Mission Assurance

within the framework of

CMMI

Presented by: Kathy Stone
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Why Do We Need Mission Assurance?

Here’s what would happen if we were able to achieve a mission rate of 99% for air travel. This would mean:

- 99% in Spec (3.8 Sigma)
- 99.9997% in Spec (6 Sigma)

- 2 Abnormal Landings at most airports each day
- 1 abnormal landing every 5 years
The Mission Assurance Approach

- Promotes mission success and reduces technical and mission risks
  - Reliance on independent reviews
  - Subject Matter Experts
  - Disciplined application of best practices
The Mission Assurance Approach

- All companies have business challenges
  - Workforce constraints
  - Budget constraints
  - Schedule constraints
  - Stakeholders and customers to satisfy
  - Competition of which to be aware
The Mission Assurance Approach

- Meeting customer defined mission objectives without defects is a product of mission assurance
The Mission Assurance Approach (cont’d)

- In today’s challenging and competitive world, the status quo won’t cut it. There must be a continuous effort to improve performance
  - Everyone should be working together towards a defined end goal
  - Improvement efforts need to be tailored to mission success criteria
  - Safety and risk management play important roles in achieving mission assurance.
Mission Assurance and Risk

- Mission Assurance is an engineered process performed over the life-cycle of a program to identify and mitigate design, production, test and field support deficiencies that could impact mission success.

- Mission Success is the achievement of program/product requirements designed to meet customer needs while maintaining corporate values.
Mission Assurance and Risk (cont’d)

- Operational risk is the possibility of direct or indirect loss resulting from failed or inadequate internal processes or from failures caused by people, technology, or external events.
- Mission assurance ensures that operational risk is reduced to a mission acceptable level and that there is a systematic methodology for identifying and analyzing operational risks.
Mission Assurance Model Elements

- Mission assurance requires total infrastructure integrity
- It needs to reflect more than design quality of technical aspects of the design
- Should make customers and suppliers part of the solution
Mission Assurance Operational Concept
Design Centric vs. Enterprise Centric Architecture Approach

- Design centric approach allocates requirements directly to enterprise systems and subsystems.
  - No process where enterprise-wide trade-offs are addressed.
- Architecture centric approach includes an enterprise model which includes all the stakeholders visions and concerns.
Example of Enterprise Wide Approach

Mission Assurance is a “cradle-to-grave” process with independent technical assessment as the cornerstone throughout the life-cycle.
Integrating the Enterprise Approach into the Mission Assurance Model

CMMI CAPABILITIES

- Metrics
  - measure
  - determine improvements in
  - can be divided into
    - Technical Capabilities
    - Managerial Capabilities
    - Operational Infrastructure
    - Organizational Infrastructure
    - Cultural Initiatives

- System Resilience
  - can be obstructed by
  - apply to all
  - can be divided into
    - Internal Organization
    - External Organization

- Culture
  - can be enhanced by
  - apply to all
  - can be divided into

- Infrastructure
  - apply to all
  - can be divided into
CMMI CAPABILITIES FOR MISSION ASSURANCE
CMMI Capabilities – The Problem Space
The CMMI Framework

- Developed to provide a consistent set of common elements to apply to any discipline
- Designed to support process improvement activities, including assessments and training
- 4 Parts: Input Process, Repository, Control Process and Output Process
- Capture a product wide architecture
Business Assurance Life Cycle

KEY ELEMENTS THAT APPLY TO ALL PHASES ACCORDING TO PROGRAM NEEDS

- Independent Non-Advocate Reviews
- Independent Communication
- Interface Management
- Conscience
- Culture
- People, Processes, Tools Qualification, & Use
- Root Cause and Corrective Action
- Risk Management
- Lessons Learned

CMMI Process Areas

- Business Acquisition Program Training
- Design Development & Procurement
- Integration Verification & Validation
- Production & Delivery
- Support & Sustainment
- Mission Operations

- Process Management
- Project Management
- Engineering
- Support
- FAA Extensions
CMMI Process Areas

Organizational Process Management
- Process Definition
- Process Focus
- Process Performance
- Training
- Innovation and Deployment

Project Management
- Project Planning
- Project Monitoring and Control
- Supplier Agreement Management
- Integrated Project Management
- Quantitative Project Management
- Risk Management

Engineering
- Requirements Management
- Requirements Development
- Technical Solution
- Product Integration
- Verification
- Validation

Support
- Configuration Management
- Measurement and Analysis
- Process & Product Quality Assurance
- Decision Analysis and Resolution
- Causal Analysis and Resolution

FAA Extensions
- Safety
- Security
The Federal Aviation Administration and the Department of Defense (FAA/DoD) collaborated to include safety and security in the FAA’s integrated CMM model.

- Best practices were selected from recognized standards.
- Participation included NASA & DoD contractors – Experts from government and industry.
The CMMI Extensions (cont’d)

- CMMI provides flexibility for organizations to incorporate specialized critical systems engineering areas

- CMMI extensions help to provide the safety and security capabilities to enhance the model
Perspectives

- Safety and security are critical to both DoD and FAA
- Both CMMI and iCMM provide a framework for safety and security activities
- Can be harmonized with CMMI to support practices to guide process improvement and capability
Integrating Mission Assurance With CMMI

Mission Success

Business Optimization
- Common Causes of Variation
- Insert New Technology/Processes
- Optimize Goals

Effectiveness & Efficiency
- Special Causes of Variation
- Bottlenecks

Consistency
- Historical Data
- Common Processes

Discipline
- Documented
- Trained
- Implemented

Chaos
- Informal Processes

Optimizing - Level 5
- Causal Analysis & Resolution
- Organizational Innovation & Deployment

Quantitatively Managed - Level 4
- Organizational Process Performance
- Quantitative Project Management

Defined - Level 3
- Requirements Development
- Technical Solution
- Product Integration
- Verification
- Validation
- Organizational Process Focus
- Organizational Process Definition
- Organizational Training
- Integrated Project Management
- Risk Management
- Decision Analysis & Resolution

Managed - Level 2
- Requirements Management
- Project Planning
- Project Monitoring & Control
- Supplier Agreement Mgmt.
- Quality Assurance
- Configuration Management
- Measurement & Analysis

Initial - Level 1

CMMI™ Version 1.2
Conclusion

- The mission assurance model can be enabled with the CMMI model
- Will develop a traceable methodology to clarify relationships
- Can be structured to help an organization become highly integrated and effective when implementing mission assurance
CMMI + the iCMM extensions = Mission Assurance

CMMI + iCMM Extension

OPF
OPD
OT

OPP
OID
PP
PMC

SAM
IPM
RSKM
QPM

REQM
RD
TS
PI

VER
VAL
CM
PPQA

MA
DAR
CAR

SAF & SEC

Mission Assurance
ANOTHER WAY TO SPELL MISSION Success
QUESTIONS?
Contact Information:

email address: 
kathleen.m.kukulkastone@boeing.com
Tel.:  562-982-2157