Developmental Change Control

RCCAC-ENG-G-600

Rev. 1.2

Rockwell Collins CETC Avionics Co., Ltd.

Approval

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Revision History

Revision	Originator	Description	Date
1.0	Sun Xiaobin Di Zhang	New Release	06/26/2015
1.1	James Zhang	Added the Signature column in the Approval page	10/12/2015
1.2	Di Zhang	1. Updated the copyright statements and the acronyms of “RCCAC”. 2. Simplified & Redrew the Figure 1. 3. Internal review PRI_SYSTEM_115 findings implementation. 4. Updated based on DAC Mary’s feedbacks: (1) a. In section 3.2 added statement about CCB meeting frequency; (2) Reworded “recommended” into “required” in section 4.1.1, 4.3.1, 4.3.2, 4.5, 4.6; (3) Added “(Optional)” in section 4.1.1 for Customer Criticality and Other Affected Programs/Products; (4) Reworded “should be provided” into “is required” in section 4.2.2; (5) Updated “after the implementation” as “after the verification” in section 4.5; (6) Added arrow line from “Assign CR status” to “CCB approve” in Figure 1; (7) In section 3.1, Removed CSE; Added RCCAC, DCN, and ECO; (8) In section 4.4, replaced “DDCN” with “DCN”; (9) At the end of section 3.2, updated statement “And the CCB meeting should be	09/18/2017

		held on needs" into "And the CCB meeting is held on an 'as needed' basis".	

Table of Content

List of Table

1 Introduction

1.1 Purpose

To describe how Developmental Change Management may be applied to design activities and artifacts without overburdening the design teams.

1.2 Applicability

Location: Rockwell Collins CETC Avionics Co., Ltd. (hereafter referred to as “RCCAC”), Chengdu, Sichuan, China

1.3 Requirements Implementation

This guidance meets the requirements for Change Control as defined in AS9100: 2016 and ISO 9001: 2015.

1.4 Industrial Standards

Table 1-1 Referenced Industrial Standards

Standard	Description
AS9100: 2016	Quality Management System – Requirements for Aviation, Space and Defense Organizations
ISO9001: 2015	Quality Management Systems – Requirements

1.5 Company Documentation

Table 1-2 Referenced Company Documentation

Document #	Description
RCCAC-QMS-P-000	Quality Manual

1.6 Definitions and Acronyms & Terms

1.6.1 Acronyms

Table 1-3 Acronyms

Acronym	Definition
RCCAC	Rockwell Collins CETC Avionics Co. Ltd.
CCB	Change Control Board
DCN	Document Change Notice
ECO	Engineering Change Order
CR	Change Request
EPA	Engineering Project Assistant
PM	Program Manager
PSSA	Preliminary System Safety Assessment
TPM	Technical Program Manager

1.6.2 Definitions

- Artifact — Item produced by the process that adds value to the organization. It may be a document, a database of information, software source code, mechanical models, etc.
- Baseline — An approved, recorded configuration of one or more configuration items that serve as the basis for further development and are changed only through change control procedures. Baselines may be developmental or formal and should be managed throughout the design and development cycle.
- Change Request (CR) - A documented request to investigate, evaluate, and apply a change against an identified artifact (product or process). Change requests can be written for tracking problems, defects, anomalies, enhancements, clarifications, specification changes, or standards violations. It is a formal request to make a change to a baselined artifact.
- Peer Review – A comprehensive, in-depth critique of a design or design artifact; the intent of which is to efficiently identify and remove defects from design documents early in the design and development process.
- Critical – A finding severity level characterized by the following:
  - Safety and certification issues
  - Loss of all or a significant portion of required functionality
  - Significant degradation of required performance
  - Adversely affects a mission-critical function, no alternative workaround is known
- Defect – Flaw in a system, a system component, or a document that causes the system, system component, or document to fail to meet its requirement; an unwanted and unintended property of software or hardware.
- Issue – Non-Trivial change to artifact that materially affects its core purpose. Said another way, an Issue is a finding that – if left uncorrected – would prevent the artifact from fully meeting its purpose.
- Minor – A finding severity level characterized by the following:
  - Little impact to required functionality and/or performance
  - Inconvenience or annoyance
- Serious – A finding severity level characterized by the following:
  - Corruption of required functionality and/or performance
  - Adversely affects a mission-critical function, an alternative workaround is known
- Trivial Issue – Trivial change to artifact. Most spelling and grammatical errors would be classified as Trivial-Issues. However, if the spelling/grammar error actually changed the meaning of a requirements statement, or made it unclear in some way, it would be classified as an Issue.

2 General

2.1

The purpose of this document is to provide guidance for effective developmental change control. A change control process can help to minimize the impact of late-breaking changes and keep the project on track and under control.

2.2

Critical aspects of an effective change control process include:

- Establish a Change Control Board (CCB)
- Establish and maintain an effective Developmental Configuration Control artifact repository
- Appropriate use of document Baselines
- Documenting and tracking issues and resolutions

NOTE: Electronic tools are available to facilitate problem reporting and tracking.

3 Roles and Responsibilities

3.1 Change Requests

Change Requests (CRs) are presented to the CCB for disposition. The CCB evaluates proposed changes, authorizes them, assigns them if the change is to be made and identifies a specific build for the product.

The following roles are associated with a Change Request (CR). For a CR, the control board is identified only as the CCB. The roles and practices associated with the CCB are described in Section 3.2 of this document.

3.1.1 Originator (Author)

The originator of the CR is the one who identified a problem or a change that is needed to an artifact or system (or domain) and provides the information for a CR. This person is assigned as the author whether they physically enter the data into the tool or not.

3.1.2 CR Implementer

The CR implementer is assigned to and responsible for implementation of the entire CR. This implementer may not perform all of the changes, yet they are responsible to see that all of the associated work is carried to completion and per the direction of the CCB. They are responsible for the coordination of work between all Tasks and child CRs assigned to the CR.

3.1.3 Task Implementer

The Task implementer is assigned to and responsible for implementation of a particular Task. This implementer may not perform all of the changes, yet they are responsible to see that all of the associated work is carried to completion of the Task and per the direction of the CCB.

3.1.4 Task Verifier

The Task verifier checks that the task was completed in accordance with the artifact's change practices and per the direction of the CCB.

3.1.5 CR Verifier

The CR verifier verifies the hardware or software changes that were made as a result of the CR. For system level CRs, the verification is done in the system test facility. There are documentation

updates or design changes that may need to be verified. The CR verifier and the CR implementer shall be a different person.

3.2 Change Control Board (CCB)

The purpose of the CCB is to manage changes to products by providing a thorough review of problem reports and change requests and rendering a verdict on requested changes to artifacts under configuration control, assign and track investigations and implementations, and monitor closure of the action items. The CCB has the authority to accept, reject, modify, clarify, and request more information for each CR.

The CCB activity is not required on artifacts that have not been baselined unless specified in the project planning documents. Once an artifact is declared a baseline, the CCB must review any changes. In addition, the CCB should also manage document baselines. E.g. determine when a new baseline of a controlled document should be established based on the number of changes that have occurred since a prior baseline. And the CCB meeting is held on an “as needed” basis.

3.2.1 Roles and Responsibilities

This section presents the roles and responsibilities associated with the CCB. The following people need to attend every CCB meeting, and their signatures are required to authorize CR acceptance and closure. Responsibilities can be delegated to other qualified persons as necessary.

- CCB Chairperson
- Technical Project Manager
- Chief Engineer
- System Integrator/System Architect
- CCB Facilitator (EPA)

NOTE: For domain CCBs, the Chief Engineer, System Integrator, and TPM are not mandatory in the CCB meeting.

The following people can optionally attend CCB meetings when their expertise or point of view is required, but should be invited to attend all CCB meetings.

- Program Manager
- Department Manager
- Group Manager
- Domain Systems Engineer(s)
- Quality Engineer
- Safety Engineer

Multiple roles may be fulfilled at the CCB meeting by a single individual depending on project size and complexity.

Additional experts can be invited to the CCB meeting as needed to provide the CCB with important information about the changes under review.

3.2.1.1 CCB Chairperson

The CCB Chairperson is the participating TPM or a CCB member who is designated by the TPM to be the CCB Chairperson. The Chairperson leads the meeting discussions and keeps the meeting on track.

3.2.1.2 Technical Program Manager (TPM)

The TPM:

- Reviews the change requests during the CCB process with focus on scope, schedule, cost, priority, and technical approach.
- Is responsible to review the change requests as a PM in case of the PM's absence.
- Is responsible to review the change request with a focus on resources as well.

3.2.1.3 Chief Engineer (CE)

The Chief Engineer reviews the change requests during the CCB process with focus on the technical approach.

3.2.1.4 System Integrator/System Architect

The system Integrator/System Architect reviews the change requests during the CCB process with focus on the technical approach especially related to the architecture and integration of the changes.

3.2.1.5 CCB Facilitator (EPA)

The Facilitator reviews the change requests during the CCB process with a focus on the process itself. The Facilitator creates a list of change requests that need to be reviewed prior to the CCB meeting and sends the list to all invitees. The Facilitator updates the state of change requests based on the decisions made during the meeting. The Facilitator is responsible for notifying other programs or products that may be affected by the change request.

3.2.1.6 Program Manager

The PM reviews the change requests during the CCB process with a focus on scope, schedule, and cost.

NOTE: If the PM attends the meeting the PM is delegated by the TPM to review the change requests.

NOTE: If the cost to implement a CR is beyond the approved budget of the program, the PM must approve the CR.

3.2.1.7 Department Manager

The Department Manager reviews the change requests during the CCB process with focus on schedule and resource.

NOTE: If the Department Manager attends the meeting the Department Manager is delegated by the TPM to review the change request with a focus on resource as well.

3.2.1.8 Group Leader

The Group Manager reviews the change requests during the CCB process with focus on schedule and resources.
NOTE: If the Group Manager attends the meeting the Group Manager is delegated by the TPM to review the change request with a focus on resources as well.

3.2.1.9 Domain Systems Engineer

The Domain Systems Engineer reviews the change requests during the CCB process with focus on technical approach related to domain expertise.

One Domain Systems Engineer can be invited by the CCB Facilitator from each domain that is affected by the CRs under review.

3.2.1.10 Quality Assurance

For the CR process, Quality Assurance will monitor and audit the change control process.

3.2.1.11 Safety Engineer

A CR may impact the safety assessment performed on the system in the Preliminary System Safety Assessment (PSSA) or if a CR is identified late in the program, the final System Safety Assessment. For this reason, the Safety Engineer needs to be considered and, if there is a potential impact, must be invited to the CCB to represent the safety aspects of the system. For CRs with safety impact, safety engineers or their delegate are required to review and approve the Cert/Safety Justification Statement field during the CCB meeting. For all other CRs, Safety Engineers are optional reviewers.

4 Change Control Process

4.1 Identify Issue and Start Change Request (CR) Process

The CR process begins when an issue is identified. This issue can be a request for a change or a problem identified internally or externally (customer, regulatory agency, etc.). Issues can also arise from other programs within the company. CRs should not be raised to ask questions or to assign action items.

4.1.1 Draft CR

Required information on a CR includes:

- Summary/Title – Short description of the issue.
- Author – Name of the person who identified the issue.
- Description – The description of the change/problem should be in clear, plain English and capture known circumstances and environment associated with issue.
- Detection Point – Activity being performed when the issue was detected. See Appendix A Change Management Defined Lists.
- Date Identified – The date the CR was identified.
- Change Request Type – Type of change request. See Appendix A Change Management Defined Lists.

- Customer Criticality – Criticality as perceived by the end customer. (Optional)
- Priority – See Appendix A.
- Affected Artifacts – Identify all artifacts that this CR affects. Example of artifacts would include documents, units, subsystems, source code, drawings, etc.
- SW and HW Configuration – Text that describes the configuration of the equipment; enter the part numbers for each unique hardware and software component in the system in which the defect or desired spec change was observed.
- Other Affected Programs/Products – Identify other programs or products that may be affected by this CR. (Optional)

4.2 CCB Review

The purpose of the CCB is to review all potential changes for desirability and impact to safety and certification, and to assist in prioritizing and scheduling future actions. The function of the CCB is to accept, reject, or request additional investigation of the CR.

4.2.1 Accept CR

Once enough information is available the CCB may accept the CR. No implementation is performed until the CR is accepted.

The following information is recommended:

- Affected Artifacts – Identify all artifacts that this CR affects. Examples of artifacts would include documents, units, subsystems, source code, drawings etc.
- Build ID/Version – Identify the Build ID or System Version this CR is scheduled to be implemented.
- Change Request Type – Type of change request. See Appendix A.
- Assignee(s) – Identify the person(s) responsible for implementing this CR.
- Verifier(s) – Identify the person(s) responsible for verifying this CR.
- Priority – See Appendix A.
- Approval Signatures – Signatures of designated individual(s) required to authorize CR acceptance.
- Severity – Impact that the issue has on the performance of the system. See Appendix A.

4.2.2 Reject CR

If the CR does not have merit or if the estimated impact is not acceptable, the CR will be rejected and filed, and the originator will be notified. Reasons for rejecting a CR may include duplicate CR, unsatisfactory schedule/cost impact, outside of scope, high probability of risk, etc.

If, at later time, it is decided that the CR will be implemented, a new CR is written. The rejected CR can be referenced on the new CR as a related CR.

The following information is required:

- Disposition – Detailed explanation of why this CR was rejected.
- Date Rejected – Date the CR was rejected.

4.2.3 Notify Other Affected Programs/Products

The CCB reviews the CR to ensure that all equipment and other affected programs have been identified. These programs are listed on the CR form. A copy of the CR should be sent to the affected programs so they may begin their CR procedure. This awareness is critical as programs re-use the components of other programs.

4.3 Design and Implement CR

4.3.1 Design and Incorporate the Change

Once the CR has been accepted, Engineering designs and incorporates the change. The following information is required:

- Implementation Description – A complete summary of the changes made to implement the CR including the artifact names and applicable versions.
- Injection Point – The activity in which a defect was inserted or the earliest activity that may have to be restarted in order to implement a change.

NOTE: Injection point is only required for a CR Type of Problem/Defect.

4.3.2 Verify CR

When the engineer(s) are satisfied that they have implemented the solution to the CR correctly, the changed artifacts (and CR) are subject to verification to assure correctness and completeness of the implemented changes. These changes should be verified at the highest level necessary to ensure successful system or product integration. Examples of this may include subsystem or system level testing.

The following information is required:

- Verification Description – A description of or reference to the methods, criteria and/or tools used to verify the CR.
- Verification Results – A summary of the results of the verification.
- Test Results – The results of the test performed for verification, e.g. n of m tests passed.
- Verification Date – The date the CR was verified.

If the verifier finds that the implemented changes are not correct and/or complete, the CR implementers are notified that rework is necessary. Upon completion of the rework effort the verification is performed again. These steps are repeated until the implemented changes are correct and complete.

4.4 Final Review

Closure is performed by a reviewer, who represents the organization that originally entered the change request. This person has the opportunity to review the actions taken to make sure they have fulfilled the intent of the change request, and that all required information has been captured.

The following information is recommended:

- Reviewer Comments – Any pertinent comments at the closing of the CR.

- Document release information – Any document related artifacts may be updated to include the information related to the release of the document which incorporated this CR. For example revision letter, revision date and configuration management numbers (DCN, ECO, etc.).
- Quality Review – Record of QA audits (i.e. not reviewed, accepted or rejected)

If a problem is found during final review, the reviewer will return the CR to the appropriate step in the CR process based upon the problem found.

4.5 Close CR

After the verification has been completed and all required information has been recorded, the CR is closed. Once a CR is closed it cannot be reopened. If the issue needs to be revisited a new CR is generated.

The following information is required:

- Close Date – The date the CR is closed.
- Closure Signatures – Signatures of designated individual(s) required to authorize CR closure.

4.6 Cancelling an Accepted CR

Once a CR is accepted, it may be cancelled only after careful consideration. Keep in mind that some work may have been implemented. It is the CCB/Program/Product Management's responsibility to assure that the cancellation of a CR is communicated to all affected parties and that all work has been "backed out".

The following information is required:

- Cancellation Reason – Detailed summary of the reason the CR was cancelled.
- Cancellation Date – The date the CR was cancelled.

Exhibit A: Process Flow Diagram for Developmental Change Control

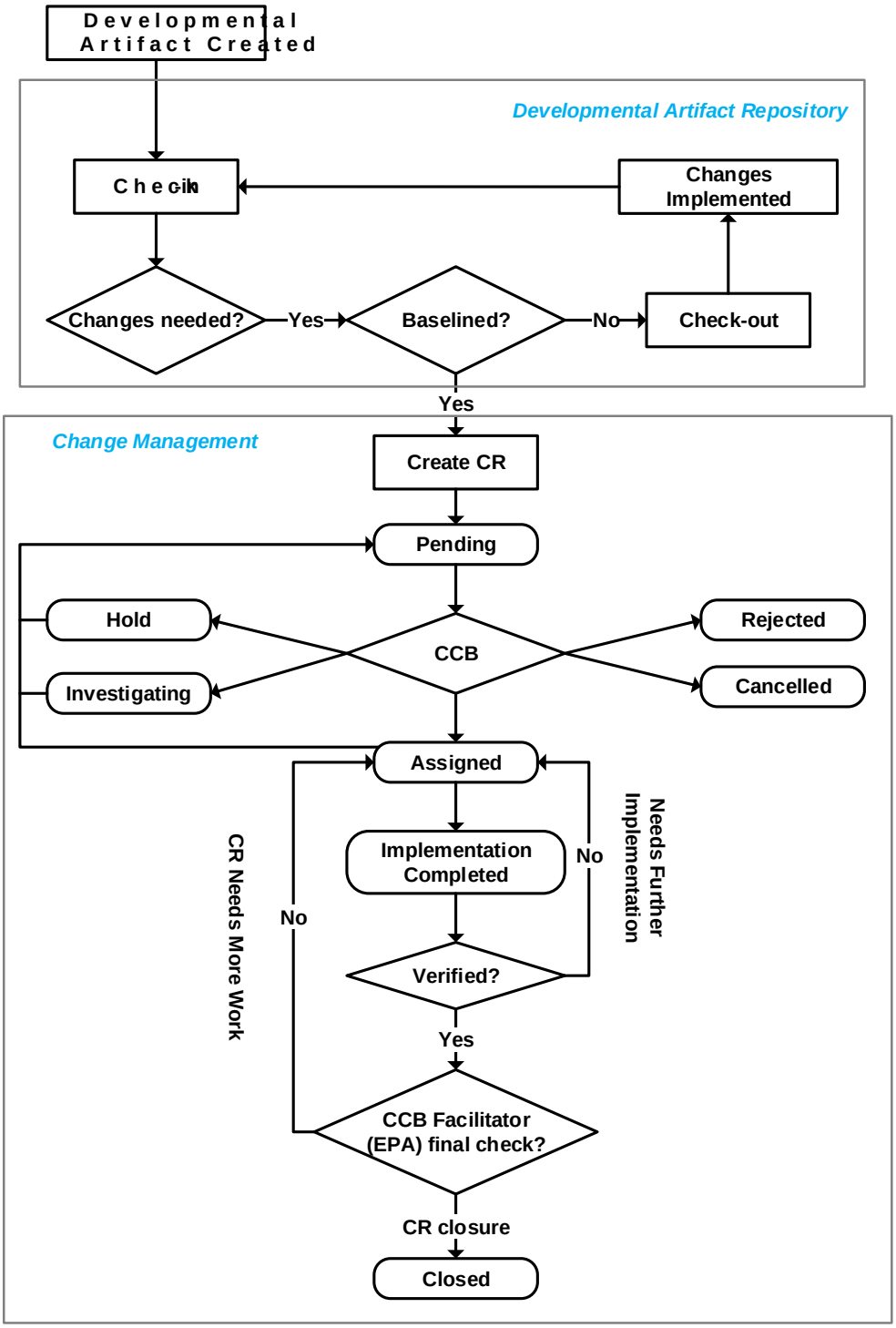

Exhibit B: Change Management Defined Lists

Change Request Type

Problem/Defect	Defect
New Requirements	Requirement
Revised Requirements	Change to existing requirements
Enhancement	Request to change implementation without changing requirements or functionality (e.g. code optimization)
Clarification	Clarify an existing requirement, data, or information without changing functionality or definition. Also includes document editing and formatting changes.

Priority

1	Urgent
2	Immediate
3	Needed
4	Desired
5	Should Do
6	Review
7	Hold

1-2 Urgent-Immediate

This category is used for CR issues that must be in the current version being developed or create a new version with more immediate delivery.

3-5 Needed-Desired-Should Do Update

This category is used for CR issues, which can be implemented in the current or future scheduled equipment update.

6-7 Review-Hold

This is a suspense category where CR issues of low priority are placed and reviewed periodically to determine the need and timing for implementation. An issue in this category can be rejected if it is later determined that it is no longer relevant.

Severity

NOTE: The Severity code “Trivial” should not be used for issues categorized with a Change Request Type of “Problem/Defect”. Problem/Defects are issues that reflect a problem with the core purpose of the artifact, whereas Trivial issues are not.

1	Critical	● Safety and certification issues. Loss of all or a significant portion of required functionality ● Significant degradation of required performance ● Adversely affects a mission-critical function, no alternative work-around is known
2	Serious	● Corruption of required functionality and/or performance ● Adversely affects a mission-critical function, an alternative work-around is known
3	Minor	● Moderate impact to system functionality ● Little impact to required functionality and/or performance ● Inconvenience or annoyance (may not be resolved)
4	Trivial	● Documentation defect (e.g. spelling, grammar, copyright, style) ● No impact to required functionality and/or performance

