Reducing Mission Risk through Anomaly Data Management and Knowledge Management

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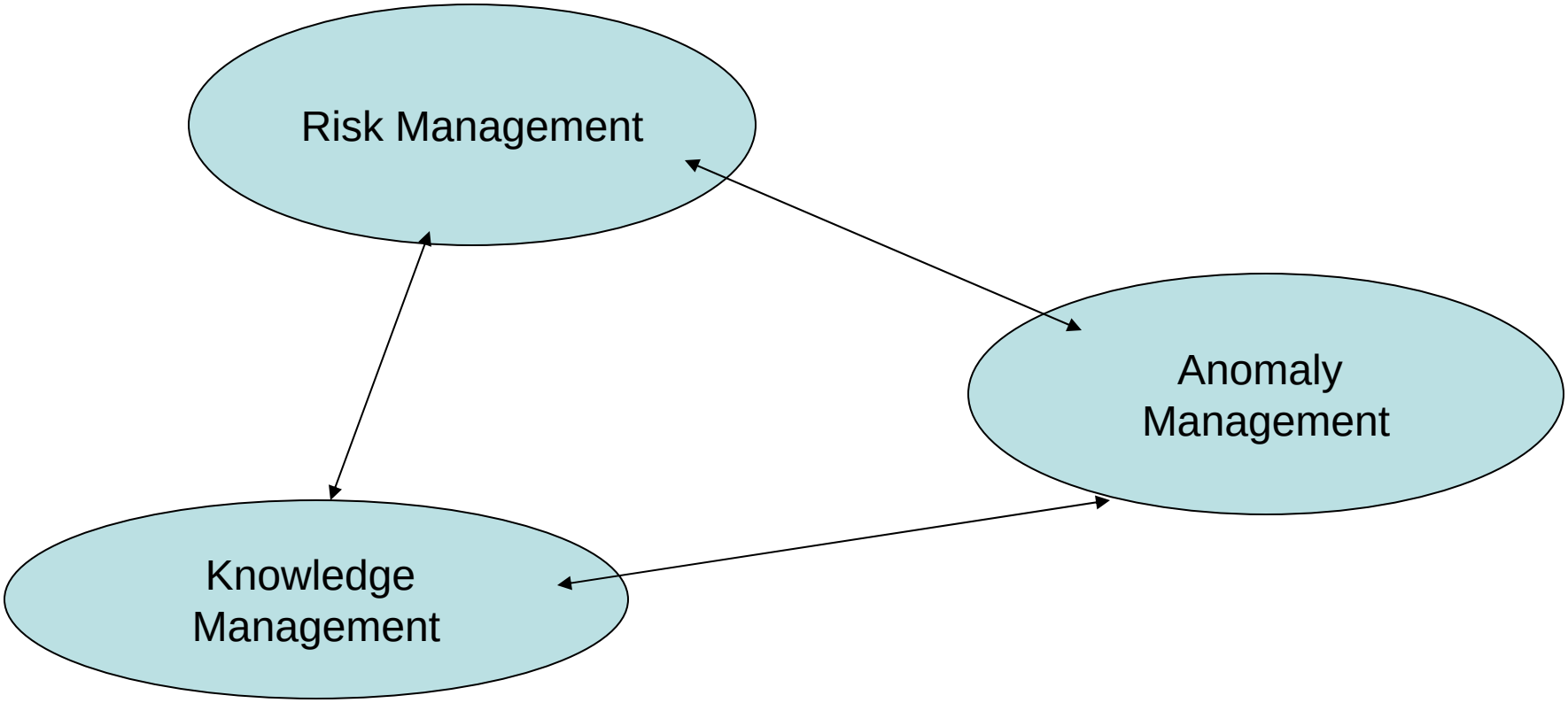
GSFC Office Of Mission Success

- The Office of Mission Success synthesizes a broad spectrum of information, from a wide array of internal and external sources, to provide an overall assessment of Center risk posture, and engages in preventative and corrective actions to assure the success of Goddard managed missions, and make Goddard a stronger organization. The Director of Mission Success provides executive leadership of the directives, standards, independent assessment, systems management, knowledge management, risk management, problem reporting and trending functions of the Center.

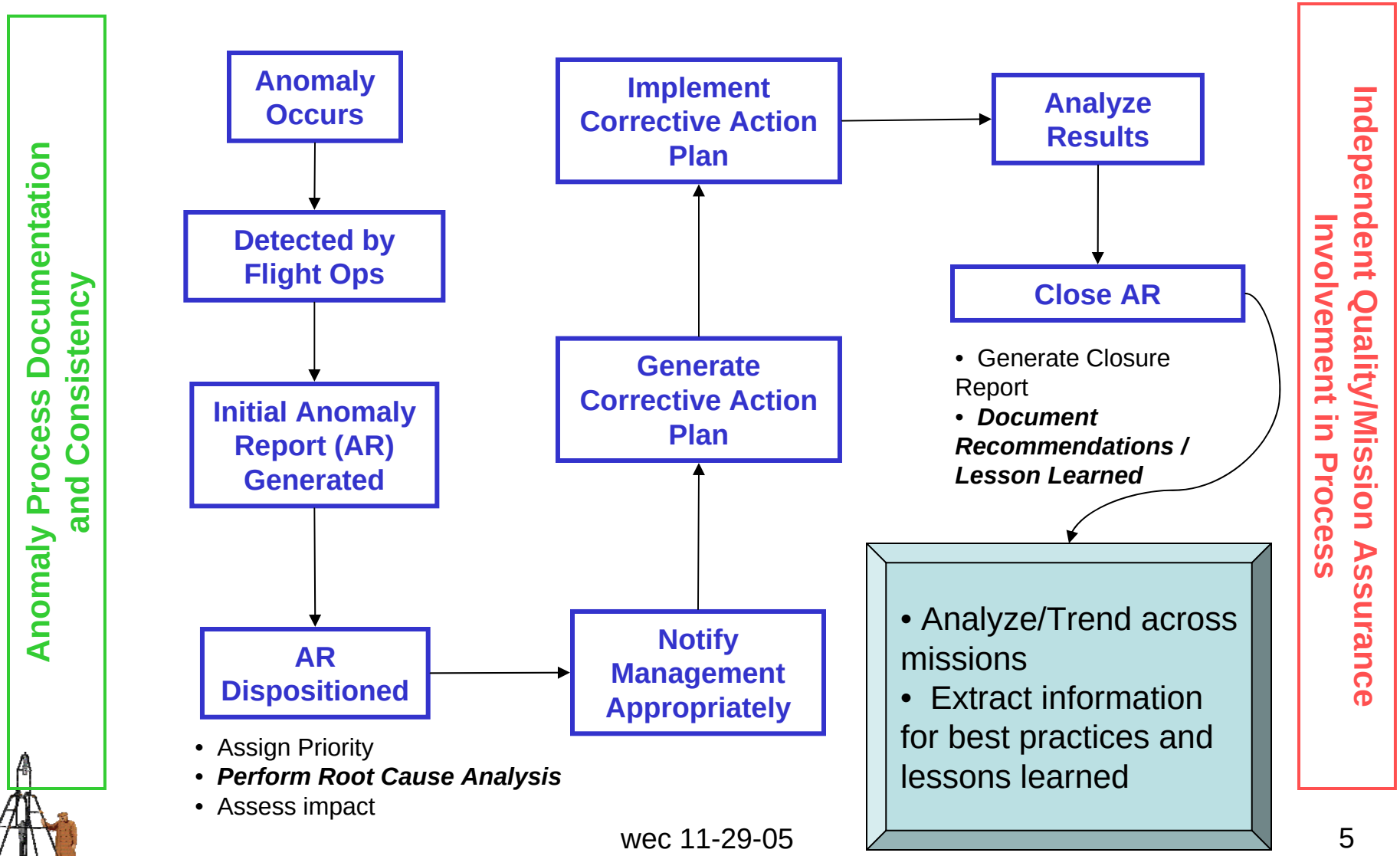
One aspect of the Office of Mission Success responsibility is to leverage Anomaly Management and Knowledge management to improve overall Center risk posture and each Flight Project's Risk Posture



How do we reduce risk?

- Analyzing and synthesizing information across institutional common processes:
  - Common anomaly management process
  - Common lessons learned process
  - Common risk management process

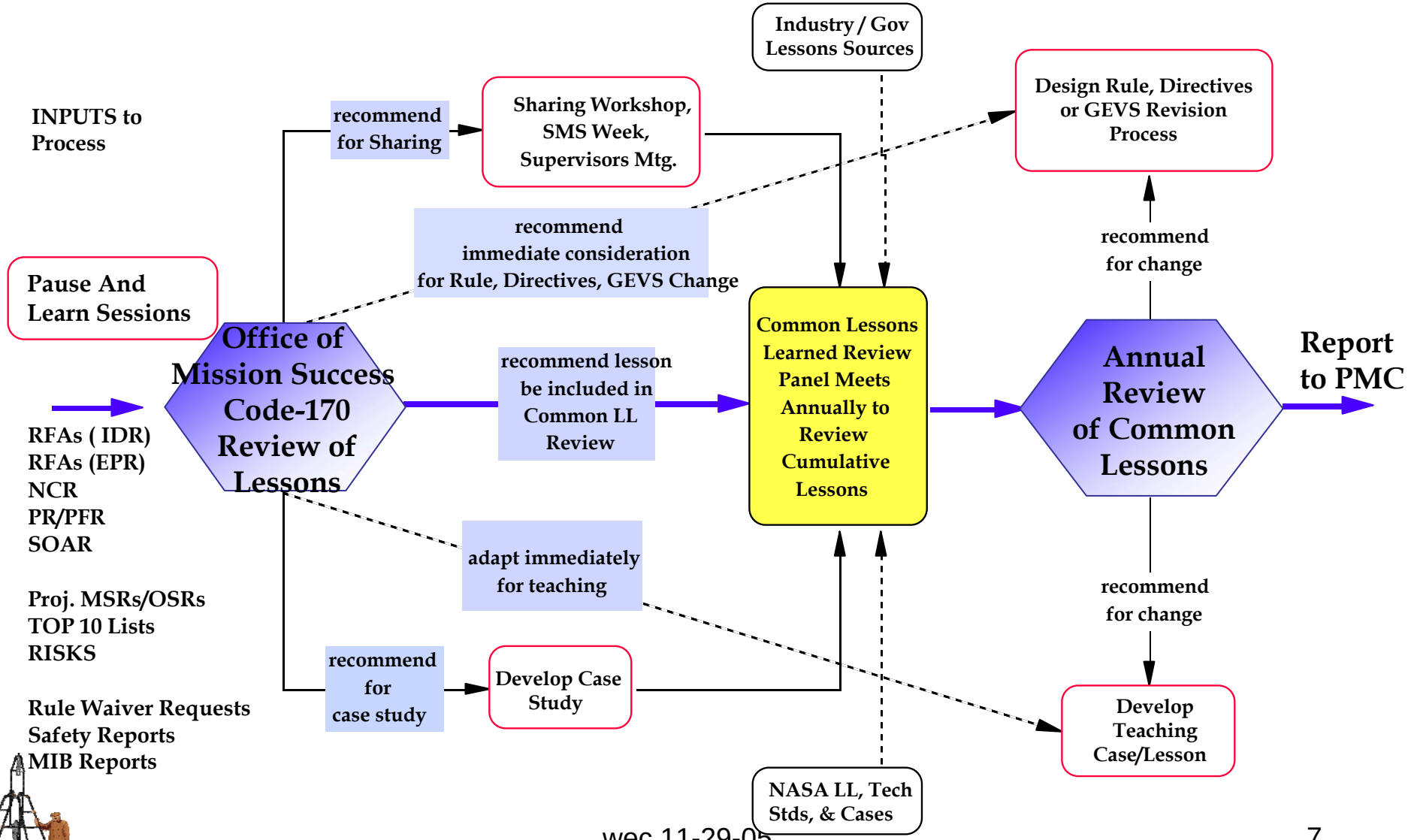
Common Anomaly Management Process



Common Anomaly Management Process

- Common anomaly management requirements across missions to provide consistency in the process
  - Procedures for working and tracking anomalies
  - Notification procedures (e.g., immediate Center management notification for significant problems)
  - Auditing function to provide independent assessments of the process
- Traditionally Goddard missions have used and maintained their own anomaly management software system, but Goddard has moved to using one system for all missions (PR/PFR System and SOARS)
  - Facilitates normalization of process across missions (e.g., terminology and quality of anomaly reports)
  - Enables flight teams to search for similar problems, and their solutions, on other missions across the Center
  - Facilitates analysis and trending of problems across missions
  - Facilitates extraction of recommendations/lessons learned for application to new and existing missions

Common Lessons Learned Process



Common Risk Management Process

How Do We Reduce Project risk?

- Collect and Analyze all on-orbit anomaly data for GSFC projects within a central database
- Capture and institutionalize the lessons learned
  - Lessons learned and best practices are incorporated into the GSFC Rules, Policy, training, workshops
- Implement the lessons learned early in the project life cycle so problems are not repeated
  - All projects must Comply with the GSFC rules and policy or request a waiver/deviation with rationale as to why they can't comply.
  - Example: WISE, IBEX, LOLA and SAM projects must comply with the GSFC rules, and policies. These Rules and policies have the lessons learned and best practices embedded.
  - Update the GSFC Rules every 3 months for quick insertion back into the project development phases.
- Provide information in virtual space that ties in all the information associated with the area of interest
- Audit, control, and measure the processes to determine opportunities for process improvements

Goddard Design Rules

A search on the term “FPGA” will yield:

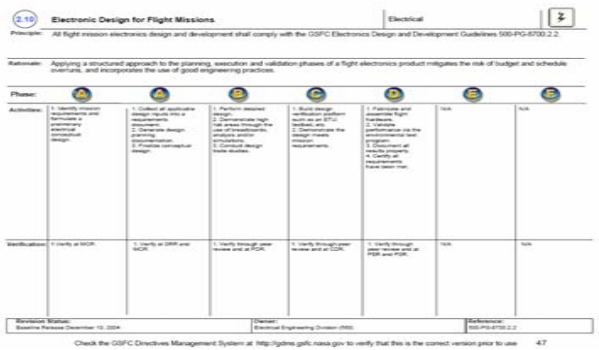
Goddard Space Flight Center

Rules for the Design, Development, Verification, and Operation of Flight Systems

GSFC – STD – 1000
Baseline Release
December 10, 2004

GODDARD SPACE FLIGHT CENTER | + NASA Homepage | + NASA en Español | SEARCH FPGA

GOLD Rule 2.10 – Electronic Design



Link to specific NASA LLIS data

Link to specific MIL-STD

Link to klabs.org page on FPGA design

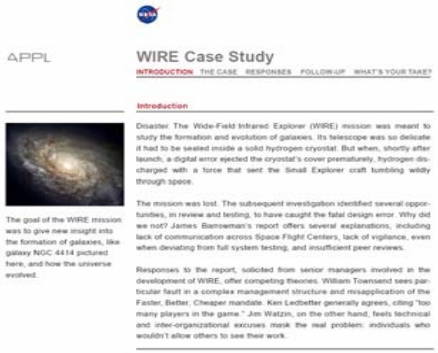
Link to JPL Blue Book FPGA rules

4.12.10.2. *ASIC/FPGA synchronous designs* - The synchronous design of ASIC or FPGA shall be verified, as a minimum by post-route timing analyses using a place and route tool and test vector simulation with timing checkers performed at the primitive level. Timing of boundary conditions (pin-outs) shall be constrained for place, route, and test vector simulation.

4.12.10.3 *ASIC performance characterization* - Functional tests shall be performed with simultaneous digital, analog and mixed signal circuitry to assess interactions, as well as, separate tests on each portion of the ASIC.

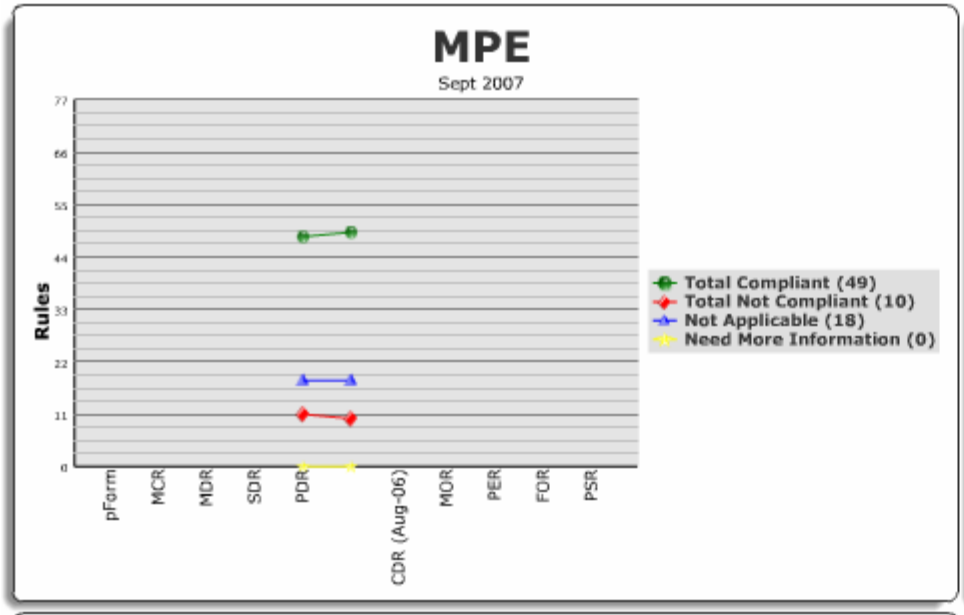
4.12.10.4 *Use of behavioral models* - ASIC design shall develop behavioral and hardware description models to capture implementation of system design specifications and evaluate performance.

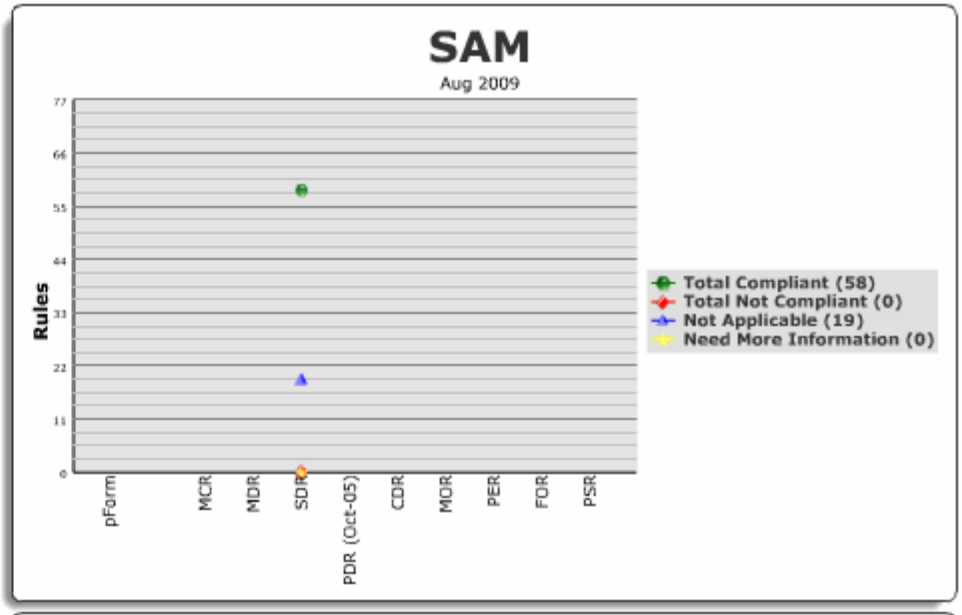
Link to relevant case study

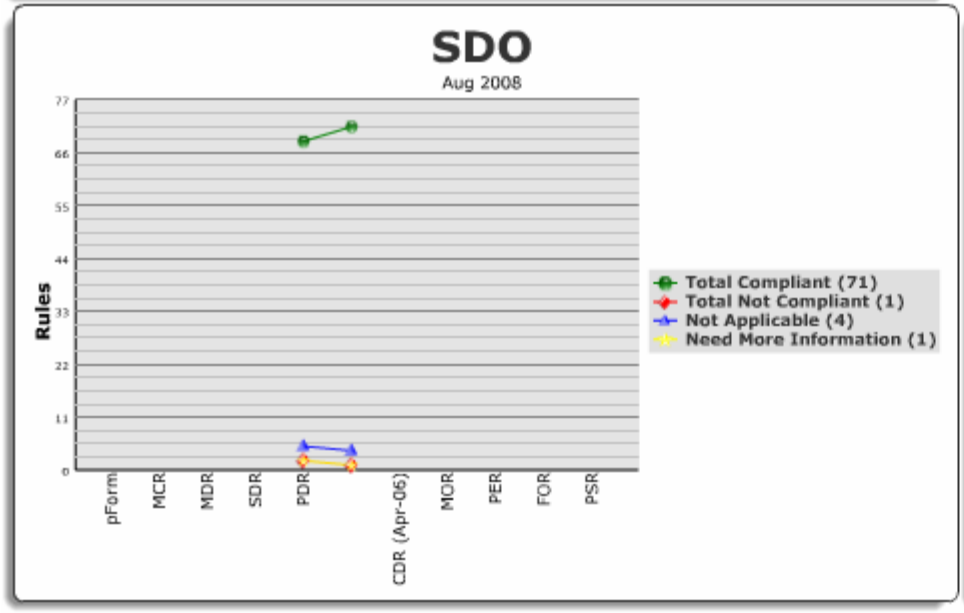


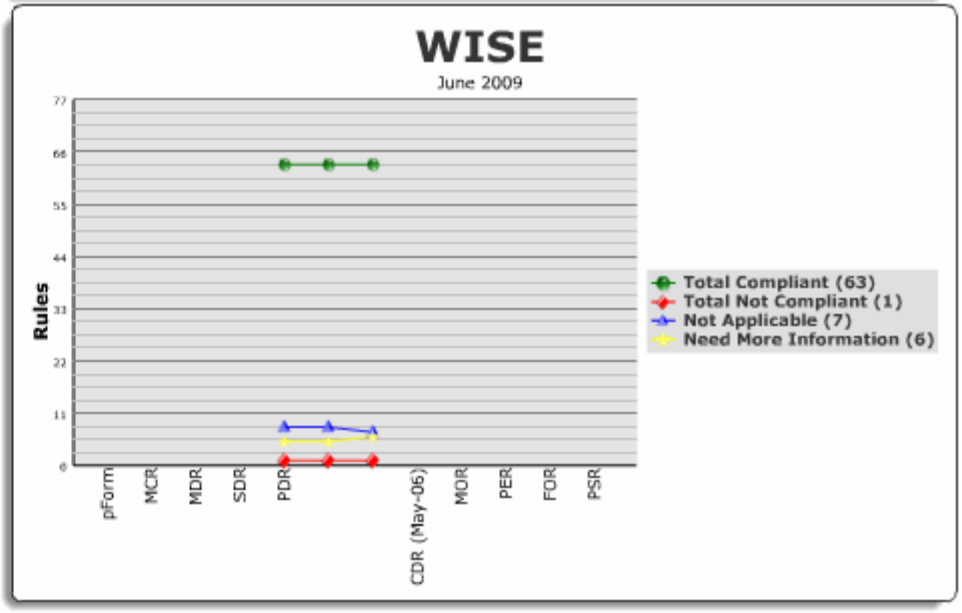
Back up

Notional project Compliance history against the GSFC Rules







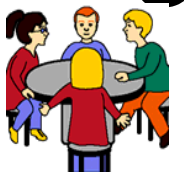


References:
(1) Submitted Project Compliance Matrices
(2) SRO Master Review Schedule
(3) Code 400 LRD

Abstract

- As we move forward into the new age of exploration we must not forget many of the lessons learned, best practices, risk and anomalies/problems we endured over the past 40 years of mission operations. Disciplined anomaly management and Knowledge management provides another avenue for reducing risk and improving mission success. By systematically collecting, reviewing and analyzing mission operations anomaly data across all projects and then processing the information through the lens of Knowledge Management, GSFC has managed to capture and pass on lessons learned systematically throughout the organization. Through this process we are able to illuminate problems that are narrowly known by a few to be more widely known by many. By making this process part of the embedded way GSFC does business the center has improved its ability to quickly learn and broadcast information throughout the organization in a disciplined manner and have a greater impact during the early phases of a project, thereby significantly reducing future project risk from repeated mistakes or known problems. By applying what we know to what we need to do, we are able to proactively work at reducing overall project risk on current and future projects earlier in the lifecycle rather than later.

Goddard Learning Architecture



Communities of Practice

Sharing Behavior

Prog/Proj Management (7120.5c)

GSFC Directives

NASA Directives

Incident Lessons

Work Processes

Technical Standards

Communication

Goddard Design Rules

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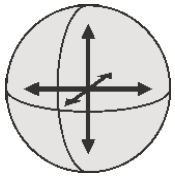
Reviews & Common LL

Proj. Mgmt. Training

Parts, Safety, ISO, & GIDEP

Problem Solving

Center Level Application of LL



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Engineering Practices

Pause for Learning

Program/Project Contextual Learning

Case Studies

Decision Making

Process Improvement

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Power & Politics

Knowledge Sharing Workshops

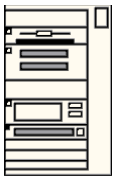
Team Dynamics

Industry Dynamics

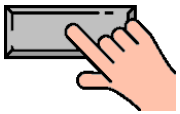
Leadership

Partnerships

Project Management Wisdom



Repository Standards



Global Search