

Configuration Management Process Assessment Strategy

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Purpose: To propose a strategy for assessing the development and effectiveness of configuration management systems within Programs, Projects, and Design Activities performed by technical organizations and their supporting development contractors.

Scope: Various entities CM Systems will be assessed dependent on Project Scope (DDT&E), Support Services and Acquisition Agreements.

Approach: Model based structured against assessing organizations CM requirements including best practices maturity criteria. The model is tailored to the entity being assessed dependent on their CM system.

The assessment approach provides objective feedback to Engineering and Project Management of the observed CM system maturity state versus the ideal state of the configuration management processes and outcomes(system).

- Identifies strengths and risks versus audit gotcha’s (findings/observations).
- Used “recursively and iteratively” throughout program lifecycle at select points of need. (Typical assessments timing is Post PDR/Post CDR)
- Ideal state criteria and maturity targets are reviewed with the assessed entity prior to an assessment (Tailoring) and is dependent on the assessed phase of the CM system.
- Supports exit success criteria for Preliminary and Critical Design Reviews.
- Gives a comprehensive CM system assessment which ultimately supports configuration verification activities.*

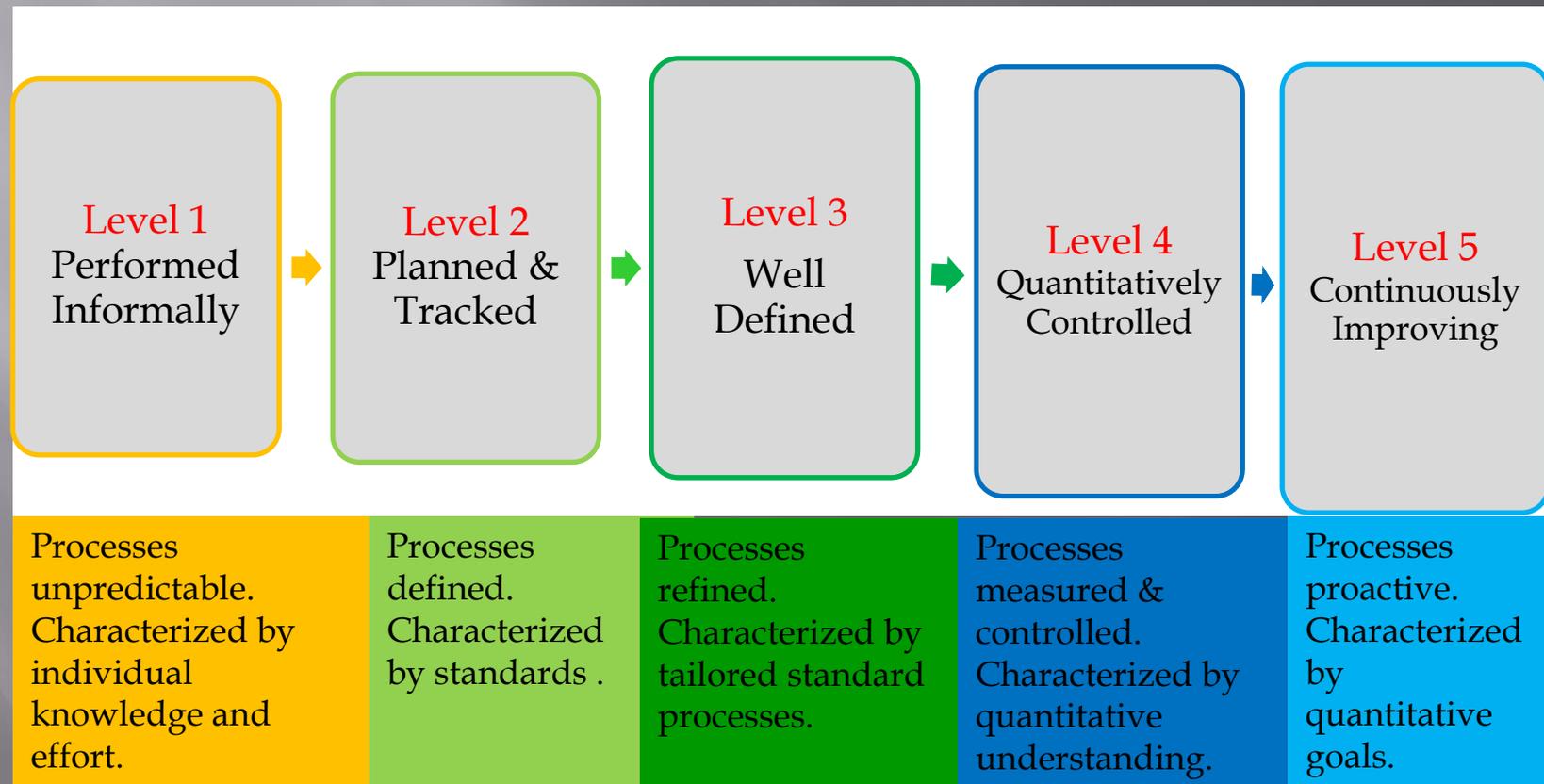
“CM Process Audits (Assessments) are an important contributor towards Configuration Verification and ultimately acceptance of design solutions and products (CI’s).”

Configuration Verification Audits*

Inputs	Mech./Facilitators	Constraints Output	Results
<ul style="list-style-type: none"> • Audit schedules, agendas and requirements • Other Configuration verification results and action items • Status and configuration information from the CSA system • Physical CI (hardware and software) test results 	<ul style="list-style-type: none"> • Documented CM Processes • Open communication • Manufacturing and Engineering Tools documentation 	<ul style="list-style-type: none"> • Contractual provisions • Audit criteria contained in the Audit Plan 	<ul style="list-style-type: none"> • Audit Report that includes results, findings, certification package(s) and action items

- The Configuration Verification activity that establishes that:
 - The product meets requirements--performance and functional requirements defined in the product definition information have been achieved by the design.
 - The documentation matches the product--design has been accurately documented in the product definition information.

Characteristics of the Maturity Levels (Adopted from SE-CMM Version 1.1)



---Maturity Statement Levels are tailored through consensus including "not applicable" levels before an entity is assessed---

The Current Model Construct to be used for Assessments is based on the five CM functions recognized in Industry and Documentation Requirements and System Descriptions (Characterized as Maturity Statements). Each module contains the applicable CM requirements mapped to the CM functional module they apply to and include supporting maturity criteria to support the assessment:

- *Configuration Management Planning Module (2 Reqs)*
- *Configuration Identification Module (9 Reqs)*
- *Configuration Change Management Module (11 Reqs)*
- *Configuration Status and Accounting Module (4 Reqs)*
- *Configuration Verification Module (1 Req)*

Assessment Model Considerations

- *Processes can overlap CM tenets*
- *Does not include SCM or TDM*
- *Requirements are mapped to module criteria*
- *Criteria are developed from best practices and mapped to the applicable requirements*

Expected Maturity Levels for each essential configuration elements were derived from Program Configuration and Data Management Best Practices and Audit Plans.

Assessment Modules	Target Maturity Level PDR Assessment	Target Maturity Level CDR Assessment
Configuration Management Planning	Level 3-4	Level 5
Configuration Identification	Level 3-4	Level 4
Configuration Change Management	Level 2-3	Level 4
Configuration Status Accounting	Level 2-3	Level 4

- The outcome is characterized and reported at the module level as a set of assessment outcomes for maturity and candidate risks.

Model Approach, Requirements, and Criteria within each configuration element module were derived from the following sources:

▣ Assessment Model Development

- AIA NAS3500 National Aerospace Standard 3500 Technical Data Package: Composition, Communication, and Application (Model and Risk Outcome Scheme)
- Systems Engineering Capability Maturity Model (SE-CMM registered service mark of Carnegie Mellon University). (Used for assessment levels)
- Program Configuration and Data Management Audit and Verification Plan

▣ CM Requirements (Beta Test)

- Systems Engineering Processes and Requirements
- Data Requirements Document Standard for a CM Plan
- Engineering Documentation Standards
- Computer - Aided Design (CAD) Standards
- Configuration Management Standard

▣ Assessment Criteria

- Engineering Documentation Standards
- Computer - Aided Design (CAD) Standards
- Configuration and Data Management Audit and Verification Plan
- Configuration Management Guidance
- Configuration Management Standard

Preliminary Assessment Planning

- Identify the entity(s) to be assessed (e.g. program, project, organization, element).
- Define the assessed entity(s) organizational structure and the personnel needed to support the Assessment.
- Define scope(depth and breadth) of the review.
- Develop and document preliminary assessment approach based on above.
- Create Assessment In-Briefing

Conduct Initial Assessment Activities

- Begin collection of reference material for each activity subject to assessment and begin the entity assessment:
- Document any considerations of “tailoring” and any sampling scheme.
- Compile and organize collected reference material.
- Develop the initial tailored model for the assessment.

Conduct Pre Assessment Meeting

- Meet with Entity Management to explain and obtain consensus of assessment objectives, methodologies, and tailored models.
- Establish consensus on the breadth and depth of the assessment (i.e. government/contractor).
- Review resources required to perform the assessments and how they will be provided.
- Review the assessment schedule.

Initiate Primary Assessment

- Based on reference material prepare assessment models.
- Schedule and hold meetings with assessed organization POCs and collect supporting objective evidence.
- Evaluate collected evidence against assessment criteria and coordinate with entity personnel as needed.

Prepare Outcome Reports

- Complete narratives and scores of assessment models, candidate risks, and results summaries. Generate out brief presentation and draft report.
- Present results to assessed entity and CM management
- Release final report.

Change Request

Program-To-Project Systems Interface Control Document (ICD); Stage-to-Project Detailed Design Data

“For Large Programs, we are using a CR Traceability Approach to set the Assessment Scope”

Supporting Process Documents:

Program/Project Plans (including CM and SEMP)
CCB Charters
Program/Project Drawing and CI/Spec Trees, IPLs.
Change Management Artifacts (Sub-Process OI's, Change Files, CSA Reports, etc.)



DOCUMENTS AND PRODUCTS AFFECTED BY THIS CHANGE:

Program-To-Project Systems ICD, Core Stage-to-Project Detailed Design Data



Project Vendor's Configuration Data Affected by this Change:

TBD

External Assessment Activity



APPLICABLE DOCUMENTS:

Cross Program Fluid Procurement and Use Control Specification;
Program to Project ICD, Volume 1: Functional Interface Definition & Program Integrated Vehicle to Project Detailed Design
Program-to-Project ICD Volume 5: Program-to-Project Command and Data Handling (C&DH) Detailed Design
Cross Program Integrated Vehicle Coordinate Systems
Program System Specification

APPLICABLE DRAWINGS:

Umbilical Electrical Connector Envelope Drawing;
Vent/Relief - Fill/Drain Quick Disconnect (QD) Envelope Drawing;
Core Stage TVC Hydraulic Ground Service Panel QD Source Control Document (SCD); Quick Disconnect Assembly, ECS Purge, Ground Helium Quick Disconnects Envelope Drawing; Main Propulsion System, Core Stage LOX and LH2 Bleed Disconnects Envelope Drawing; Main Propulsion System, Core Stage Drawing



CM Process Assessment Strategy

“Notional Assessment Model Excerpt”

Configuration Element	Assessment Notation	Project Milestone:		Potential Risk
		Expected	Actual	
CM Planning				
<p>P1. A strategy shall be prepared to conduct configuration management for configuration items and configuration documentation. (MPR 7123.1 2.214.1a)</p> <p>PDR Expected: Level 3</p> <p>CDR Expected: Level 5</p>	<p>By this time in the development process the Configuration Element CM Planning should be a Maturity Level 3 Well Defined. This maturity level means refined processes characterized by tailored standard processes.</p> <p>It was determined during this assessment that key criteria of (1) Organizational relationship, (2) Staffing, and (3) Training were at Maturity Level 2 Planned & Tracked. In each criterion the processes were defined and characterized by standards but they were not refined by tailoring to the circumstances. The Level 2 for such a number of criteria result in a Level 2 ranking for the entire element.</p>	3	2	<p>There is a risk that expectations of the Program Office will differ with expectations of CDM Office.</p> <p>Lack of defined organizational relationship results in risk of ineffective assignment of personnel. Inadequate staffing and training results in risk of ineffective performance of key CM functions.</p>
P1 Criteria	Assessment Notation			
<p>CM Organizational charts and functional job descriptions are available.(CxP 70073-01-03 Appendix C)</p>	<p>Organizational Charts and Functional Job Descriptions were provided when requested and are maintained as part of a document maintained by the Program CDM Lead. Organizational Charts and Job Descriptions were adequately detailed and current. (Ref: WP Pln 100) WD. NR.</p>			
<p>Organizational relationship of CM/DM Office to program clearly defined and documented. (MGM 8040.1 Table III)</p>	<p>Other than general references to high-level policy criteria that CM/DM Office shall provide “support” for applicable programs there is not a documented and clearly defined organizational relationship. The CDM Lead stated some of the CDM personnel assigned non CDM tasks by Program management. The CDM Lead stated so far the unrelated assignments have not yet been significantly disruptive but are likely to become so as work load increases with maturing program. P&T. CR.</p>			<p>Lack of documented relationship fosters a risk of ineffective assignment of CM personnel at the expense of core CM duties.</p>
<p>All applicable areas of CM are staffed. (MGM 8040.1 Table III)</p>	<p>Applicable areas of CM are staffed with the exception of Board Secretariat. Currently (and for the past 18 months) the duties of the vacant position have been rotated among available CM personnel. The CDM Lead stated the duties of the Board Secretariat have been performed but with some confusion and a slower pace than desired. P&T. CR</p>			<p>Inadequate staffing of a core CM position results in risk of ineffective performance of key CM duties.</p>

Section 1

Summary of the Assessment Activities including the General Process with any Unique Assessment Process Outcomes and a Summary Statement for each Assessment Module Result.

Section 2

The Final Tailored Assessment Model with all Assessment Notes.

Section 3

The Candidate Risks List Derived from the Assessment Outcome mapped to the relevant Modules, Requirements and Criteria Statements.

Note--The final report draft is reviewed with the assessed entity to obtain consensus on the results before the final report is released.