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Quality Assurance Plan

RAMS-Dependability and Safety Evaluations

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Quality Assurance Plan

RAMS-Dependability and Safety Evaluations

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1. Introduction

1.1 Purpose

The quality assurance plan (QAP) document describes the quality system for the RAMS Call-of-Order nr.2 project. It defines which standards, conventions and practices will be followed, when, and by whom. It describes the quality assurance activities to be carried on during the different project phases and the person/organization responsible for these activities.

The outcomes of this document are:

- establishment of the quality targets by identifying the standards, conventions and practices to be implemented on this project,
- a strategy for conducting the quality assurance process activities,
- identifying what are the evidences for the quality assurance activities,
- how to check the adherence of software products, processes and activities to the applicable standards, procedures, and requirements.

The activities of software configuration management (SCM) and software verification and validation (SVV) are performed on the scope of the quality assurance activities.

1.2 Scope

This plan establishes the software quality assurance (SQA) activities performed throughout the life cycle of the RAMS. It is applicable to the software products (documents and source code) constructed in the scope of the project.

The quality assurance plan was developed in conformance to the Critical Software standards especially with Quality Assurance process standard [REF-2]. According to the internal Critical Software tailoring schemes (see section *6. Tailoring strategy* from [REF-2]) the tailoring attributes applicable to the project are:

Project type:		service
Project attributes:	criticality	critical
	size of team	small
	schedule	aggressive

1.3 Audience

This document is firstly addressed to all project members, quality assurance personal, customer and other stakeholders.

1.4 Definitions and acronyms

1.4.1 Definitions

Audit	A systematic and independent examination to determine whether activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives (ISO 8402:1994, definition of Quality Audit).
Quality Assurance	All the planned and systematic activities implemented within the quality system and demonstrated as needed, to provide adequate confidence that an entity will fulfil requirements for quality [ISO 8402:1994].
Software Quality Assurance	Quality Assurance applied to software.

Software quality assurance plan	is a systematic pattern of all actions necessary to provide the adequate confidence that the item or a product produced conforms to the established requirements.
Tailoring	The process by which individual requirements (clauses, paragraphs or sentences) of specifications, standards and related documents are evaluated and made applicable to a specific project in the most cost-effective manner. The evaluation will determine the extent to which the requirements are most suitable for the acquisition or development of a specific system. Application of the requirements may be any of deletion, addition or modification of requirements in the standard(s).

1.4.2 Acronyms

CSW	Critical Software, SA
COO2	Call-of-Order nr.2
PMP	Project Management Plan
SPMP	Software PMP
SQAP	Software QAP
TBC	To Be Confirmed
TBD	To Be Defined
AP	Applicable Document
REF	Reference Documents
PA	Product Assurance
SVV	Software Verification and Validation
SCM	Software Configuration Management
SRR	System Requirements Review
PDR	Preliminary Design Review
CDR	Critical Design Review
QR	Qualification Review
AR	Acceptance Review
CM	Configuration Management
QA	Quality Assurance
PM	Project Manager
QAP	Quality Assurance Plan
PMP	Project Management Plan

1.5 Document structure

Section 1. Introduction, provides information about the document content including the purpose, scope, audience, definitions and acronyms, structure and references list.

Section 2. Software quality assurance management, describes the organisation, structure and responsibilities for quality assurance in the relevant software processes.

Section 3. Software process definition, identifies the selected project software life cycle, provides definition of the software process and identifies the relevant milestones.

Section 4. Quality assurance tasks, specifies the tasks to be performed throughout the software process.

Section 5. Quality metrics, identifies the produce and process metrics that shall be collected evaluate the status of the project.

Section 6. Milestones reviews and audits, defines the technical reviews and audits to be conducted.

Section 7. Training plan, identifies the training defined for the project staff and explain how SQA will check that they have been implemented.

1.6 References

1.6.1 Applicable documents

[AP-1] "Organisation Manual", Critical Software, SA, CSW-2002-CPD-0675.

[AP-2] "Project Management Process", Critical Software, SA, CSW-2002-QAD-0040.

[AP-3] "Configuration Management Process", Critical Software, SA, CSW-2002-SEP-1023

[AP-4] "Version Control System", Critical Software SA, CRITICAL-2000-QAD-0081.

[AP-5] "Unit Testing Procedure", Critical Software SA, CSW-2002-PRO-0513.

[AP-6] "Document Review Procedure", Critical Software SA, CSW-2002-PRO-0510.

[AP-7] "Code Review Procedure", Critical Software SA, CSW-2002-PRO-1233.

[AP-8] "Audit Guidebook", Critical Software SA, CSW-2002-GBK-1406.

[AP-9] "Verification Process". Critical Software SA, CSW-2002-SEP-0354.

1.6.2 References documents

[REF-1] "Software Development Process", Critical Software, SA, CSW-2002-SEP-0909.

[REF-2] "Quality Assurance Process", Critical Software, SA, CSW-2002-SEP-0449.

2. Software quality assurance management

This section describes each major element of the organization that influences the quality of the software.

2.1 Organization

The project structure is the following:

- ESA/ESTEC Client
- Critical Software (CSW), Prime Contractor

Key personnel have been selected by each consortium company in order to guaranty the best level of quality for the RAMS COO2 project. Each key person will perform quality assurance tasks according to its roles.

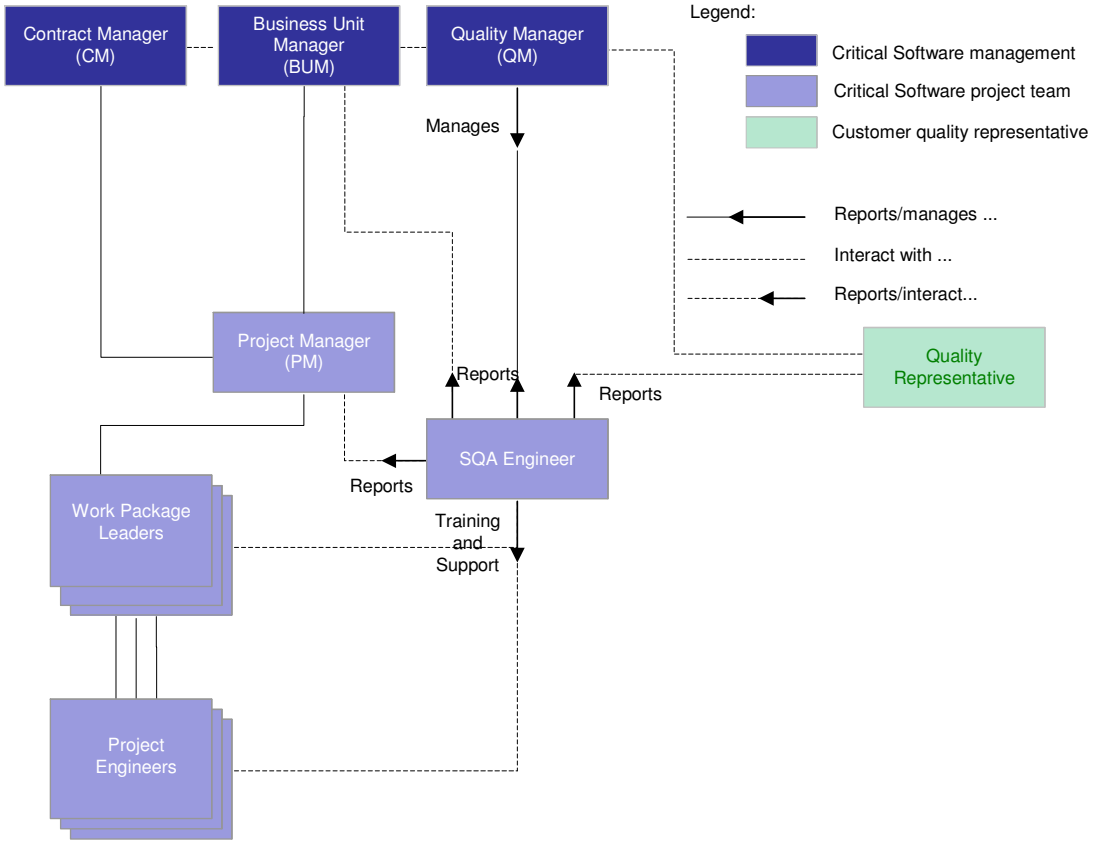

Figure 1 – RAMS COO2 quality assurance relationships

2.2 Responsibilities

Generic responsibilities for each relevant role presented in Figure 1 are define in Quality Assurance process [REF-2], project specific description are:

Contract Manager (CM)	is responsible for all the contractual and administrative matters with the ESTEC and he will be the primary point of contact of the ESTEC Contracts Officer.
Quality Manager (QM)	provides guidance to the Software Quality Assurance engineer in the implementation of the Quality Assurance activities. The QM shall analyse the Software Quality Assurance reports and it shall act in conformance to what is stated in the report. The QM is responsible to define and organize the audits according to the define procedures. The QM also approves the quality assurance plan performed by the SQA engineer. The QM may report to the higher management levels if it is not able to correct the non-conformances reported in the product assurance (PA) report.
Business Unit Manager (BUM)	is responsible a business areas within CSW and oversees the work performed by the project manager (PM).
Project Manager (PM)	is responsible to provide to the SQA engineer the necessary support and commitment to implement the quality assurance activities in the project. The Project Manager approves the Software Quality Assurance plan performed by the SQA engineer.
Software Quality Assurance Engineer (SQA)	is responsible to implement the Software Quality Assurance activities in the project according to what is defined in the quality assurance process [REF-2] and detailed in this plan. The SQA engineer is appointed and managed by the QM and periodically reports to the project manager and quality manager. The SQA must not have any other responsibility or tasks in the project.

Customer Quality Manager	is the person from the ESTEC responsible for the quality of the project.
Work Package Leaders	will guarantee the technical quality correctness over the work and will have direct reporting lines to the Project Manager. They are responsible for coordinating the activities of the technical team and harmonize actions and priorities, in relation to the project objectives and quality needs. The work package leaders elaborate and implement technical strategies related to meeting the requirements, risk mitigation or prevention of unexpected events.
Project Engineer (PE)	is responsible for the development of all tasks assigned to him. Guaranteeing all quality standards adopted for the project, and interacting directly with the Project Manager overseeing his work.

2.3 Personnel

Additional to the responsibilities defined in section 2.2 all the elements of the RAMS COO2 team are responsible for:

- applying the standards, conventions and practices defined to the project,
- analysing/using the supplied documents,
- using the version control repository as defined,
- properly update the configuration status of documents,
- generating problems reports when is specified for.

The software quality assurance (SQA) engineer participates in the project in order to provide feedback related to achieved or not achieved goals and to focus the team on achievement of the next goals (preventive action). The SQA engineer may not attend all meetings. Typically, the SQA engineer analyses the meeting agenda provided by the project manager (PM) and decides accordingly in the type of participation, if any.

The SQA engineer should also conduct detailed quality assessments in support of product assurance (PA) reporting activities which synthesises the results obtained and corrective actions implemented. Typically, the PA report is performed at milestones reviews (SRR, PDR, CDR and AR). The PA reports the totality of activities, standards, controls and procedures in the lifetime of a software product which establish confidence that the delivered software product, or software affecting the quality of the delivered product, will conform adequately to customer requirements. The SQA engineer effort for this project is 20%.

The SQA engineer will be familiar with and will be able to apply the standards and guidelines defined for CSW software development process [REF-1] and he will be familiar with software quality, software development related activities, and structured analysis, design, coding, and testing.

Additionally, the software quality assurance (SQA) engineer should check if the:

- project is properly organized, with an appropriate life cycle,
- evaluation team members have defined tasks and responsibilities,
- documentation plans are implemented,
- documentation is correctly implemented,
- documentation and coding standards are followed,
- standards, practices and conventions are being used,

- reviews and audits take place and are properly conducted,
- tests are specified and rigorously carried out,
- problems are recorded and tracked,
- project uses appropriate tools, techniques and methods,
- software is safely and securely stored as defined,
- records of all activities are properly kept,
- staff are properly trained,
- risks to the project are minimized.

Work Package Leaders are responsible for:

- reporting to the software quality assurance (SQA) engineer about the adherence to standards, conventions and practices,
- checking if files are being properly stored and on the right location,
- checking if tools, methods and techniques are being properly used.

Project engineers (PE) are responsible for:

- tracking problems and applying corrective actions,
- weekly reporting the performed tasks – 15-5 report.

2.4 Resources

The quality assurance activities are independent from any tool or other non-human resources. The resources necessary to carry out the process activities are the availability of the software quality assurance (SQA) engineer and the defined guidebooks, checklists and templates identified to carry out the activities. However, the SQA engineer should analyse the output from tools used during software engineering tasks such as: code reviews, change control system, etc.

Software quality assurance (SQA) engineer will have access to the facilities and equipment of RAMS COO2 project. SQA engineer will have access to computer resources to perform SQA functions such as process and product evaluations and audits.

2.5 Deliverables

The deliverables that specify, describe and support the RAMS COO2 or the software development process shall be created and updated periodically throughout the development cycle.

For project's deliverables to be developed and not yet listed in section 2.5, the SQA engineer will assist in identifying the specifications, standards, and templates to be followed in the preparation of the required deliverable.

The RAMS COO2 project documentation generated by the project to report the quality assurance activities is consistent to the software development process [REF-1].

The following subsections list the relevant work products (deliverables and non-deliverables) that will be developed/ maintained and identify the associated standard or guidelines that are used to develop/maintain the document to which this quality assurance plan applies.

After each deliverable is reviewed, approved and issued it shall be placed under change control procedure. At this point forward all changes shall be analysed, discussed and approved, at least, by the stakeholders that were involved in the previous approval.

2.5.1 System requirements review

The documents that shall be deliverable during the system engineering phase are:

Document Title	Reference	Standard, Guideline or Template
Minutes of the COO2 Start of activities Meeting	DL-RAMS-02-MoM-KOM CSW-RAMS-2003-MMN-1332	CRITICAL-2000-TPL-0099-meeting-minutes.dot
Evaluation Report (issue 1) – RTEMS 4.5.0 Description and scope Definition	DL-RAMS02-01-01 CSW-RAMS-2003-TNR-1334-01	CRITICAL-2000-TPL-0134-critical-report-us.dot

The non-deliverable documents produced are:

- DRR Document Review Record
- PTR Personal Task Report
- AIL Action Item List
- RIL Risk Item List

2.5.2 Preliminary design review

The documents that shall be deliverable during the software requirements engineering phase are:

Document Title	Reference	Standard, Guideline or Template
Evaluation Report (issue 2) – Updated with Fault Model	DL-RAMS02-01-02 CSW-RAMS-2003-TNR-1334-02	CRITICAL-2000-TPL-0134-critical-report-us.dot
Evaluation Report (issue 3) – Updated with Metrics Definition	DL-RAMS02-01-03 CSW-RAMS-2003-TNR-1334-03	CRITICAL-2000-TPL-0134-critical-report-us.dot
Evaluation Report (issue 4) – Updated with Experiments Framework Description	DL-RAMS02-01-04 CSW-RAMS-2003-TNR-1334-04	CRITICAL-2000-TPL-0134-critical-report-us.dot
Quality Assurance Plan	DL-RAMS02-QA CSW-RAMS-2003-QAP-1233	CSW-2002-TPL-0923-quality-assurance-plan.dot CSW-2002-GBK-1541-quality-assurance-gbk.doc
Progress Report #1	DL-RAMS02-PR-01 CSW-RAMS-2003-PRG-1333	CSW-2003-TPL-0030-monthly-progress-report.dot

The non-deliverable documents produced are:

- DRR Document Review Record
- PTR Personal Task Report
- AIL Action Item List
- RIL Risk Item List

2.5.3 Critical design review

The documents that shall be deliverable during the design engineering are:

Document Title	Reference	Standard, Guideline or Template
Robustness Testing Report (issue 1) – Test Case Definition	DL-RAMS02-02-01 CSW-RAMS-2003-TCS-1335	CRITICAL-2000-TPL-0134-critical-report-us.dot
Robustness Testing Workloads	N/A	CRITICAL-1998-GBK-0001-programming-conventions-cpp.doc
Robustness Testing Report (issue 2) – Updated with Test Results	DL-RAMS02-02-02 CSW-RAMS-2003-TCS-1335	CRITICAL-2000-TPL-0134-critical-report-us.dot
Stress Testing Report (issue 1) – Test Cases Definition	DL-RAMS02-04-01 -CSW-RAMS-2003-TCS-1338	CRITICAL-2000-TPL-0134-critical-report-us.dot
Stress Testing Workloads	N/A	CRITICAL-1998-GBK-0001-programming-conventions-cpp.doc
Stress Testing Report (issue 2) – Updated with Test Results	DL-RAMS02-04-02 CSW-RAMS-2003-TCS-1338	CRITICAL-2000-TPL-0134-critical-report-us.dot
Minutes of the COO2 Review Meeting	DL-RAMS02-MoM-RM CSW-RAMS-2003-TCS-1336	CRITICAL-2000-TPL-0099-meeting-minutes.dot
Progress Report #2	DL-RAMS02-PR-02 CSW-RAMS-2003-PRG-1337	CSW-2003-TPL-0030-monthly-progress-report.dot

The non-deliverable documents produced are:

- DRR Document Review Record
- PTR Personal Task Report
- AIL Action Item List
- RIL Risk Item List

2.5.4 Acceptance review

The documents that shall be deliverable the acceptance phase are:

Document Title	Reference	Standard, Guideline or Template
Product Assurance Report	DL-RAMS02-PA CSW-RAMS-2003-PAR-NNNN	CSW-2002-TPL-0744-pa-report.dot
Evaluation Report (issue 5) – Updated with Problems Found and Potential Improvements	DL-RAMS02-01-05 CSW-RAMS-2003-RPT-1334-05	CRITICAL-2000-TPL-0134-critical-report-us.dot
Final Report	DL-RAMS02-06-01 CSW-RAMS-2003-RPT-1339-01	CRITICAL-2000-TPL-0134-critical-report-us.dot

The non-deliverable documents produced are:

- DRR Document Review Record
- PTR Personal Task Report
- AIL Action Item List
- RIL Risk Item List
- BOM Bill of Materials
- CSF Customer Satisfaction Form
- LLF Lessons Learned Form

2.6 Schedule

Software quality assurance (SQA) schedules are closely coordinated with the software development schedule in the RAMS project.

3. Software process definition

The software development process (SDP) followed in the RAMS project doesn't follow the CSW software development described in [REF-1]. This project is not a software development project but a software evaluation project. A new project life cycle was defined for this project following the cascade scheme (see Figure 2).

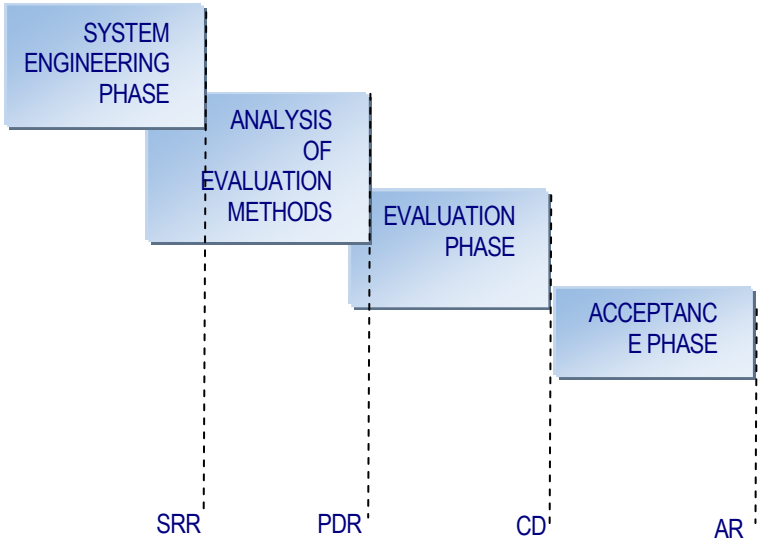

Figure 2 – RAMS project life cycle

The System Engineering Phase comprises the activities of understanding the system under evaluation. The work product of this phase is one or more sections of the Evaluation Report describing the product under evaluation and the definition of the scope of the evaluation.

The Analysis of Evaluation Methods Phase comprises the activities of defining methods, metrics and framework for the system under evaluation. The work products of this phase are Fault Model Specification, Metrics Definition, Framework Description and Quality Assurance Plan.

The Evaluation Phase comprises the activities of evaluation of the modules of the system using the methods pre-defined. The work products of this phase are Test Case Specification and Test Reports.

The Acceptance Phase comprises the activities of delivering the final results to the client. The work products of this phase are the Product Quality Assurance, Test Report and Final Presentation.

Following the selected life cycle organization and software development process phases the project relevant milestones are:

- System requirements review
- Preliminary design review
- Critical design review
- Acceptance review

The RAMS COO2 project documentation generated by the project is consistent with the software development process [REF-1] and tailoring scheme.

4. Quality assurance tasks

The scheduling of SQA tasks is driven by the RAMS COO2 project plan. Therefore, an SQA task is performed in relationship to what software development activities are taking place. One or more SQA tasks can be performed concurrently until a task is completed. A task is considered completed when the required report e.g., product assurance (PA) report, document review report, audits report, etc. are satisfactory completed or action items have been closed. To verify the delivery of a fully conforming, high-quality product every individual assigned to the project will participate in quality assurance. The following tasks, requires coordination and cooperation of all project team.

The quality assurance activities to be performed throughout the project and the identification of documentation to be produced are consistent with the CSW quality assurance process documentation [REF-2]. The quality assurance tasks considered are presented in the following sections.

If non-conformances are found in any of the SQA engineer activities they shall be reported using the product assurance (PA) report, audit report or generic non-conformance report (NCR) as appropriate.

4.1 Task: Develop software quality assurance plan

Reference: [REF-2] SUP.3.A1 Develop software quality assurance plan

This task considers the creation of this software quality assurance plan in accordance with the project contractual requirements and CSW software development process.

Evaluate Facilities	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Develop SQA Plan		X						
Provide feedback to SQA Plan	X	X	X					
Approve SQA Plan	X		X					

Table 1 – Responsibility for develop quality assurance plan

4.2 Task: Evaluate facilities

Reference: [REF-2] SUP.3.A1 Develop software quality assurance plan
Reference: [REF-2] SUP.3.A4 Report quality results

This task aims to evaluate facilities, both existing and planned, for adequacy by assessing whether they provide the needed equipment and space used for software development and support.

Evaluate Facilities	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Evaluate facilities		X						
Resolve problems found		X	X					

Table 2 – Responsibility for evaluate facilities

4.3 Task: Evaluate software tools

Reference: [REF-2] SUP.3.A2 Assure quality of processes activities
Reference: [REF-2] SUP.3.A4 Report quality results

This task aims to monitor evaluations of tools, both existing and planned, used for software development and support.

Evaluate Software Tools	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Evaluate tools					X	X		
Decision inside project		X	X		X	X		
Monitor evaluation		X						

Table 3 – Responsibility for evaluate software tools

4.4 Task: Evaluate project planning, tracking and monitoring

Reference: [REF-2] SUP.3.A2 Assure quality of processes activities
Reference: [REF-2] SUP.3.A5 Project life cycle milestones assurance
Reference: [REF-2] SUP.3.A6 Participation in project meetings

This task includes the project plan, monitoring and risk management evaluation.

Evaluate Poject Panning, Tacking and Monitoring	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Develop project management plan (PMP)			X					
Review management plan (PMP)		X						
Approve management plan (PMP)								X
Monitor project status		X						
Resolve problems found		X	X					
Ensure meetings performed		X	X					
Guarantee action item list updated		X	X					
Perform risk management			X					

Table 4 – Responsibility for ealuate project planning, tracking and monitoring

4.5 Task: Review work products

Reference: [REF-2] SUP.3.A2 Assure quality of processes activities
Reference: [REF-2] SUP.3.A3 Assure quality of work products
Reference: [REF-2] SUP.3.A4 Report quality results
Reference: [REF-2] SUP.3.A8 Subcontractor control

Deliverable work products are identified in section 2.5. Deliverables. Section *6. Milestones reviews and audits*, lists the software products to be evaluated by SQA engineer and describes the review process to be followed

Review Work Products	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Review work products		X	X		X	X		
Rework by author	Applies as applicable							
Approve work products		X	X					X

Table 5 – Responsibility for review work products

4.6 Task: Evaluate non-deliverable work products

Reference: [REF-2] SUP.3.A2 Assure quality of processes activities
Reference: [REF-2] SUP.3.A3 Assure quality of work products

Reference: [REF-2] SUP.3.A4 Report quality results
Reference: [REF-2] SUP.3.A6 Participation in project meetings

Non-deliverable work products are (also) identified in section 2.5. Deliverables.

Review Work Products	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Review work products		X	X		X	X		
Rework by author	Applies as applicable							
Approve work products		X	X					

Table 6 – Responsibility for non-deliverable work products

4.7 Task: Evaluate review procedures

Reference: [REF-2] SUP.3.A2 Assure quality of processes activities
Reference: [REF-2] SUP.3.A3 Assure quality of work products
Reference: [REF-2] SUP.3.A4 Report quality results
Reference: [REF-2] SUP.3.A5 Project life cycle milestones assurance

This SQA engineer task assures that quality review procedures are in place for all software products, which may include representations of information other than traditional hard-copy documents, and that these products have undergone software product evaluation, testing, and corrective action as required by the standard.

Corrective Action Procedure	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Perform review		X	X		X	X		
Evaluate review procedures		X						
Resolve problems found		X	X					

Table 7 – Responsibility for evaluate review procedures

4.8 Task: Evaluate the corrective action procedure

Reference: [REF-2] SUP.3.A2 Assure quality of processes activities
Reference: [REF-2] SUP.3.A3 Assure quality of work products
Reference: [REF-2] SUP.3.A4 Report quality results
Reference: [REF-2] SUP.3.A6 Participation in project meetings

This activity aims the verification of corrective actions procedure.

Corrective Action Procedure	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Maintain corrective action procedure		X			X*			
Follow corrective action procedure	X	X	X		X	X		X
Evaluate/report correction action procedure		X						
Resolve problems found		X	X					

Table 8 – Responsibility for corrective action procedure

* The project shall indicate (in the project management plan, if there is one) a senior engineer responsible to implement and maintain the corrective action procedure.

4.9 Task: Evaluate the configuration management process

Reference: [REF-2] SUP.3.A2 Assure quality of processes activities
Reference: [REF-2] SUP.3.A3 Assure quality of work products
Reference: [REF-2] SUP.3.A4 Report quality results
Reference: [REF-2] SUP.3.A6 Participation in project meetings

This activity aims to verify if the configuration management standards are been followed in the project.

Configuration Management Process	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Follow CM processes		X	X		X	X		
Evaluate/report CM process		X						
Resolve problems found		X	X		X**			

Table 9 – Responsibility for configuration management process

** The project shall indicate (in the project management plan, if there is one) a senior engineer responsible to implement and maintain the activities.

4.10 Task: Evaluate project configuration management repository

Reference: [REF-2] SUP.3.A2 Assure quality of processes activities
Reference: [REF-2] SUP.3.A3 Assure quality of work products
Reference: [REF-2] SUP.3.A4 Report quality results
Reference: [REF-2] SUP.3.A6 Participation in project meetings

This activity aims to verify if the project team uses the configuration management repository in a coherent and secure way.

Project Configuration Management Repository	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Create/maintain project repository				X*				
Use project repository		X	X		X	X		
Evaluate/report project repository		X						
Resolve problems found		X	X	X*				

Table 10 – Responsibility for project configuration management repository

* The project shall indicate (in the project management plan, if there is one) a senior engineer responsible to implement and maintain the project repository.

4.11 Task: Evaluate change control procedure

Reference: [REF-2] SUP.3.A2 Assure quality of processes activities
Reference: [REF-2] SUP.3.A3 Assure quality of work products
Reference: [REF-2] SUP.3.A4 Report quality results
Reference: [REF-2] SUP.3.A6 Participation in project meetings

This activity aims to verify if the change control procedure is been applicable in conformance with the standards.

SQA engineer will verify if CM process and procedures are been followed with the appropriate level of conformance.

Change Control Procedure	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Execute change control procedure			X		X	X		
Monitor change control		X	X					
Resolve problems found		X	X					

Table 11 – Responsibility for change control procedure

4.12 Task: Evaluate media, storage and handling procedure

Reference: [REF-2] SUP.3.A2 Assure quality of processes activities
Reference: [REF-2] SUP.3.A4 Report quality results
Reference: [REF-2] SUP.3.A6 Participation in project meetings

This activity aims to verify that configuration management (CM) certifies the media containing the documentation and source code correspond to one another.

Media, Storage and Handling Procedure	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Follow procedure					X	X		
Evaluate/report procedure		X						
Resolve problems founded		X	X					

Table 12 – Responsibility for media, storage and handling procedure

4.13 Task: Evaluate robustness and stress test process

Reference: [REF-2] SUP.3.A2 Assure quality of processes activities
Reference: [REF-2] SUP.3.A3 Assure quality of work products
Reference: [REF-2] SUP.3.A4 Report quality results
Reference: [REF-2] SUP.3.A6 Participation in project meetings

The purpose of this activity is to evaluate the applicability of the acceptance testing standards.

Acceptance Test Process	Quality Manager	SQA Engineer	Project Manager	CM Engineer	Senior Engineers	Project Engineers	Subco. Org.	Customer Org.
Create testing plans and test case definition			X		X	X		
Review test documentation		X	X		X	X		
Testing documentation under CM					X	X		
Perform tests					X	X		
Correct errors					X	X		
Approve testing results		X	X					
Evaluate/report process		X						
Resolve problems founded		X	X					

Table 13 – Responsibility for acceptance test process

5. Quality metrics

5.1 Process metrics

Process metrics shall be collected, stored, analyzed and reported on a regular basis (in the product assurance report) by applying quality models and procedures. The following process metrics shall be used:

- duration: how phases and tasks are being completed versus the planned schedule;
- effort: how much effort is consumed by the various phases and tasks compared to the plan;
- report: every document declared as a deliverable shall be subjected to formal review and produce as output a review report.

6. Milestones reviews and audits

Table 14 identifies the required milestone reviews and audits for the entire software development phases. Non-scheduled audits may be conducted to response to warning signs.

The review will be carry out following the CSW standards defined for that purpose, [AP-9] - "Verification Process". Critical Software SA, CSW-2002-SEP-0354.

Life Cycle Phase	Work Products	Reviews Type	Review Date
System Engineering	Evaluation Report (issue 1) – RTEMS4.5.0 Description and Scope Definition	Formal	01-07-2003
	Kick-Off Meeting minutes	Informal	23-06-2003
	Internal progress meeting minutes	Informal	Weekly
Analysis of Evaluation Methods	Evaluation Report (issue 2) – Updated with Fault Model	Formal	09-07-2003
	Evaluation Report (issue 2) – Updated with Metrics Definition	Formal	15-07-2003
	Evaluation Report (issue 2) – Updated with Experiments Framework Description	Formal	25-07-2003
	Quality Assurance Plan	Formal	11-07-2003
	Monthly Progress Reports	Informal	Monthly
	Internal progress meeting minutes	Informal	Weekly
Evaluation	Robustness Testing Report (issue 1) – Test Cases Definition	Formal	25-07-2003
	Robustness Testing Report (issue 2) – Updated with Tests Results	Formal	27-07-2003
	Robustness Testing Workloads	NA	
	Stress Testing Report (issue 1) – Test Cases Definition	Formal	05-09-2003
	Stress Testing Report (issue 2) – Updated with Tests Results	Formal	17-09-2003
	Stress Testing Workloads	NA	
	Monthly Progress Reports	Informal	Monthly
	Review Meeting	Informal	03-09-2003
	Internal progress meeting minutes	Informal	Weekly
Acceptance	Product Assurance Report	Formal	01-10-2003
	Evaluation Report (issue 5) – Updated with Problems Found and Potential Improvements	Formal	01-10-2003
	Final Report	Formal	01-10-2003
	Monthly Progress Reports	Informal	Monthly
	Internal progress meeting minutes	Informal	Weekly
	Final Presentation Meeting minutes	Informal	09-10-2003

Table 14 – Required reviews

No audits will be carried out for this project due to its short duration.

7. Training plan

Table 15 provides a matrix that identifies the required skills to perform SQA tasks to implement this RAMS SQA plan (note that SQA activities are responsibility of all team members). The training schedule will be compatible with the project schedule. In some cases, training will be conducted as on-the-job training (OJT).

SQA engineer monitors the plan in order to evaluate if the training is provided as planned and with the required quality.

Some of the training activities specified in Table 15 may not be implemented if the participant of training has already acquired experience on the tasks.

Task	Skill Requirements	Type	Participant
Documentation reviews	Software development and documentation standards and guidelines, verification process	Classroom	All CSW team members and other external participants
Audits	Software development life cycle processes, audit procedure	Classroom/OJT	SQA engineer
SQA management	Project management	Classroom	SQA engineer, PM
Metrics	Data collection and analysis, quality assurance process	Classroom	SQA engineer
Tools	Project members training	Classroom/OJT	SE, PE
Risk management	Risk management Process	Classroom	PM
Configuration management	Configuration management process	Classroom	CM engineer
Release management	Release management procedure, configuration management process	OJT	CM engineer
Problem reporting and correction action	Configuration management process	Classroom	All CSW team members
Change control	Change control procedure, configuration management process	OJT	All CSW team members
Project management	Project management process	Classroom	PM

Table 15 - Training needs