ 3358

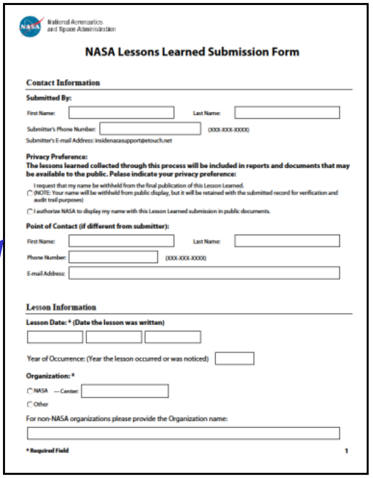
Objective: Share knowledge and lessons learned with open and honest dialog while not villanizing anyone.
Products: Knowledge transfer among team members, potential entry into the Lessons Learned Information System www.llis.nasa.gov

Duration	*Activity*	*Who*	*Outcome*
10 Min	Kick-Off - Lessons Learned Process and background	Michael Bell	Shared Understanding
50 min	Areas of Excellence • What Worked? • How can we learn from this situation?	All	Discussion
50 min	Opportunities • What didn't work? • How can we learn from this situation?	All	Discussion
10 Min	Summarize	Michael Bell	Action Items

Pre-work/ Read Ahead
Review of Project Products / Outputs

Facilitator Role:
- ✓ Help to stay focused on the task within the allotted time
- ✓ Ask probing questions
- ✓ Scribe/ Capture relevant lessons learned data

Resources:
- KSC Lessons learned process - KDP-KSC-P-2393
- Think Tank Online Brainstorming System http://kscapp002.ksc.nasa.gov:8080/thinktank/server/logout.jsp


National Aeronautics and Space Administration

NASA Lessons Learned Submission Form

Contact Information

Submitted By:
First Name: ____ Last Name: ____
Submitter's Phone Number: ____ (XXX-XXX-XXXX)
Submitter's E-mail Address: insidenasasupport@etouch.net

Privacy Preference:
The lessons learned collected through this process will be included in reports and documents that may be available to the public. Pelase indicate your privacy preference:
- I request that my name be withheld from the final publication of this Lesson Learned. (NOTE: Your name will be withheld from public display, but it will be retained with the submitted record for verification and audit trail purposes)
- I authorize NASA to display my name with this Lesson Learned submission in public documents.

Point of Contact (if different from submitter):
First Name: ____ Last Name: ____
Phone Number: ____ (XXX-XXX-XXXX)
E-mail Address: ____

Lesson Information

Lesson Date: * (Date the lesson was written)
Year of Occurrence: (Year the lesson occurred or was noticed)
Organization: *
- NASA — Center:
- Other

For non-NASA organizations please provide the Organization name:

*** Required Field** 1

Five Questions

A PaL session can explore many issues, but the team should try to focus on these five questions:
What did we intend to do?
- **What worked well, and why?**
- **What didn't work well --why?**
- **What did we learn from this?**
- **What should we change?**

5

Creating a lesson

Significant Events that change Policy, Standards or Procedures

IPAO

Lessons Learned from KSC's CLCS project

November 13, 2002

(Existing documents such as PowerPoint presentations, white papers and technical reports)

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First Name: Michael Last Name: Bell

Submitter's Phone Number: (XXX-XXX-XXXX)

Submitter's Email Address: michael.a.bell@nasa.gov

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***Title:** The title should accurately reflect and summarize the subject of the lesson learned. A unique title is preferred but not mandatory.

***Abstract:** The abstract should be a short concise summary of the lesson, preferably no more than a short paragraph or two in length.

***Supporting Documentation:**

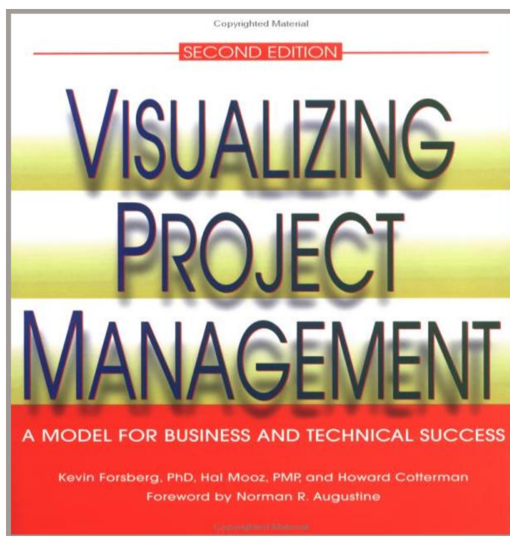
(Click "Browse" to find on your local system the file you wish to upload.
The size of the file should be **less than 100 MB**. The file name should not contain spaces or any of \, |, ^, :, ", %, /, >, <, ?, * characters.)

***Organization:**

NASA --- Center: Select NASA Field Center

6

“Of all project management concepts, lessons learned from prior failures and successes is most neglected” (p 5)



7

LLIS Search -> Which Lessons Might Impact

Quick disconnect for different systems should be designed differently in order to prevent cross-connections

Lessons Learned Information System Summary	
Project Name: Space Craft Element High Pressure Gas Servicing	**Organization:** NE-F2
Project Description:	**Date:** 7/25/2008

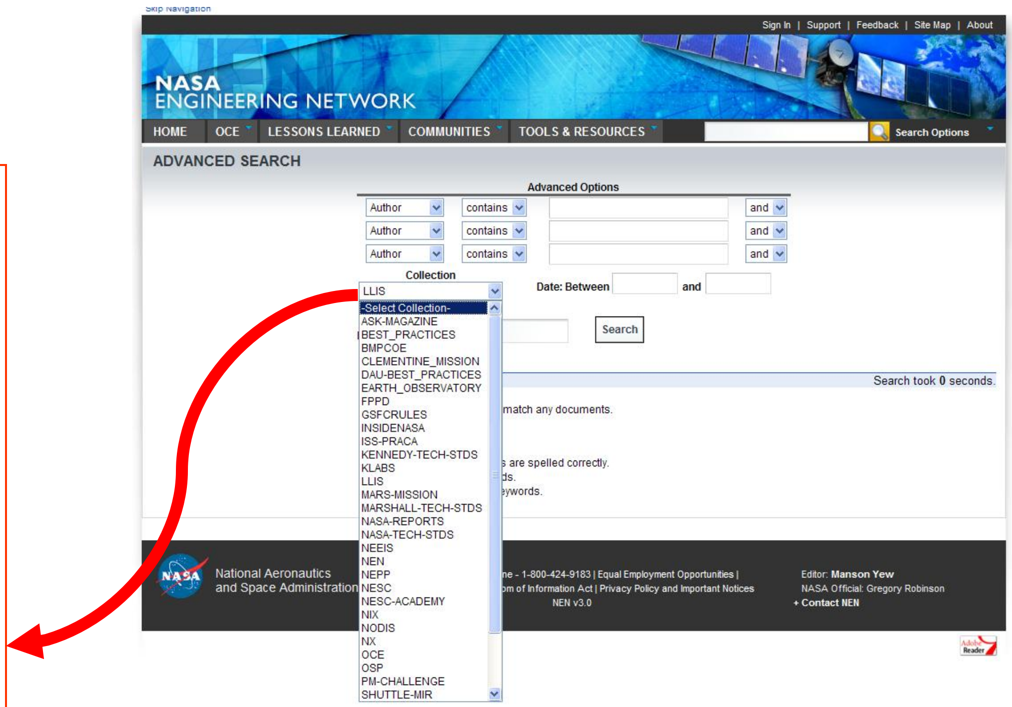
Title	LLIS Information		Search Term(s)	Summary of Event	Relevant Recommendations
Gravity Probe-B Nitrogen Contamination Mishap Investigation Final Report	Number	1041	ghe	Gaseous nitrogen (GN2) was inadvertently used instead of gaseous helium (GHe) to service the Gravity Probe-B guard tank vent line. Since the tank temperature was much lower than the freezing point of nitrogen, significant blockage of the vent line with frozen nitrogen occurred.	Different gases should be separated from one another and easily identifiable
	Date	10/15/2001	gn2		Gases should be traceable and accountable to prevent unintended changes
	Organization	MSFC			
	Submitter(s)	Robert B. Goss			
LH2 Quick Disconnects	Number	0111	gn2	Quick disconnects for the Space Shuttle main engine drying/purge lines are identical to those for the main propulsion system LH2 prepressurization system.	Quick disconnects for different systems should be designed differently in order to prevent cross-connection
	Date	8/27/1992			
	Organization	KSC			
	Submitter(s)	David Pennington			
Breakout Boxes	Number	0075	gn2	Three breakout boxes were knocked off the orbiter aft compartment entrance platform, damaging flight hardware.	Protective hold locations should be provided for hand portable equipment
	Date	5/2/1992			Hand portable equipment should be equipped with eyelets for tethering
	Organization	KSC			
	Submitter(s)	David Pennington			
GOX Vent Arm Air Receivers Bleed Manifold Venting Operations	Number	0138	gox		Vents should be equipped with mufflers to reduce noise levels below OSHA thresholds, if necessary
	Date	9/25/1992			
	Organization	KSC			
	Submitter(s)	Lisa L. Musgrave			
High Pressure Incident	Number	0587			... pressure systems should be trained on high pressure gas ...ar with the system they are operating
	Date	5/13/1998			...s for flight hardware processing equipment should be
	Organization	KSC			
	Submitter(s)	Lisa Grace Kestel			
Pressure Systems, Galvanic Corrosion, Rupture, Explosion	Number	0315			...ystems should be properly treated to limit corrosion
	Date	10/20/1993	pneumatic	A leak from an underground GH2 line resulted in an explosion. The leak occurred when high pressure gas was applied to a pipe that was thinner than expected due to galvanic corrosion.	Proof pressure testing should be used to recertify pressure systems
	Organization	MSFC			
	Submitter(s)	Margo White			

Lessons learned are important to future programs, projects, and processes because they show insights from previous projects

NEN Search Across Multiple Repositories (45)

- ASK-MAGAZINE (ASK-MAGAZINE)
- Best Practices (NASA Best Practices for Design and Test)
- BMPCOE (Best Manufacturing Practices Center of Excellence)
- Clementine Mission (Clementine Mission Lessons Learned)
- Earth Observing (Earth Observing - Earth Observing-1 Baseline Lessons Learned)
- ESH-DOE (Society of Effective Lessons Learned Sharing hosted by the Department of Energy's Environment, Safety and Health
- GSFC-RULES (GSFC Open Learning System Rules)
- INSIDENASA (InsideNASA)
- ISS-PRACA (Problem Reporting and Corrective Action System)
- KLABS (NASA Office of Logic Design Digital Engineering Lessons Learned)
- ***LLIS (Lessons Learned Information System)***

NEN (NASA Engineering Network)
NEPP (NASA Engineering Parts and Packaging)
NESC (NASA Engineering and Safety Center)
NIX (NASA Image Exchange)
NODIS (NASA Online Directives Information Systems)
NX (NX)
OCE (Office Of The Chief Engineer)
OSP (Orbital Space Plane Lessons Learned)
POLARIS (Program/Project Online Library And Resource Information System) SOFTWARE (Software Process Asset Library)
SSP-PRACA (Space Shuttle Program - Problem Reporting and Corrective Action System)
STI (Scientific and Technical Information)
SYSTEM-ENG (System Engineering Collection)
TECHDOC (Techdoc contains technical documentation)



List supporting document, such as reports, procedures or standards or NPRs

Lessons Learned Entry: 3197 Proof-Load Testing of Ground Support Equipment (GSE) Platforms, Slings, and Handling Fixtures Versus Rated Load Testing

Lesson Info:

- **Lesson Number:** 3197
- **Lesson Date:** 2010-05-26
- **Submitting Organization:** KSC
- **Submitted by:** Annette Pitt
- **POC Name:** Alan Baldwin
- **POC Email:** alan.j.baldwin@usa-spaceops.com
- **POC Phone:** 321-861-7034

Abstract:

For many years Ground Support Equipment (GSE) was periodically proof loaded based on NSTS 08171, Operations and Maintenance Requirements and Specifications Documents (OMRSDs) File VI requirements. This caused premature wear of components, decreased safety, and increased time to perform maintenance. Reliability Centered Maintenance (RCM) methodology was used to determine optimum maintenance tactics for GSE and flight assets.

Description of Driving Event:

During Orbiter Processing Facility (OPF) open bay periods the Orbiter Maneuvering System (OMS) pod handling fixture was proof loaded to 20,000 lbs. This required extensive setup, working at heights, working with suspended loads, and the setup of safety clears for two days. The 20,000-lb weights were raised to the handling fixture and then transferred from the crane hook to the handling fixture. The load was then translated full travel path both east and west. Any type of a failure at this point would have caused extensive damage.

Lesson(s) Learned:

Annual proof load testing could be replaced with nondestructive evaluation (NDE) inspection of the critical welds. Proof load of GSE can be replaced with visual/NDE inspections and rated load tests. KNPR 8715.3 provides a section for the nonload test of slings and lifting fixtures. In the case of the OMS pod handling fixture, it is 200% of rated load. In most other cases, it is 150%.

Recommendation(s):

Perform a review of test history, maintenance performed, operation history, and design safety to determine the optimum maintenance requirements.

Documents Related to Lesson:

1. KNPR 8715.3, KSC Safety Practices Procedural Requirements
2. NSTS 08171, Operations and Maintenance Requirements and Specifications Documents (OMRSDs)

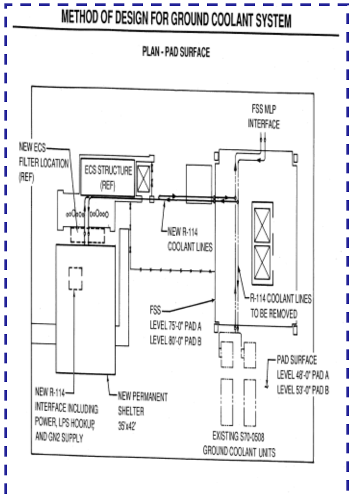
Mission Directorate(s):

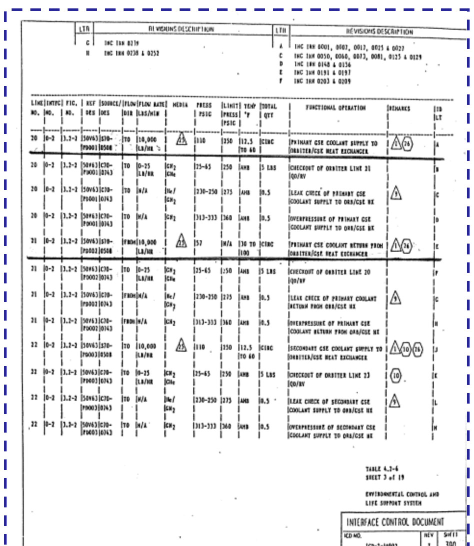
- Space Operations

Additional Key Phrase(s):

- 1.Ground processing and manifesting
- 1.Early requirements and standards definition
- 1.Long term sustainability and maintenance planning
- 1.Engineering design and project processes and standards
- 1.Configuration control and data management
- 1.Maintenance
- 1.Planning of requirements verification processes

Supporting technical reference documentation can be attached / included in the lessons learned entry





LTR	REVISIONS DESCRIPTION
G	INC IRN 0219
H	INC IRN 0238 & 0252
A	INC IRN 0001, 0007, 0017, 0025 & 0027
C	INC IRN 0050, 0060, 0073, 0081, 0125 & 0129
D	INC IRN 0148 & 0136
E	INC IRN 0191 & 0197
F	INC IRN 0203 & 0209

LINE NO.	INTFC NO.	FIG. NO.	REF DES	SOURCE/ DES	FLOW DIR	FLOW RATE LBS/MIN	MEDIA	PRESS PSIG	LIMIT PRESS PSIG	TEMP °F	TOTAL QTY	FUNCTIONAL OPERATION	REMARKS	ID LT
20	0-2	3.2-2	50V63 P0001	S70-0508	TO	10,000 LB/HR	△	110	350	12.5 TO 60	CIRC	PRIMARY GSE COOLANT SUPPLY TO ORBITER/GSE HEAT EXCHANGER	△1 26	A
20	0-2	3.2-2	50V63 P0001	C70-0743	TO	0-25 LB/HR	GN_2 GHe	25-65	250	AMB	5 LBS	CHECKOUT OF ORBITER LINE 21 QD/HV		B
20	0-2	3.2-2	50V63 P0001	C70-0743	TO	N/A	He/ GN_2	230-250	275	AMB	0.5	LEAK CHECK OF PRIMARY GSE COOLANT SUPPLY TO ORB/GSE HX	△9	C
20	0-2	3.2-2	50V63 P0001	C70-0743	TO	N/A	GN_2	313-333	360	AMB	0.5	OVERPRESSURE OF PRIMARY GSE COOLANT SUPPLY TO ORB/GSE HX		D
21	0-2	3.2-2	50V63 P0002	S70-0508	FROM	10,000 LB/HR	△	57	N/A	30 TO 100	CIRC	PRIMARY GSE COOLANT RETURN FROM ORBITER/GSE HEAT EXCHANGER	△1 26	E
21	0-2	3.2-2	50V63 P0002	C70-0743	TO	0-25 LB/HR	GN_2 GHe	25-65	250	AMB	5 LBS	CHECKOUT OF ORBITER LINE 20 QD/HV		F
21	0-2	3.2-2	50V63 P0002	C70-0743	FROM	N/A	He/ GN_2	230-250	275	AMB	0.5	LEAK CHECK OF PRIMARY COOLANT RETURN FROM ORB/GSE HX	△9	G
21	0-2	3.2-2	50V63 P0002	C70-0743	FROM	N/A	GN_2	313-333	360	AMB	0.5	OVERPRESSURE OF PRIMARY GSE COOLANT RETURN FROM ORB/GSE HX		H
22	0-2	3.2-2	50V63 P0003	S70-0508	TO	10,000 LB/HR	△	110	350	12.5 TO 60	CIRC	SECONDARY GSE COOLANT SUPPLY TO ORBITER/GSE HEAT EXCHANGER	△1 10 26	J
22	0-2	3.2-2	50V63 P0003	C70-0743	TO	0-25 LB/HR	GN_2 GHe	25-65	250	AMB	5 LBS	CHECKOUT OF ORBITER LINE 23 QD/HV	10	K
22	0-2	3.2-2	50V63 P0003	C70-0743	TO	N/A	He/ GN_2	230-250	275	AMB	0.5	LEAK CHECK OF SECONDARY GSE COOLANT SUPPLY TO ORB/GSE HX	△9	L
22	0-2	3.2-2	50V63 P0003	C70-0743	TO	N/A	GN_2	313-333	360	AMB	0.5	OVERPRESSURE OF SECONDARY GSE COOLANT SUPPLY TO ORB/GSE HX		M

TABLE 4.2-6
SHEET 3 of 19

ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM

INTERFACE CONTROL DOCUMENT
ICD NO. ICD-2-1A002 REV J SHEET 390

Lessons Learned Entry 2736 Ground Cooling Reliability and Operating Stability Design Enhancement

Lesson Info:

- **Lesson Number:** 2736
- **Lesson Date:** 2010-04-22
- **Submitting Organization:** KSC
- **Submitted by:** Annette Pitt
- **POC Name:** Matthew Craycraft
- **POC Email:** matthew.c.craycraft@nasa.gov
- **POC Phone:** 321-861-3876

Abstract:

The Space Shuttle Orbiter rejects heat from onboard electrical equipment, crew members, and other sources to an independent ground refrigerant loop through an onboard heat exchanger. Ground-provided umbilicals that separate from the spacecraft at launch provide primary loop single-phase coolant to the onboard heat exchanger from the circulation unit located at the base of the launch pad. The collected heat is in turn rejected from this primary coolant loop to a secondary two-phase refrigerant system. This method of heat rejection proved to be unreliable and difficult to control for the ground cooling system operator because the spacecraft heat loads varied. A much more stable, reliable system was put in place when a third intermediate loop was implemented into the ground cooling system with a heating element that allowed the refrigerant loop to operate at a constant set point.

Description of Driving Event:

The ground cooling unit was experiencing regular failures, and was consuming many engineering hours identifying and resolving problems. Also, constant vigilance was required because it was difficult for the operator to control to the desired cooling set points.

Lesson(s) Learned:

To reject varying spacecraft heat loads prior to launch, circulate a primary loop single-phase refrigerant through the spacecraft-to-ground heat exchanger while maintaining a constant heat load via a heater on a secondary ground loop to a tertiary two-phase refrigeration loop because that makes a more stable and reliable system for ground-cooling equipment than the previously used variable-load system.

The heaters eliminate mechanical load control devices such as hot gas bypass, cylinder unloaders, and desuperheat, and allow the refrigeration loop to operate at one known set point, providing the ability to quickly identify and correct problems.

Recommendation(s):

For ground cooling equipment at the launch pad used to reject varying spacecraft heat loads prior to launch, circulate a primary loop single-phase refrigerant through the spacecraft-to-ground heat exchanger while maintaining a constant heat load via a heater on a secondary ground loop that rejects heat to a tertiary two-phase refrigeration loop operating at a single set point.

Evidence of Recurrence Control Effectiveness:

Not Applicable

Documents Related to Lesson:

Click here to download Ground Coolant Design Presentation 1990
Click here to download Ground Coolant System Presentation 1991
Click here to download Ground Coolant Presentation 1993
Click here to download Ground Coolant System Reliability Improvement Study

Mission Directorate(s):

- Space Operations
- Exploration Systems

Additional Key Phrase(s):

- 1.Launch support systems
- 1.Orbiting Vehicles
- 1.Launch Systems

Additional Info:

- **Project:** Space Shuttle Orbiter

Enabling Collaboration

From: "Whittlesey, Albert C" <albert.c.whittlesey@jpl.nasa.gov>
Date: Fri, 3 Oct 2008 08:27:58 -0700
To: "Oberhettinger, David J" <david.j.oberhettinger@jpl.nasa.gov>
Subject: Re: Subscription Notification: New Documents Available on the NASA Engineering Network

David,

Thanks for sending the item.

The Lesson Learned system, as I have complained about in the past, has taken all useful information out of it and the words printed in the LL have no value to me whatsoever. It has as much value to me as saying that the sun rises in the East. I believe even managers would find the words in there to be obvious and adding no value to their knowledge base.

However, it does have the name and telephone number contact of the cognizant individual.

I called Dale Force at GRC and it was then that I got a very nice and useful story. I'm happy.

Thanks again.

Albert
x4-3497
------ Forwarded Message
From: <nen-subscriptions@etouch.net>
Date: Sat, 27 Sep 2008 17:35:48 -0700
To: "Oberhettinger, David J" <david.j.oberhettinger@jpl.nasa.gov>
Subject: Subscription Notification: New Documents Available on the NASA Engineering Network

<http://www.nasa.gov>
New Document Notification

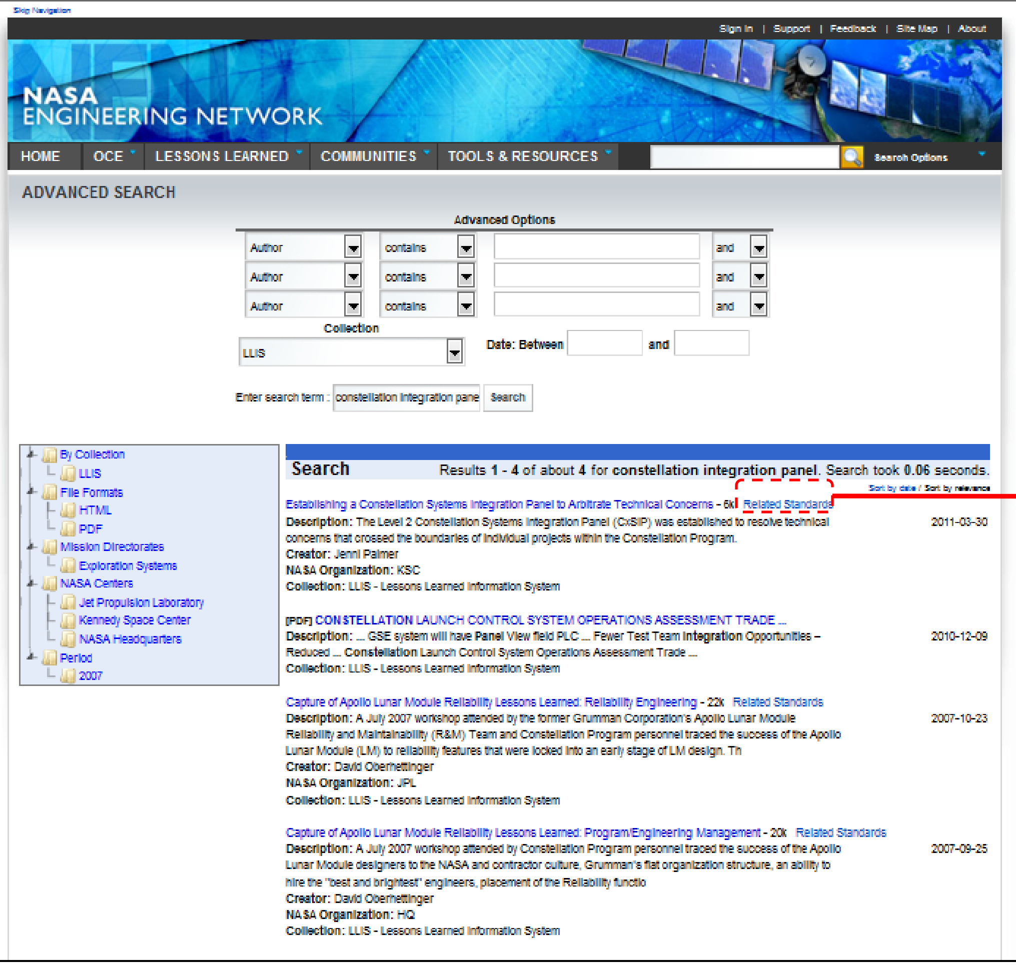
The NASA Engineering Network has added the following document(s) which match your subscription. If you would like to change your subscription, please visit: http://insidenasa.nasa.gov/portal/site/llis and log-in with your user account.

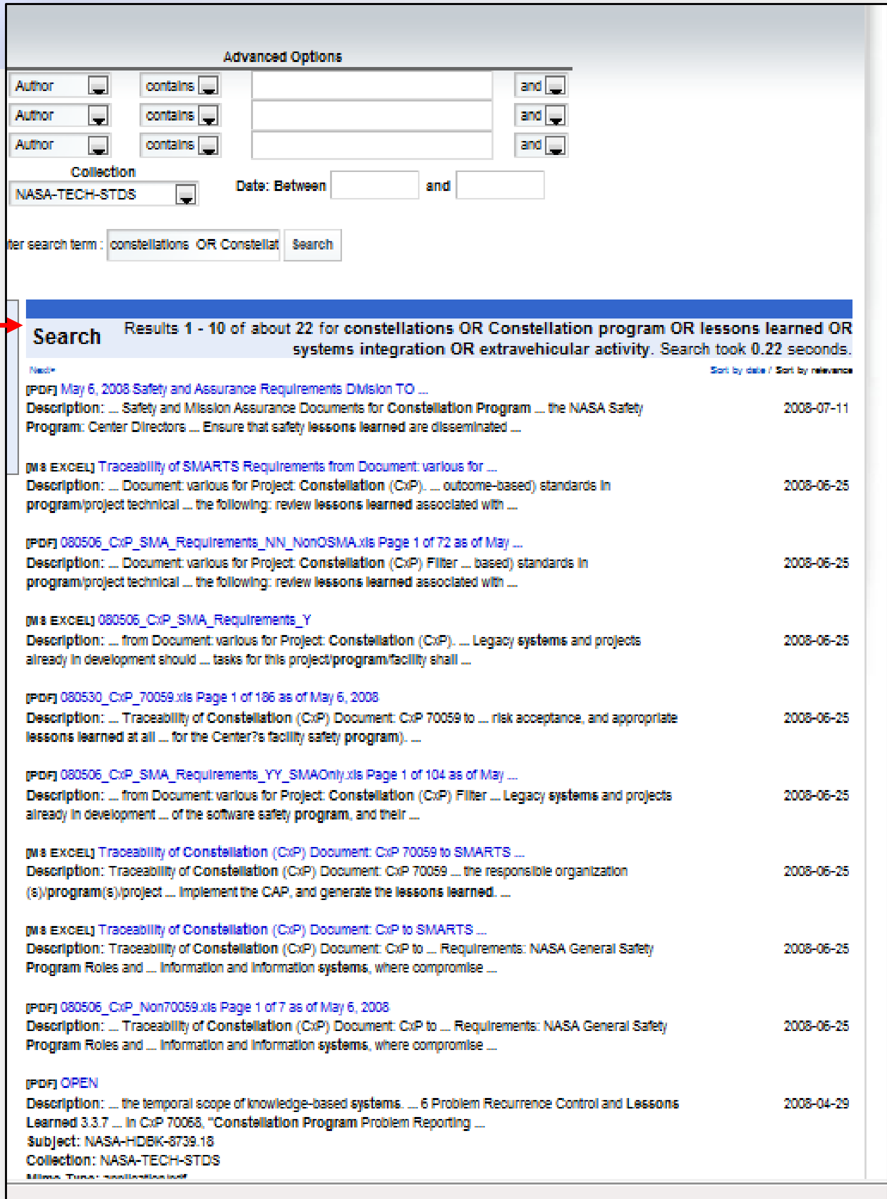
Category: **NASA Centers/Glenn Research Center**

Document: **External filter needed to achieve low EMI from TWTA (Lessons Learned Entry: 1864)** <http://nen.nasa.gov/llis_content/imported_content/lesson_1864.html>

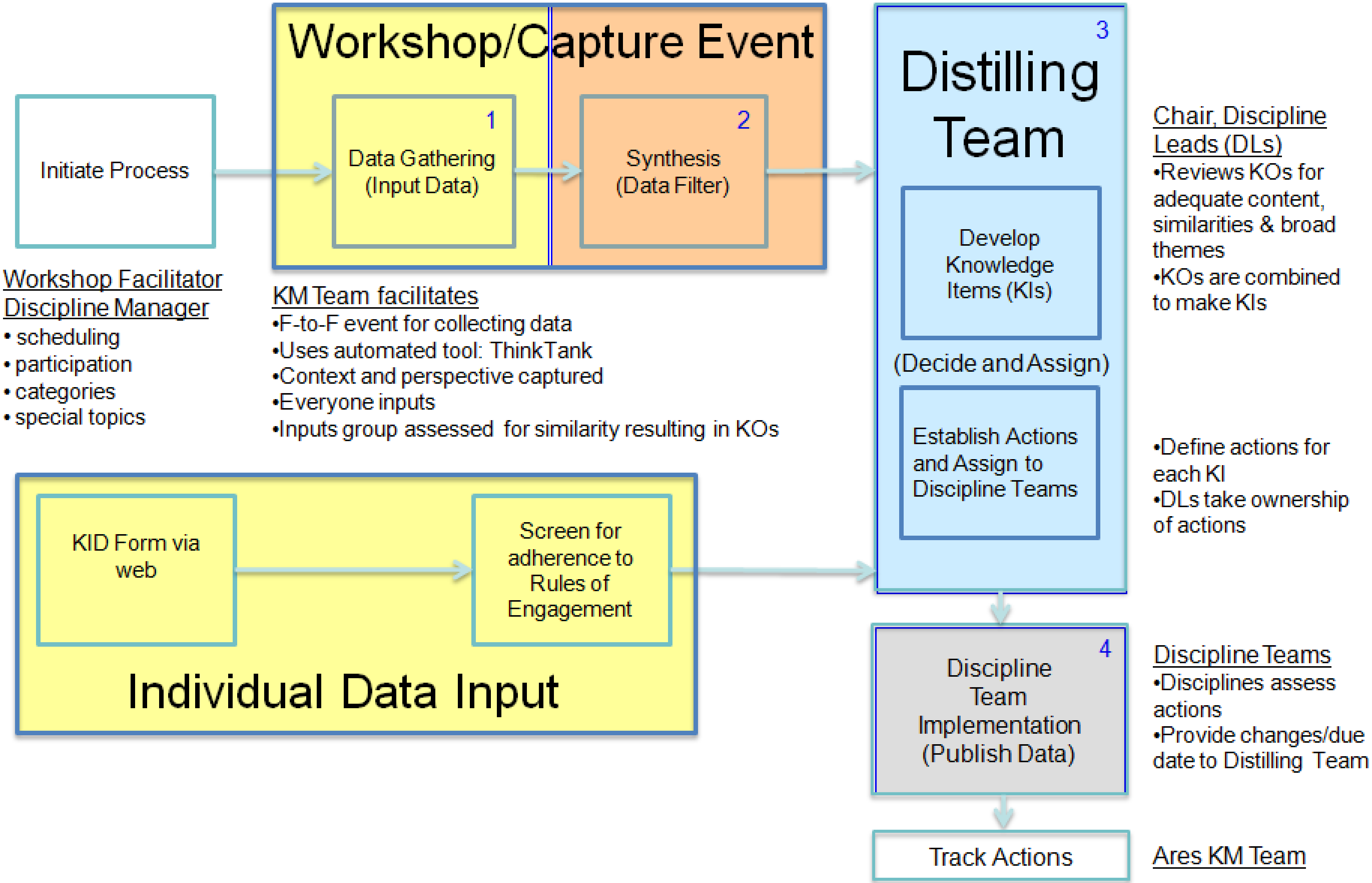
For help, please contact nen-admin@etouch.net

Dynamic Link to NASA Standards



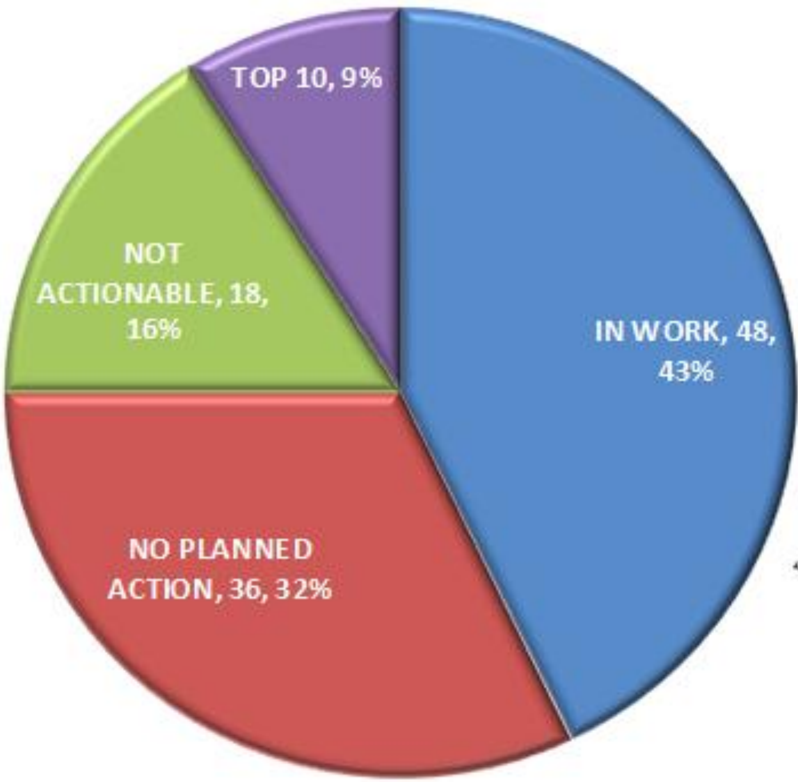


Ares KM Approach



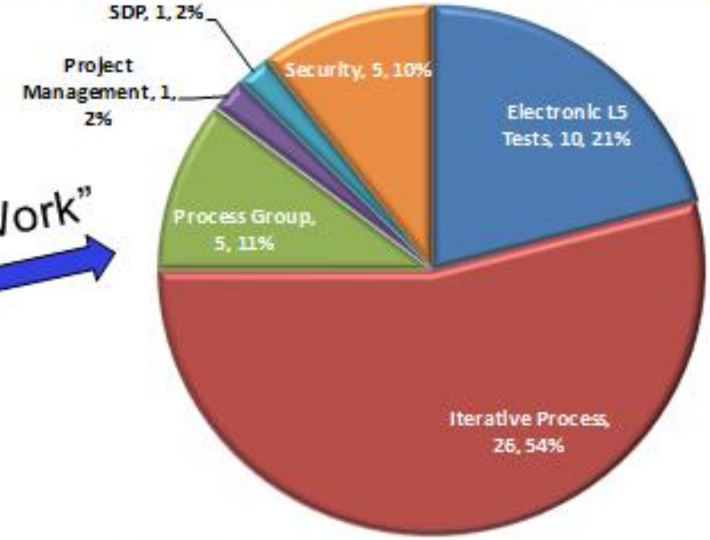
Build 10-1 Lessons Learned - Summary

- **Total Submitted: 112**

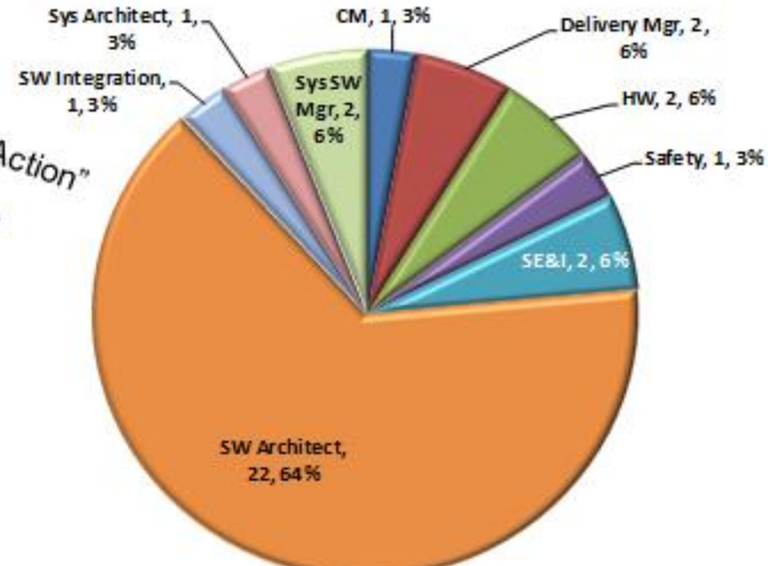


"In-Work"

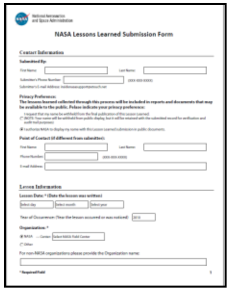
These Lessons Learned appear to be addressed in processes currently In-Work.

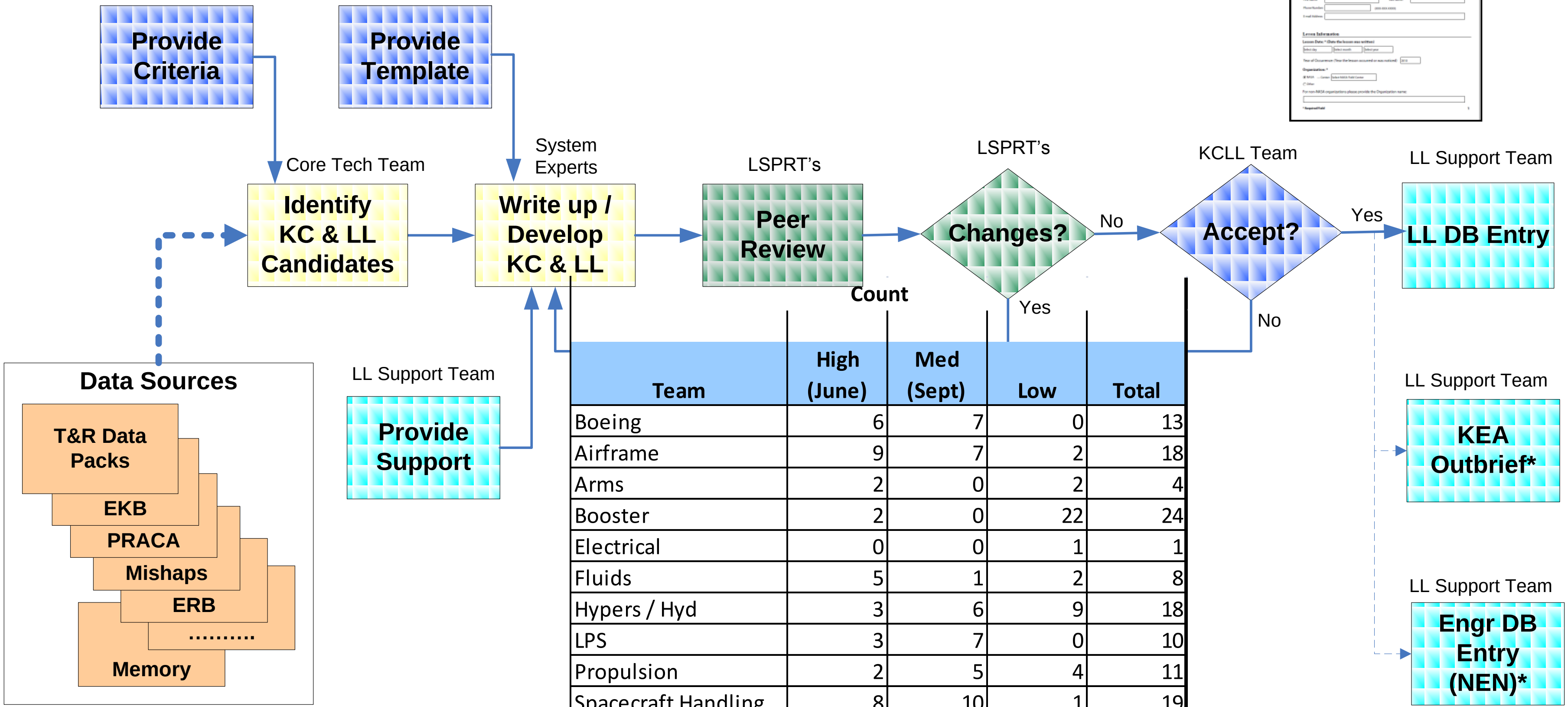


"No Suggested Action"



KSC Shuttle Ground Ops
Lessons Learned Collection Process





Count

Team	High (June)	Med (Sept)	Low	Total
Boeing	6	7	0	13
Airframe	9	7	2	18
Arms	2	0	2	4
Booster	2	0	22	24
Electrical	0	0	1	1
Fluids	5	1	2	8
Hypers / Hyd	3	6	9	18
LPS	3	7	0	10
Propulsion	2	5	4	11
Spacecraft Handling	8	10	1	19
Structures	1	9	11	21
Veh Inst / Elec	6	13	0	19
Vehicle Conditioning	4	10	4	18
Totals	**51** (June)	**75** (Sept)	**58** (Future)	**184**

A lesson learned entry
1) pertains to safety or mission success
2) is likely to be relevant to other projects
3) does not duplicate an existing lesson learned

Lessons Learned Entry: 1727 Diffusion Confusion: Achieving Process Control Given Complex Networks of Suppliers

Lesson Info:

- **Lesson Number:** 1727
- **Lesson Date:** 0-04-14
- **Submitting Organization:** JPL
- **Submitted by:** Thuykien Nguyen
- **POC Name:** Jon Cowart
- **POC Email:** jon.n.cowart@nasa.gov
- **POC Phone:** 321-861-3042

Abstract:

A video clip lesson learned on the topic of Process Control. The Shuttle External Tank (ET) employs a diffuser to control the uniform dispersal of gases used to maintain positive pressure as the level of liquid oxygen and liquid hydrogen drop after launch. An unacceptable material substitution by a sub-tier vendor was discovered that affected a number of diffusers already installed on ETs, including one on the tank mated to Discovery for the Return-to-Flight mission. Effective process control assures that guidelines are followed and that mission-critical products are created the same way every time. This 4-minute, 48-second video is a product of the Space Shuttle Program and its Process Control Focus Group.

Description of Driving Event:

Click here to view the lesson learned video.

Lesson(s) Learned:

When spaceflight programs employ a complex network of suppliers, an unacceptable material substitution by a sub-tier vendor may not be detected until a component is already installed.

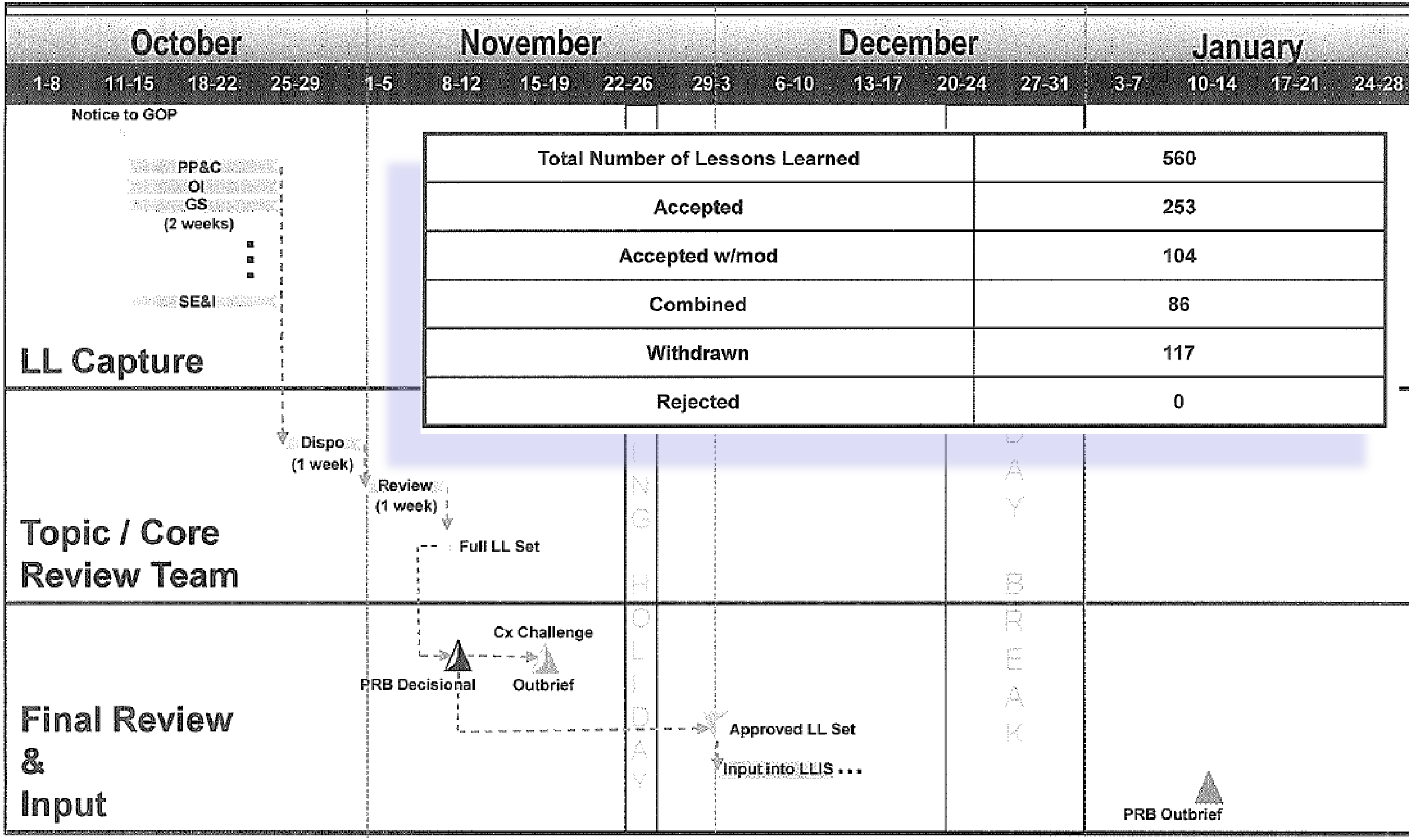
Recommendation(s):

Give special attention to process control and verification for completed assemblies that are acquired through complex supplier relationships that involve multiple tiers and multiple sources at the same tier.

Additional Key Phrase(s):

- Program Management.
- Program Management.Acquisition / procurement strategy and planning
- Program Management.Communications between different offices and contractor personnel
- Engineering Design (Phase C/D).
- Engineering Design (Phase C/D).Launch Systems

Constellation GOP Lessons Capture



Total Number of Lessons Learned	560
Accepted	253
Accepted w/mod	104
Combined	86
Withdrawn	117
Rejected	0

What's Next?

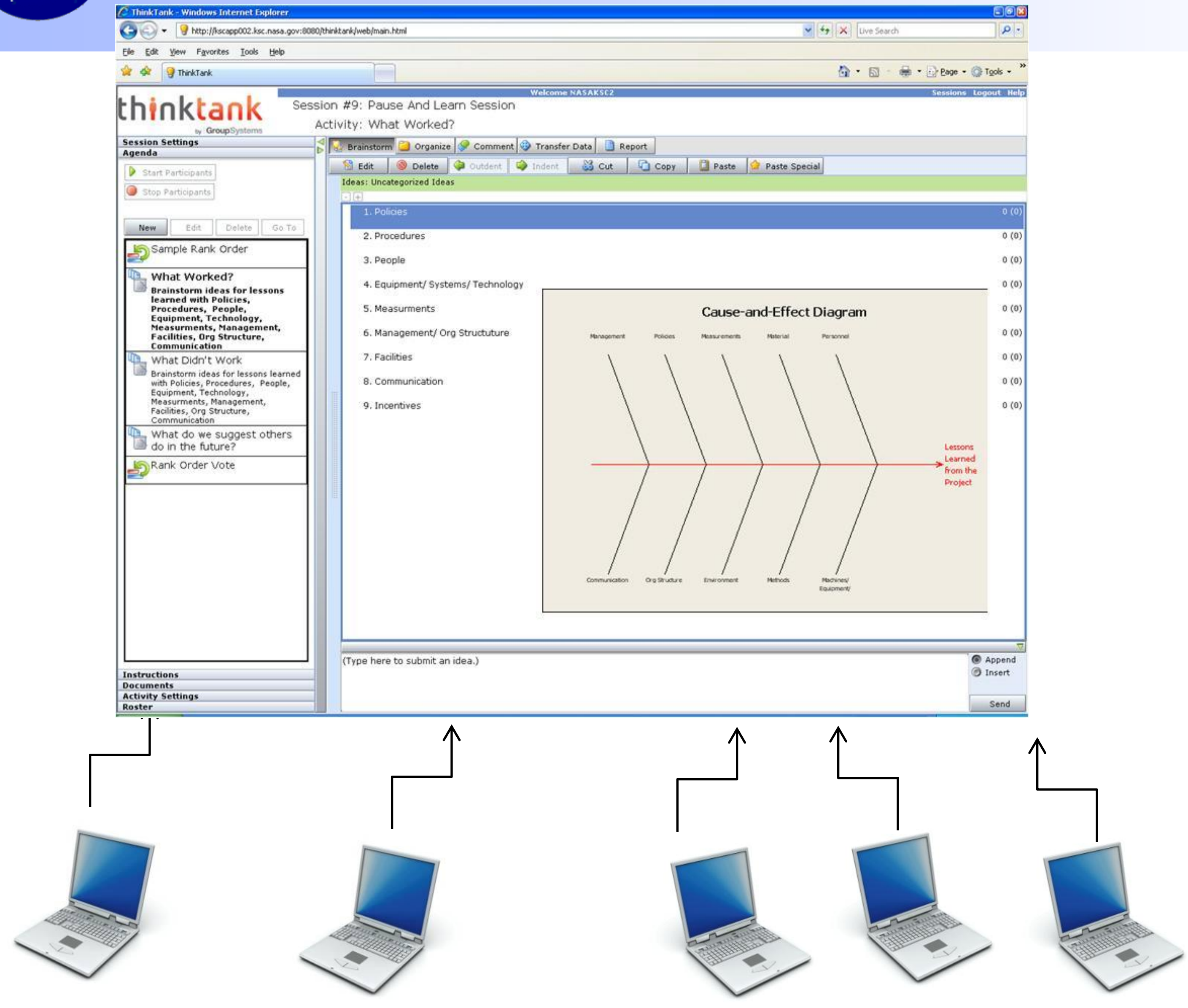
- **Now that a significant amount of new entries are in the process of being added from the Space Shuttle Grounds Ops project and Constellation Ground Ops, *data mining* could potentially uncover;**
  - ❑ **Associations between entries and discover novel /unidentified patterns.**
  - ❑ **Understand how lessons are clustered together with other associated terms**
  - ❑ **Analyze trends or themes that have design implications for the new flight projects**

Knowledge sharing is critical to NASA's success. The NASA Lessons Learned Program enables the agency's workforce to find and share knowledge easily and broadly, enabling project teams to learn from one another's on-the-job experiences and recommendations for managing and mitigating project risk.

" Some of the best lessons we ever learn are learned from past mistakes. The error of the past is the wisdom and success of the future."

-Dale Turner

Think Tank Session: Electronic After Action Review Brainstorming



Lesson Components

The date this lesson occurred

A person who would know about this lesson

Includes part of: the event leading to lesson, the lesson,

Describe the situation leading to the Lesson

What did you learn from this experience?

What do you suggest to others to do in the future?

Policy or procedure that was changed

Lessons Learned Entry: 1779

Lesson Info:

- Lesson Number: 1779
- Lesson Date: 2007-5-8
- Submitting Organization: KSC
- Submitted by: Michael Bell
- POC Name: Wayne Kee
- POC Email: Wayne.M.Kee@nasa.gov
- POC Phone: 321-867-8723

Subject:
Power Outage

Abstract:
A total loss of power at Orsino Substation occurred at 12:06 pm on Friday March 2, 2007. The power loss affected all facilities south of Schwartz Road at Kennedy Space Center, except the Assembly and Refurbishment Facility (ARF). The cause of the power loss was a failure of Florida Power & Light (FPL) 115KV line feeding the Orsino Substation. FPL arrived at 1:08 pm and rerouted the power and restored service to the Orsino Substation at 1:36 pm. All infrastructure systems came online as expected with no anomalies. Personnel affected by the power outage were released on Administrative leave.

Description of Driving Event:
The cause of the power loss was a failure of Florida Power & Light (FPL) 115KV line feeding the Orsino Substation.

Lesson(s) Learned:

1. Employees were not familiar with the long-standing policy and procedure for evacuating employees with disabilities as described in the Consolidated Comprehensive Emergency Management Plan (CCEMP), JDP-KSC-P-3001.
2. Practical usage of National Incident Management System (NIMS) is needed above training curriculum. Also, the command and control structure changes from the Center Director to the Incident Commander.
3. Personnel should be placed on administrative leave when there is an uncertainty of loss of power duration.
4. Identify facilities that have internal battery operated fire alarm paging systems and utilize these systems to make announcements in the affected areas.

Recommendation(s):

1. NIMS Training will continually be emphasized to our emergency responders at all levels. Follow the National Incident Management System (NIMS) adopted in the CCEMP.
2. Personnel should be placed on administrative leave when there is an uncertainty of loss of power duration. Contributing factors to personnel dismissal: Emergency lighting (only lasting 60-90 minutes during power loss), total darkness in facilities and loss of air conditioning without any backup.
3. Supply PAWS with battery back-up.
4. Adverse weather conditions must be written into appropriate policy especially when personnel egress facilities during emergencies.
5. Assure appropriate emergency lighting sources in stairwells and hallways are available with backup.

Evidence of Recurrence Control Effectiveness:
N/A

Documents Related to Lesson:
KSC Lessons Learned Industrial Area Power Outage, Tech Doc # 07_04_04_S_LLPOWER
Consolidated Comprehensive Emergency Management Plan, (CCEMP) JHB 2000, Rev D
Warning, Alerting and Evacuation, JDP-KSC-P-3001
Fire Response, JDP-KSC-P-3003
Loss of Utilities, JDP-KSC-P-3012

Mission Directorate(s):

- Space Operations

Additional Key Phrase(s):

- Additional Categories. Emergency Preparedness
- Additional Categories. Facilities
- Additional Categories. Fire Protection

Additional Info:

- Project: Emergency Preparedness Program

Approval Info:

- Approval Date: 2007-07-26
- Approval Name: ghenderson
- Approval Organization: HQ

Developing a Lessons Learned

- A successful experience (brightspots, useful workarounds or solutions) on the project. When, where, what phase, how did they occur?
- A problem or challenge on the project (technical gliches, communication gaps, testing overlooked) When, where, what phase, how did they occur?
- What would you recommend to others based on this experience? (Best practices, new process steps, templates, new methods)