



Integrated Risk and Knowledge Management Program — IRKM-P

Program helps people do work more effectively.

NASA Headquarters, Washington, DC

The NASA Exploration Systems Mission Directorate (ESMD) IRKM-P tightly couples risk management and knowledge management processes and tools to produce an effective “modern” work environment. IRKM-P objectives include: (1) to learn lessons from past and current programs (Apollo, Space Shuttle, and the International Space Station); (2) to generate and share new engineering design, operations, and management best practices through pre-existing Continuous Risk Management (CRM) procedures and knowledge-management practices; and (3) to infuse those lessons and best practices into current activities. The conceptual framework of the IRKM-P is based on the assumption that risks highlight potential knowledge gaps that might be mitigated through one or more knowledge management practices or artifacts. These same risks also serve as cues for collection of knowledge — particularly, knowledge of technical or programmatic challenges that might recur.

The main components of the IRKM-P are the following:

- **Continuous Risk Management**

The CRM process is a continuous, iterative process that identifies, analyzes, plans, tracks, controls, communicates, and documents risk through all lifecycle phases of an organization’s product developments. ESMD uses an enterprise risk management approach and a common framework for identifying, analyzing, communicating, and managing risks for ESMD and its performing organizations. Risks are communicated vertically through an escalation process — horizontal integration occurs through a multi-tiered risk management working group and board structure. This network is also used to communicate lessons learned and best practices.

- **Process 2.0**

The IRKM-P also has an important work-process-assist element called “Process 2.0,” or P20, which is modeled on the U.S. Army after-action review (AAR) process. P20s are process-focused, collegial, structured reflection events. They

rapidly deliver sustainable results through (1) focusing the team on doing work better — derived from Deming’s plan-do-check-reflect, (2) careful, discussion time management, (3) employment of structured thinking /logic techniques, and (4) enforcement of disciplined thinking to drive out actionable process improvements for the team. P20s have been used for a diverse set of team processes ranging from loads analysis to budget processes.

- **Knowledge-Based Risks**

ESMD defines Knowledge-Based Risks (KBRs) as: a risk record, with associated knowledge artifacts, that provides a story-telling narrative of how this risk was mitigated — and what worked or didn’t work. A KBR is also a means of transferring knowledge in a risk context. As key risks are mitigated, particularly risks which are likely to recur across other programs in ESMD, lessons are captured — what were the effects of mitigation activities; how were cost, schedule, and technical performance impacted, and so on. These lessons are appended to the risk record and organized in the risk tool by work breakdown structure for reuse by program and project risk managers in helping to identify new risks or develop better plans for pre-existing risks. When new candidate risks are identified, risk owners use related KBRs and other risks as inputs to developing their risk mitigation, analysis, and documentation approach. This provides a tight coupling of CRM with lessons learned. Instead of a “collect, store, and ignore” approach, KBRs form an active collection of lesson-learned, which are continually reused and updated.

- **Wiki-Enabled Teams**

Wiki-enabled teams perform a set of essential collaboration and knowledge sharing functions across the directorate. An important part of exploiting this technology has been helping teams critically examine their work processes and information architecture, which is then mapped into the tool. The wiki

provides teams an easy to use, flexible interface to collaborate on documents, conduct discussions, manage calendars, locate information, and, most importantly, work more effectively.

- **Knowledge-Sharing Forums**

Knowledge-sharing forums can range from simple lunch seminars to larger conferences, such as APPEL’s Masters Forum. A key goal in holding these forums is to provide speakers with subject matter expertise pertinent to risk drivers across ESMD. Many of these forums are recorded for later reuse.

- **Experience-Based Training**

Experience-based training involves risk management case studies, which serve as the ultimate multi-media “lessons learned” interface in our online environment. The first case developed addresses the project success story of the Space Shuttle Super Light Weight Tank development — going back to the IRKM-P framework of risks providing a cuing function, this subject was chosen because we are currently challenged by several mass-related risks — and will continue to be challenged to control mass for the heavy lift booster, lunar lander, and habitat modules. These RM cases are intended to highlight key transferrable aspects of risk management, including the identification and analysis of risks, rigorous mitigation planning, and risk trades. The proper application of risk management principles examined in these cases can help manage lifecycle costs, development schedules, and risk, resulting in safer and more reliable systems for Constellation and other future programs.

The IRKM-P continues to evolve and serves as an effective extension of management leadership to facilitate integration, collaboration, and effective work-process implementation across the complex ESMD enterprise.

This work was done by David M. Lengyel of NASA Headquarters. Further information is contained in a TSP (see page 1). HQN-11315-1