Integrated Risk and Knowledge Management for Exploration

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Introduction

Objective: Introduce and discuss real work process improvements that utilize organizational management innovations and leverage existing ESMD information technology resources

Customer: The ESMD civil servants and contractor work force

Goal: No nonsense, straight-up, “Real Deal” approaches to make your job more fun and make you more effective

- Work more effectively and efficiently
- Make better – more risk informed decisions
- Manage risks in a proactive fashion

Not another burdensome management / administrative demand on your time …….. This stuff will save you time !

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Why Integrate Risk and Knowledge Management?

Designing a complex architecture of hardware, software, ground and space-based assets to return to the Moon and then go on to Mars will require:

1) an effective strategy to learn from past lessons, and
2) a set of inter-related practices to generate and share knowledge for reuse as we progress forward. ESMD risk and knowledge management communities have embarked on an effort to integrate risk and knowledge management (KM) over the lifecycle of the Constellation and Advanced Capabilities Programs using a set of inter-related strategies, which include:

Practice 1: Establish *Pause and Learn* Processes

Practice 2: Generate and Infuse Knowledge-Based Risks (KBRs)

Practice 3: Establish Communities of Practice (CoP)

Practice 4: Provide Knowledge Sharing Forums

Practice 5: Promote Experienced-Based Training

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ESMD and Stealth KM

"Knowledge-enabling processes (i.e. process improvement) will lay a solid KM foundation for future organizational evolution and help align KM with business-based goals and objectives

Improving processes also provides an opportunity to deploy supporting KM tools and techniques such as collaboration or CRM software and processes – this can give important momentum to knowledge workers, and can help them to work in a more holistic and community-based way

Bottom-line: **Process evolution equals culture evolution"**

Niall Sinclair
Author of Stealth KM

Practice 1: Pause and Learn

"The Need to Pause, Reflect, and Learn"

PaL is modeled after the Army After Action Review (AAR) system by Dr. Ed Rogers KM Architect at the GSFC.

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.

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

Attributes of a PaL

Informal, facilitated roundtable discussion (1/2 hour to full day)
- Includes moderator and rapporteur
- Focuses on tasks and goals that were to be accomplished

Not for attribution
- Does not judge success or failure (not a critique)
- Encourage employees to surface lessons

Focused on particular area of project life (phase and function)
- Management PaL, Technical PaL, Conceptual PaL, et. al.
- Team participation may vary, depending on PaL focus and objective

Maximizes participation
- Primary benefactors are the ***participants themselves***
- More project activity can be recalled and more lessons shared

Must be conducted *inside a project's schedule*, not outside or later
- Recall of key details more likely and insights can be immediately applied
- Affirms learning as integral part of project life cycle

PaL as a Process

Step 1
- Identify when PaLs will occur
- Determine who will attend PaLs
- Select Moderators, Rapporteurs
- Select potential PAL sites
- Review the PAL plan

Step 2
- Review what was supposed to happen
- Establish what happened (esp. dissenting points of view)
- Determine what was right or wrong with what happened
- Determine how the task should be done differently next time

Step 3
- Review objectives, tasks, and common procedures
- Identify key events
- Rapporteurs collect *ALL* observations
- Organize observations (identify key discussion or teaching points)

[1] **Adapted from United States Army Manual: A Leader's Guide To After Action Reviews**

Definition

Knowledge-Based Risk *n.* **1.** A risk based on lessons learned from previous experience. **2.** A closed risk with documented lessons learned appended. **3.** A means of transferring knowledge in a risk context.

Lessons Learned on Lessons Learned

- **Start Early**
- **Need to Capture, Learn From and Repeat Successes--Need to Learn from and Prevent Failures, Mishaps, Near Misses**
- **There was a limited number of useful lessons learned in the NASA Lessons Learned Information System database. The good ones are masked by the hundreds of poor ones, so that extensive effort is required to sort them out.**
- **Lesson Learned – Well-understood mechanisms for "transfer of knowledge" during Program development are crucial to a successful long-term Program.**
- **Flow all applicable Lessons Learned into Requirements, Processes, and Plans. Institutionalize the Use of Lessons Learned.**
- **Provide Sufficient Resources, Planning, and Management Support to Analyze and Incorporate Lessons Learned. NASA and Contractor Must Work Together**
- **The best lessons learned for running a major program should be captured in a *living handbook of best practices*. New lessons learned should be screened for applicability, and included in the handbook.**

ESMD Is Taking a New Approach to Lessons Learned…..

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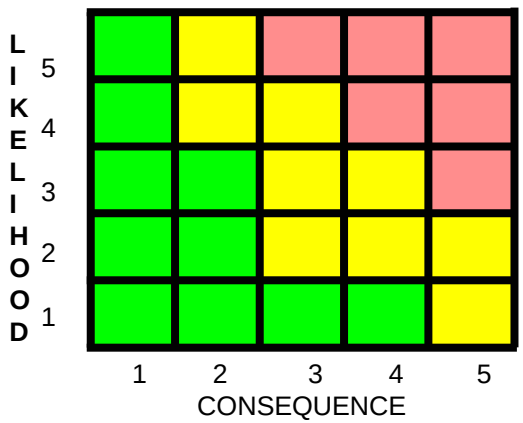
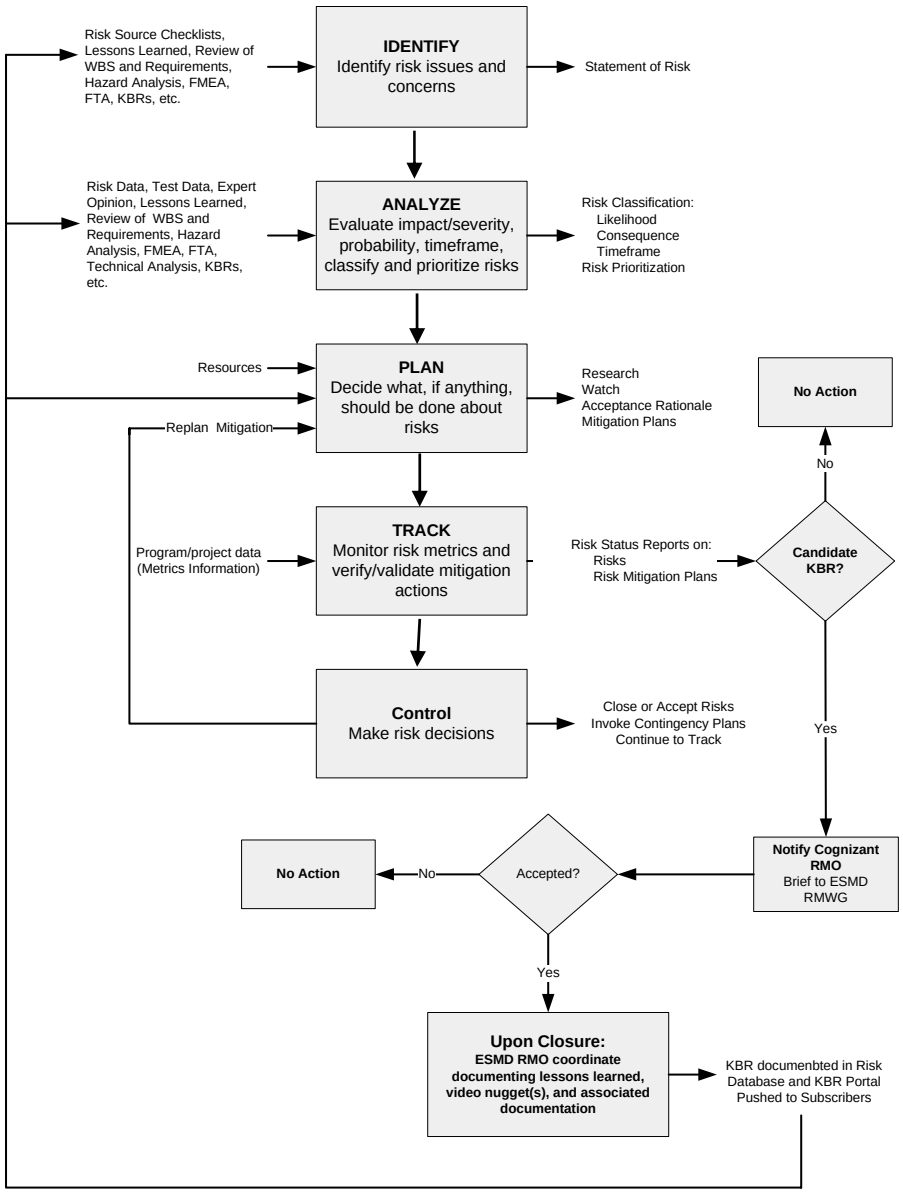
Knowledge-Based Risks Strategy

The ESMD KBR strategy is intended to convey risk-related lessons learned and best practices to ESMD personnel. This strategy integrates the existing Continuous Risk Management (CRM) paradigm used at NASA with knowledge management--with the primary focus on integrating transfer of knowledge through existing work processes and not adding an additional burden to the workforce to incorporate new KM tools and concepts.



KBR Process Flow Chart



- KBRs are documented as a requirement in ESMD Risk Management Plan – this flows down to Levels 2 and 3 (Program and Project) Risk Management Plans
- Leverages Standard Continuous Risk Management (CRM) paradigm
- Adds filtering process for identifying significant risks as KBR candidates
- Captures "What worked – OR – Didn't work in terms of mitigation strategies
- Provides Infusion Process for KBRs Back Into Risk Management and other processes Which current NASA Lessons Learned System lacks

KBR Criteria

Risks that are "Candidate KBRs" should meet several of the following criteria (listed in order of importance):

(1) Were mitigated (not accepted or watched)

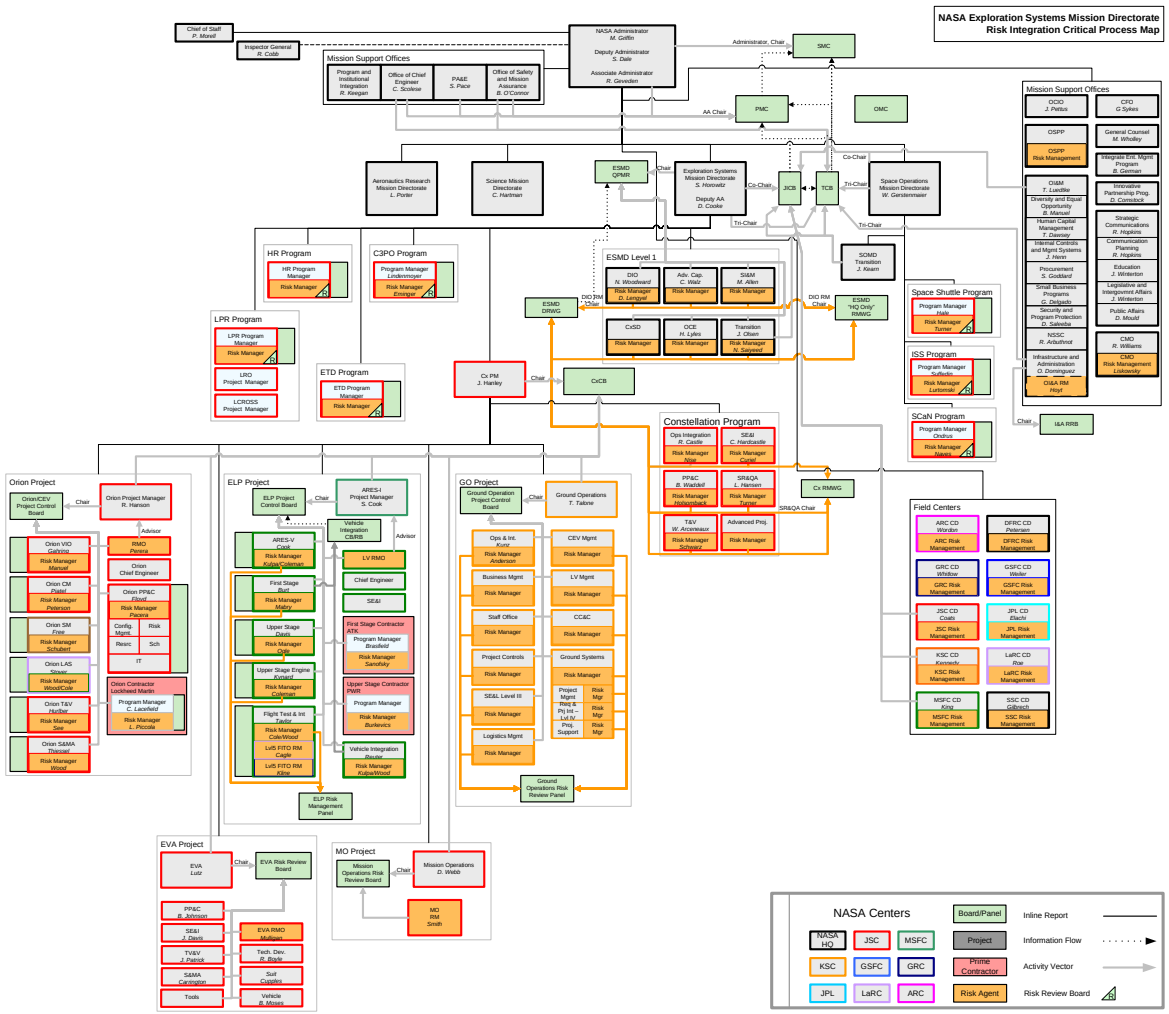
(2) Will likely appear again in other programs / projects

(3) Included a particularly effective mitigation approach / implementation, or an error in mitigation planning or implementation could have been avoided

(4) Was on the performing organization's Top Risk List at some point during the life cycle

(5) Was owned (and/or worked on) by a particularly knowledgeable person who could serve as a "expert" on the risk topic

Application of Risk Management Assurance Mapping



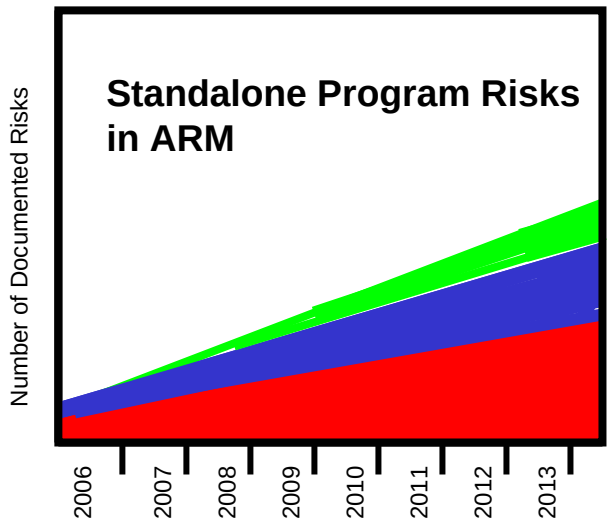
Multiple KBR Capture Points – Multiple Delivery Points

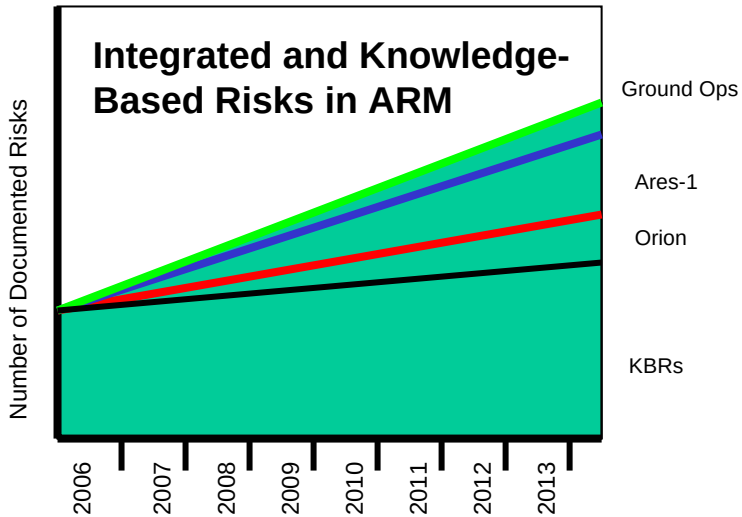
Internal and External to ESMD

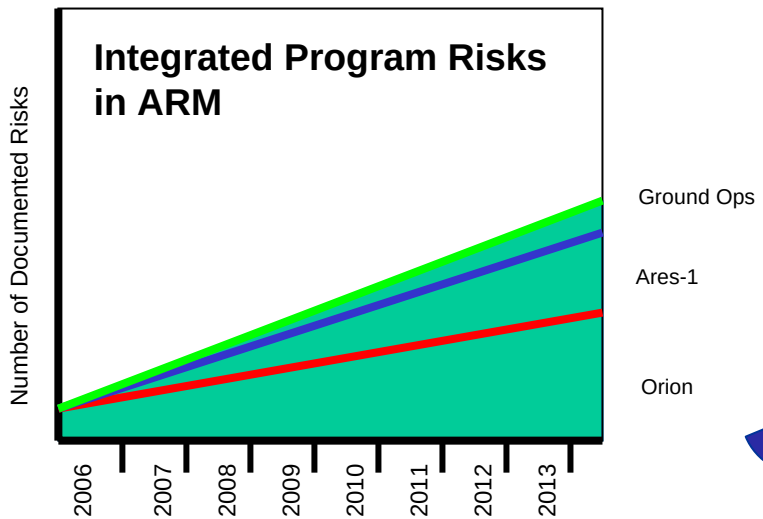
Knowledge-Based Risks (Continued)

More access to risk information is required to close "knowledge gaps"

KBRs will become a living reference over time as risks are identified, mitigated and closed







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Knowledge-Based Risks (Continued)

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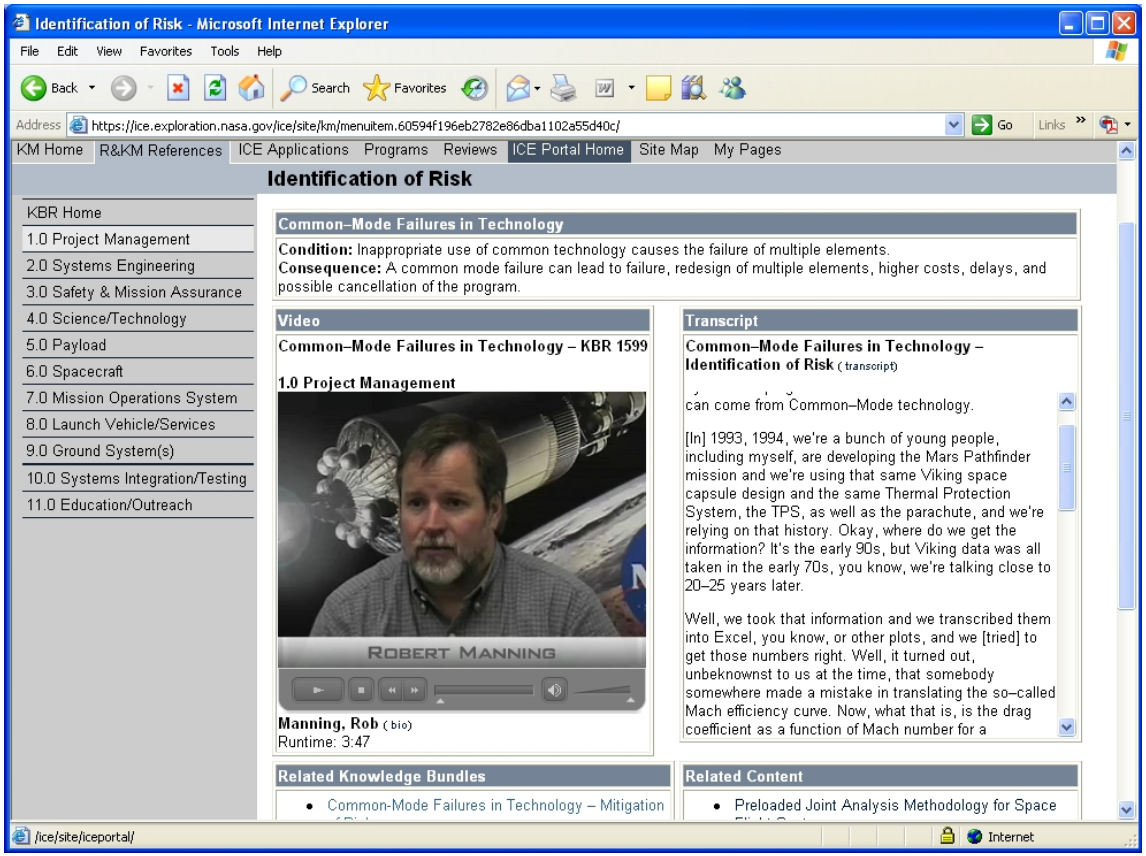


- **Embedded 3-8 min Video Nugget with Transcript**
- **Related Knowledge Bundles**
- **Related Content – reports, documents, etc.**
- **Threaded discussion (blog) feature to be added to comment on each KBR**
- **Hosted on ESMD R&KM portal**

First Closed Risk KBR – Lunar Recon Orbiter

LRO Spacecraft

Delta II Booster

Atlas V Booster

LCROSS Spacecraft

- **The design of the LRO propulsion tanks was influenced by a number of factors including launch vehicle characteristics. The Delta II Expendable Launch Vehicle's (ELV) spin stabilized upper stage made the Nutation Time Constant (NTC) a key parameter in assessing the stability of the spacecraft. The uncertainty in predicting the effects of liquid propellant motions and the relatively large propellant load and mass fraction for the LRO tank resulted in the identification of a potential risk. Close coordination and communication with all levels of management early in the design trade study process allowed for the effective mitigation of the risk and provided additional lunar exploration opportunity.**

Practice 3: Communities of Practice

Knowledge resides with people and is often lost via actions like:

- **Downsizing**
- **Retirements**
- **Shuttle Transition**
- **People Movement**

Participation in a CoP should be considered part of any professional's career growth

Communities of Practice (Continued)

"Communities of Practice (CoP) are groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis"

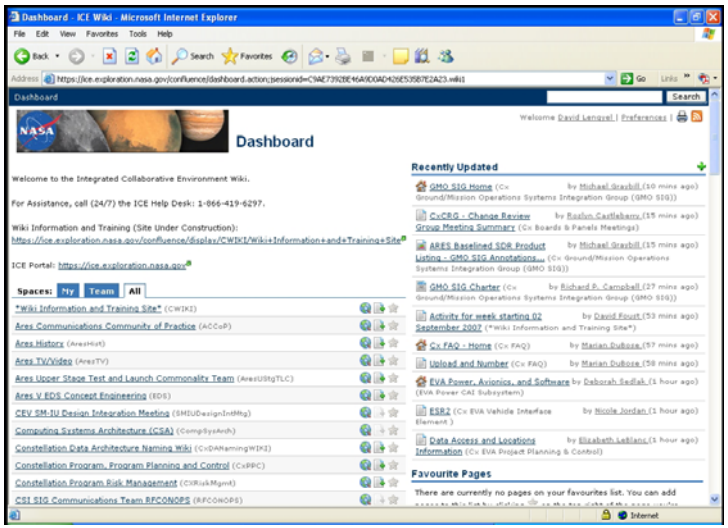
"CoPs share information, insight and advice. They help each other solve problems."

"They may create tools, standards, generic designs, manuals, and other documents—"

"Cultivating CoP in strategic areas is a practical way to manage knowledge as an asset, just as systematically as companies manage other critical assets."

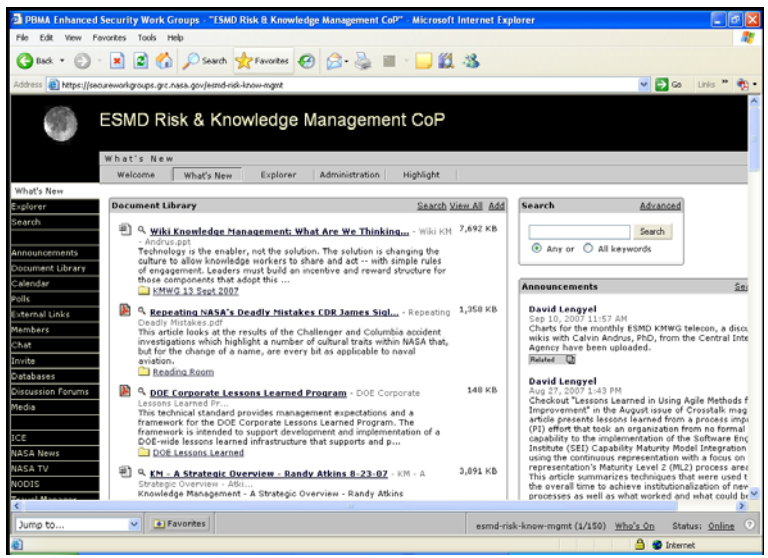
Communities of Practice. Wenger, et al

IT Enabling ESMD CoPs in a Secure Environment



The **Confluence Wiki** provides secure collaborative functionality within the ESMD Integrated Collaborative Environment (ICE). ESMD Wiki spaces now number over 130

The **PBMA toolkit** provides NASA CoPs with a secure environment to share documents, conduct threaded discussions, polls, manage calendars, locate expertise, collaborate and learn. Over 30 ESMD CoPs are serviced by PBMA.



Practice 4: Knowledge Sharing Forums

ESMD Alumni Sharing Events:

- These events bring in alumni from Apollo, Space Shuttle, and other programs to discuss their experiences and lessons learned
- This is an extensive, under-utilized knowledge base
- ESMD has invited selected alumni to brown bag lunches and other lessons learned forums

Knowledge Sharing Workshops and Seminars:

- At Knowledge Sharing Workshops, senior project leaders share their insights, what they learned and what they might have done differently based on a recent project experience.
- These workshops are attended by emerging project leaders who want to understand the wisdom of successful project managers

APPEL Master's Forums:

- Conducted twice annually
- ESMD has and will continue to participate in these events

Practice 5: Experienced-Based Training

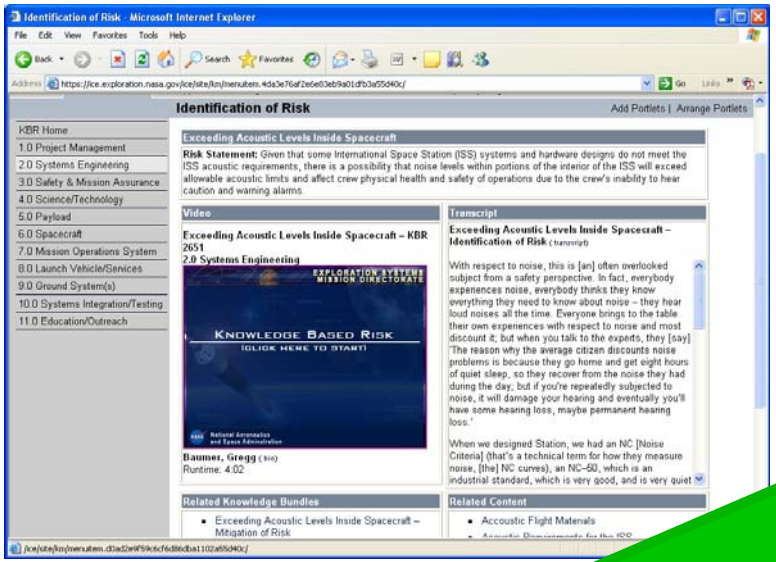
Project Management and Engineering Training

- **Already conducted by APPEL and NESC Academy**
- **ESMD will focus its efforts in training on leveraging the existing infrastructure of training courses throughout NASA**
- **ESMD will help shape existing courses by providing ESMD-related experiences, gleaned from case studies, KBRs, and other sources of lessons**

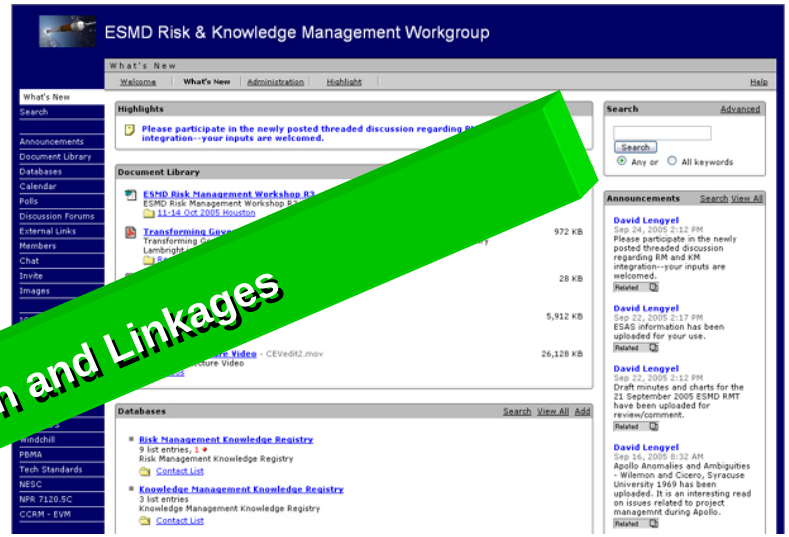
Case Studies

- **ESMD will facilitate the development of case studies that will help transfer the context of program/project decisions to the workforce and emerging leaders**
- **Senior ESMD managers would help shape the content based on their experiences and leadership**
- **Case studies will make existing training programs more relevant and useful to upcoming ESMD leaders who participate**

KM Practices and Tool Integration



Portals



Wikis/CoPs

Rich Integration and Linkages

Engineering / Management Training

Knowledge-Sharing Forums

ESMD Risk & KM Teaming

ESMD is teamed with:

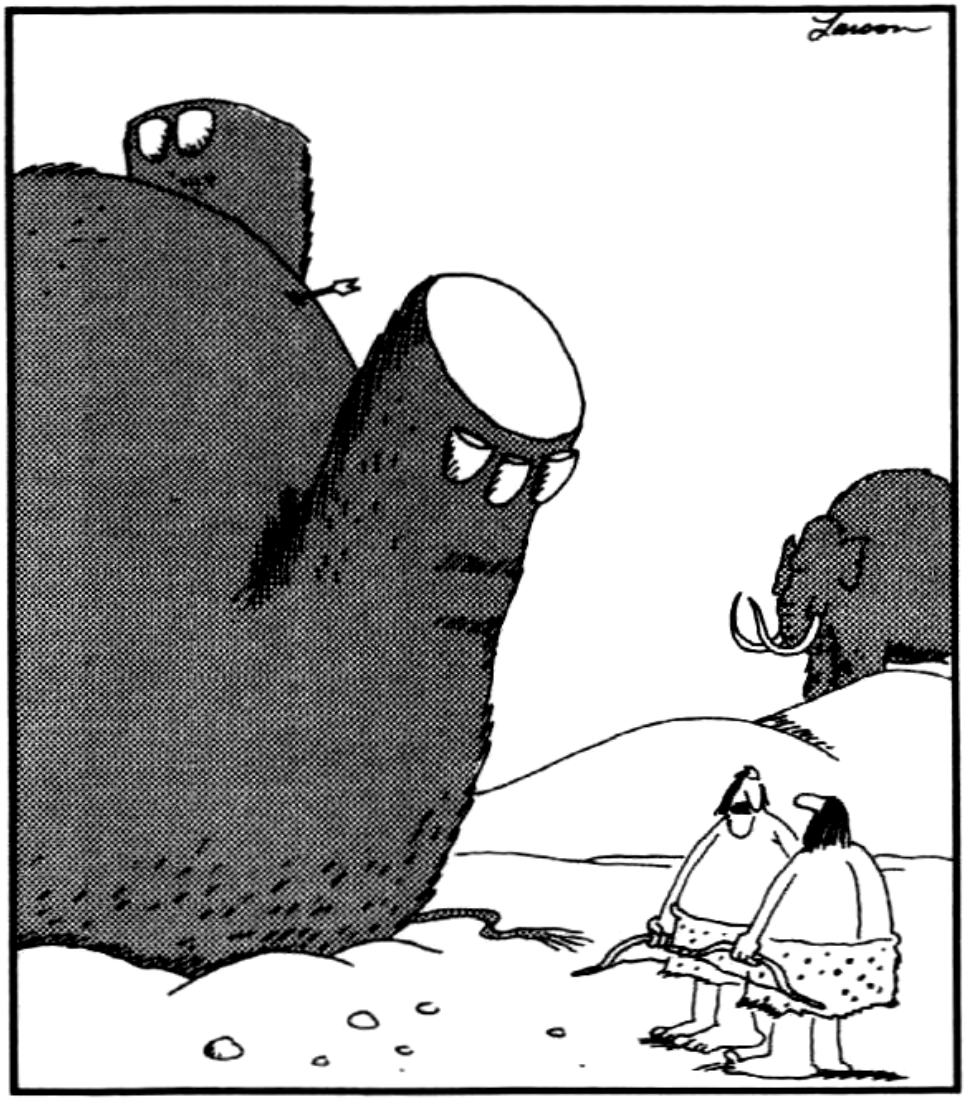
- Space Operations Mission Directorate
- Office of Safety & Mission Assurance
- NASA HQ Institutions & Administration
- Academy of Program / Project & Engineering Leadership
- NASA Engineering & Safety Center (NESC) Academy
- JSC Chief Knowledge Officer
- GSFC Chief Knowledge Officer
- MSFC / Ares Chief Knowledge Officer
- Constellation Program
- ISS Program
- SSP Program
- Pratt-Whitney-Rocketdyne Chief Knowledge Officer
- Lockheed-Martin
- ATK-Thiokal
- United Space Alliance, Office of the Chief Engineer
- The Aerospace Corporation
- NASA Alumni Association
- Defense Acquisition University – Best Practices Clearinghouse

Summary

“ESMD faces exciting opportunities and formidable challenges. To reduce risk and apply knowledge more effectively, ESMD should integrate its KM, RM and OL initiatives into a comprehensive plan that will accomplish more with less bureaucracy. The goal is not compliance with detailed processes and procedures but compliance with intent: the intent to learn, to share and probe every possible angle so ESMD’s missions have the highest possible chance of success. ESMD must take risks with ‘eyes wide open’ and ‘minds fully engaged’ at every decision, every trade and with every residual risk.”

From: Strategy for Exploration Systems Mission Directorate
Integrated Risk Management, Knowledge Management
and Organizational Learning Whitepaper
Dave Lengyel & Dr. Ed Rogers

Questions?



"We should write that spot down."

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