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SOFTWARE PRODUCT ASSURANCE PLAN FOR HMA FOLLOW ON

TASK 4 – ORDER

SUMMARY

The current plan defines the quality assurance and control activities fixed in the scope of the current project lifecycle; it defines the software quality assurance and control implementation plan, states the software verification and validation policies, and identifies the procedures to be applied in the contract's lifetime.

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Issue and Revision Register

Issue	Revision	Date	Amendments Description	Author
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Table of Contents

1 INTRODUCTION 8
1.1 Purpose 8
1.2 Scope 8
1.3 System Overview 8
1.4 Document Overview 8
2 APPLICABLE AND REFERENCE DOCUMENTS 9
2.1 Applicable Documents 9
2.2 ED Procedures and Operative Instructions Documents 9
2.3 Reference Documents 11
3 TERMS, DEFINITIONS AND ABBREVIATED TERMS 12
3.1 Abbreviations 12
3.2 Terms 12
4 SOFTWARE PRODUCT ASSURANCE PROGRAMME IMPLEMENTATION 13
4.1 Organization 13
4.1.1 Software Product Assurance Function 13
4.1.2 Configuration Manager Function 13
4.2 Resources 13
4.3 Reporting 13
4.4 Risk Management 13
4.5 Supplier Selection and Control 14
4.6 Process Assessment and Improvement 14
5 SOFTWARE PROCESS ASSURANCE 15
5.1 Software Development Cycle 15
5.2 Projects Plans 15
5.3 Software Dependability and Safety 16
5.4 Software Documentation and Configuration Management 16
5.4.1 CI Identification 16
5.4.2 Baseline Identification 16
5.4.3 Modifications Management 16
5.4.4 Configuration Status Accounting 16
5.4.5 Documentation Management 17
5.5 Reuse of Software 17
5.6 Product Assurance Planning for Individual Processes and Activities 17

5.6.1 Planning 17
5.6.2 Procedure to execute the Reviews 17
5.6.3 Preliminary Review (PR) 19
5.6.4 Mid Term Review (MTR) 19
5.6.5 Acceptance Review (AR) 19
5.6.6 Final Presentation (FP) 20
5.6.7 Audits 20
5.6.8 Methods and Tools 20
5.7 Procedures and Standards 21
6 SOFTWARE PRODUCT QUALITY ASSURANCE 22
6.1 Product Quality Objectives and Metrication 22
7 COMPLIANCE MATRIX TO SOFTWARE PRODUCT ASSURANCE REQUIREMENTS 25

Index of Figures

Figure 5.1 – Software Development Life cycle 15
Figure 5.2 – SPAP and Other Plans 15

Index of Tables

Table 2.1 – Applicable Documents 9
Table 2.2 – ED Applicable Documents 11
Table 3.1 – List of Acronyms 12
Table 4.1 – List of Quality Reports 13
Table 5.1 – ED Reviews Planning 17
Table 5.2 – Processes Performed and Procedure To Be Applied 21
Table 6.1 – Product Quality Metrics 24
Table 7.1 – Traceability between ECSS-Q-80B and this SPAP 27

1 INTRODUCTION

1.1 Purpose

The purpose of the current Software Product Assurance Plan (hereafter "SPAP") is to define the Software Quality Assurance and Control activities addressed to describe the software lifecycle, define the software quality assurance and control implementation plan, state the software verification and validation policies, and identify the procedures to be applied in the contract's lifetime for Heterogeneous Missions Accessibility (HMA) Follow On Task4 - Order implementation.

1.2 Scope

The current SPAP refers to the HMA Follow On Task4 - Order implementation context. Elsag Datamat spa (hereinafter ED), acting as Prime Contractor and con terra acting as Sub-Contractor according with the HMA Follow on activities SOW [AD-2] and ED Proposal [AD-5].

1.3 System Overview

See HMA Follow On Task4 - Order ED proposal [AD-5].

1.4 Document Overview

The current SPAP is structured applying ECSS-Q-80B [AD-7] as requested in HMA Follow on activities SOW [AD-7].

It is structured in the following sections:

- **Section 1** gives an introduction to the plan and sets the context and scope; provides glossary and references used in the current document;
- **Section 2** lists the applicable and reference documents;
- **Section 3** provides the list of terms, definitions and abbreviations used in this document;
- **Section 4** fixes organization, responsibility, resources, reporting, supplier selection and control;
- **Section 5** describes the Software Process Assurance in terms of SW life cycle, documentation and configuration management, SW Engineering processes and the related standards and procedures to apply;
- **Section 6** defines the Software Product Quality Assurance in terms of product quality objectives and metrication.
- **Section 7** provides the compliance matrix between the requirements stated in ECSS-Q-80B [AD-7] and the sections of the current SPAP.

2 APPLICABLE AND REFERENCE DOCUMENTS

In the next sections will be listed the following type of documentation:

- Applicable documents, including technical and standard documents
- Applicable ED Procedures and Operative Instructions documents
- Reference documents

2.1 Applicable Documents

Id.	Title	Reference	Issue	Date
[AD-1]	Invitation to Tender AO/1-5949/09/I-LG – HMA Follow On	RES-POE/2009/34/LG/cb	-	19 Jan 2009
[AD-2]	HMA Follow on activities SOW	SGSE-DFPR-EOPG-SW-08-0001	1.2	Nov 2009
[AD-4]	HMA FO Negotiation and Kick-Off Meeting	HMAFO-MOM-0001-SPB	-	24 Jun 2009
[AD-5]	Proposal for HMA Follow On Task4 - Order		1.0	13 Mar 2009
[AD-6]	HMA FOLLOW ON – TASK 4 Software Development Plan	P50638 /DSASGT-2995-09/00	1.0	20 Nov 2009
[AD-7]	Space Product Assurance. Software Product Assurance	ECSS-Q-80B	-	10 Oct 2003
[AD-8]	Space Engineering Software	ECSS-E-ST-40C		6 Mar 2009

Table 2.1 – Applicable Documents

2.2 ED Procedures and Operative Instructions Documents

Id.	Title	Reference	Issue	Date
[AED-1]	GESTIONE DEGLI ACQUISTI (Procurement Management)	PRC-QUA-03	00	24 sep 2007

Id.	Title	Reference	Issue	Date
[AED-2]	PIANO DI GESTIONE DEL PROGETTO – LINEE GUIDA PER LA COMPILAZIONE (Guide to the Project Management Plan)	IO-PRO-11	01	19 may 2005
[AED-3]	IL PROCESSO DI GESTIONE DEI RISCHI DI PROGRAMMA (Risk Management Process)	PG-DQA-18	00	12 oct 2004
[AED-4]	IL PROCESSO DI GESTIONE DELLA CONFIGURAZIONE DEI SISTEMI (System Configuration Management Process)	PG-DQA-09	00	05 may 2003
[AED-5]	IL PROCESSO DI GESTIONE DELLA DOCUMENTAZIONE (Documentation Management Process)	PRC-QUA-04	00	19 oct 2007
[AED-6]	PROCEDURE PER LA VERIFICA E VALIDAZIONE (Procedures for Verification & Validation)	PD-DGI-07	00	25 jun 2004
[AED-7]	PROCEDURE PER LO SVILUPPO DEL CSCI (Procedures for CSCI Development)	PD-DGI-04	00	25 jun 2004
[AED-8]	LINEE GUIDA PER LA VALUTAZIONE DEL SOFTWARE NELLA DIVISIONE GOVERNO E ISTITUZIONI (Guide to the Software evaluation)	PD-DGI-10	00	20 nov 2006
[AED-9]	GESTIONE DELLE NON CONFORMITÀ (Non-Conformity Management)	PRC-QUA-13	00	05 dec 2008
[AED-10]	PROCEDURE PER LA MANUTENZIONE NELLA DIVISIONE GOVERNO E ISTITUZIONI (Procedures for the Maintenance)	PD-DGI-06	00	25 jun 2004
[AED-11]	PROCEDURA PER LA GESTIONE DEL PROTOCOLLO (Procedure for the Document Identifier management)	PRC-DSA-02	00	02 jan 2008
[AED-12]	GESTIONE DEI PRODOTTI E DEI MATERIALI (Products and Materials Management)	PRC-QUA-25	01	03 jul 2009

Id.	Title	Reference	Issue	Date
[AED-13]	PROCEDURE PER L'ESECUZIONE DI RIESAMI, ISPEZIONI ED AUDIT DI QUALITÀ (Procedures for the Reviews execution, Inspections and quality Audits)	CQ-DQA-02	03	18 feb 2003
[AED-14]	Iter di firma della documentazione tecnica emessa dalla Divisione Difesa Spazio Ambiente (Signature procedure of the technical documentation issued by Defence, Space&Enviromental Division)	P-5164/DSAQUD-1887-09/00	00	23 jul 2009
[AED-15]	Verifiche Ispettive Interne (Internal Audits)	PRC-QUA-15	00	15 nov 2007

Table 2.2 – ED Applicable Documents

2.3 Reference Documents

No reference documents are foreseen in this SPAP.

3 TERMS, DEFINITIONS AND ABBREVIATED TERMS

3.1 Abbreviations

Acronym	Description
AR	Acceptance Review
CSCI	Computer Software Configuration Item
CM	Configuration Manager
COTS	Commercial Off-the-shelf
DDF	Design Description File
DJF	Design Justification File
DRD	Document Requirements Definition
ECSS	European Cooperation for Space Standardization
ED	Elsag Datamat spa
ESA	European Space Agency
FCA	Functional Configuration Audit
FP	Final Presentation
HMA	Heterogeneous Mission Accessibility
HW	Hardware
ICD	Interface Control Document
KO	Kick Off
MTR	Mid Term Review
OGC	Open Geospatial Consortium
OPGW	Ordering & Programming Gateway
PCA	Physical Configuration Audit
PM	Project Manager
PQE	Program Quality Engineer
PR	Preliminary Review
QMS	Quality Management System
SDP	Software Development Plan
SOW	Statement Of Work
SPA	Software Product Assurance
SPAP	Software Product Assurance Plan
SPR	Software Problem Report
SRN	Software Release Note
SVN	Subversion
SW	Software
TL	Technical Leader

Table 3.1 – List of Acronyms

3.2 Terms

No particular Terms are foreseen in this SPAP.

4 SOFTWARE PRODUCT ASSURANCE PROGRAMME IMPLEMENTATION

4.1 Organization

This topic is covered in the ED HMA FOLLOW ON – TASK 4 Software Development Plan [AD-5], containing also the responsibilities, from technical and management point of view.

4.1.1 Software Product Assurance Function

The Software Product Assurance Function shall be covered by a Program Quality Engineer (PQE) belonging to ED Divisional (Defense, Space and Environment Division) Quality Function (DSA DQF). DSA DQF is a project-independent function and the responsible is Mr. Mario Masciarelli who makes available DSA DQF resources, the PQEs, to the program structures, for quality control and quality assurance activities.

The PQE for HMA Follow On Task4 - Order implementation project is Mr. Raffaele Barbati.

4.1.2 Configuration Manager Function

The Configuration Manager function is covered by Daniele Marchionni already Project Manager.

4.2 Resources

ED will make available, in its location of Rome, offices and spaces able to perform the engineering activities to develop the project.

During the execution of the program, ED will make available to its personnel the HW and SW resources necessary to execute the activities and to prepare all deliverables fixed in the ED Proposal [AD-5].

4.3 Reporting

After the execution of the Software Product Assurance (SPA) activities, specific SPA Reports will be issued. The SPA Reports consist in Inspection Report, Review Report and Audit Report, made available in terms of forms by the Company Quality Department, as detailed in Table 4.1:

Quality Report	Form ID
Audit Report	Mod-QUA-036
Inspection Report	Mod-QUA-035
Review Report	Mod-QUA-034

Table 4.1 – List of Quality Reports

All the SPA Reports shall be archived into the PQE Quality Report Folder (QRF) and they will be make available for customer (or internal) consulting/audit.

4.4 Risk Management

The PQE will provide both identification and control of any risk should arise in the execution of SPA activities. The Risk Management process and Critical Item Management will be described in the SDP.

4.5 Supplier Selection and Control

The HW and SW COTS products purchased will be selected according to the ED Quality Procedure PRC-QUA-03 [AED-1]; then they will be subjected to the incoming inspection and operational testing according to the ED Quality Procedures PRC-QUA-25 [AED-12].

However, all HW resources, to be used, will be procured by ED and no HW will be delivered by ED.

4.6 Process Assessment and Improvement

The assessment and improvement process for this project will be performed by means of internal process audit/inspection according to the ED procedures [AED-15] and [AED-15].

5 SOFTWARE PROCESS ASSURANCE

5.1 Software Development Cycle

The Software Development Life cycle of the HMA Follow On Task4, depicted in Figure 5.1, is described in the Software Development Plan [AD-5]. Reviews, performed at the end of each phase, will ensure the completeness and correctness of the outputs of each phase.

During the development cycle, as described in the Software Development Plan [AD-5], the major milestones have been identified to approve the delivered items and to authorize the start of the next phase.

The following sections 5.6.n describe in detail the listed phases, starting from the Preliminary Review (PR), in terms of development activities, documentation to be produced and verification activities to be executed before the delivery of documents at the fixed milestones.

Documents delivered at the end of a phase could be re-issued at following milestones, if their update is needed.

The Software Development Process activities have been derived from the WPDs contained in the HMA Follow On Task4 - Order ED proposal [AD-5].

Figure 5.1 – Software Development Life cycle

The activities and the related Quality Control activities are detailed in the section 5.6.

5.2 Projects Plans

The relationship between planning documentation and the current SPAP is shown here below:

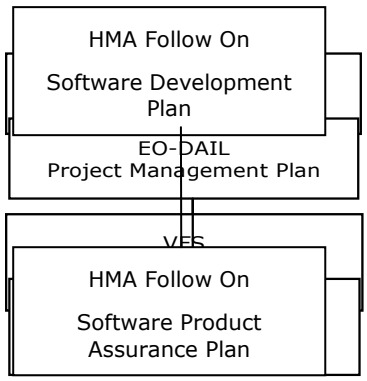

Figure 5.2 – SPAP and Other Plans

5.3 Software Dependability and Safety

The software dependability and safety do not apply.

5.4 Software Documentation and Configuration Management

This topic is covered in the HMA Follow On Task4 SDP. In the next sub-sections the ED minimum requirements are described.

5.4.1 CI Identification

The HMA Follow On Task4 CSCIs will be identified following the ED Procedure PG-DQA-09 [AED-4] about system components codification.

The CSCI codification identified will be inserted in the Configuration Items Data List (CIDL).

5.4.2 Baseline Identification

During the Software Development Lifecycle (Figure 5.1) the following baselines shall be identified:

1. Functional Baseline: containing the Customer documentation
2. Allocated Baseline: containing HMA Follow On Task4 Specification
3. Development Baseline: containing HMA Follow On Task4 Design and Test documentation
4. Product Baseline: containing the SW, the SW Release documentation (SRN) and the Test Report documentation
5. Test Environment Baseline: containing HMA Follow On Task4 Test Scripts, Test Tools, Test Data and all about test environment

5.4.3 Modifications Management

Modifications Management will be performed by means of the using of ED forms as reported in QUA-106-08/00 [AED-9] and in PG-DQA-09 [AED-4].

All Modification Requests, enhancement or anomalies ones, shall be approved by an internal Configuration Control Board (CCB) and if there will be contractual impacts the modification requests shall be then submitted to customer approval. In this last case more details about this topic will be provided in HMA Follow On Task4 SDP.

The internal CCB shall be composed at least as follows:

- PM (always attend)
- PQE (always attend)
- TL (always attend)
- CM (always attend)

It will be CM responsibility to write the CCB minutes and to collect all the signatures of the CCB participants.

5.4.4 Configuration Status Accounting

The CM shall produce a Configuration Status Accounting (CSA) at least at foreseen baselines release or at milestone achievement. It will be part of the baseline itself and shall be contain at least:

- Items (e.g. software unit, class, document, etc.) name belonging to the related CI
- Items responsibility
- Items version

- Baseline name
- Items status (e.g. check-in, check-out) and related responsible of the status action

5.4.5 Documentation Management

HMA Follow On Task4 Project documentation will be produced according to the ED procedure PRC-QUA-04 [AED-5].

File Name documentation naming convention (document identification) will be issued according to the ED procedure DSAQUD-0001-08/00 [AED-11].

5.5 Reuse of Software

HMA Follow On Task4 implementation project foreseen the reuse of the Ordering & Programming Gateway - OPGW component already implemented in the frame of HMA-I and HMA-E projects and detailed into HMA Follow On Task4 - Order ED proposal [AD-5].

5.6 Product Assurance Planning for Individual Processes and Activities

5.6.1 Planning

The SPA activities will be performed in order to give appropriate visibility on all SW development phases and to demonstrate that SPA requirements are appropriately taken into consideration and implemented.

Each formal review (in front of ESA) is preceded (at least one week before) by an ED internal review. In this way, in the next sections the reference to the formal review is mentioned only but is intended that both the reviews have to be considered.

The complete overview on the planning of both engineering activities and quality control activity is contained in the HMA Follow On Task4 SDP with the details contained in to the HMA Follow On Task4 - Order proposal WPDs [AD-5].

The following table (Table 5.1) summaries the control activities referring the related milestones considering KO date = 24 June 2009:

Milestone Name	Event	Review Date with ESA	ED Reviews
PR	Preliminary Review	02-Feb-2010	25-Jan-2010
MTR	Mid term Review	May-2010	May-2010
AR	Acceptance Review	Nov-2010	Nov-2010
FP	Final Presentation	Mar-2011	Mar-2011

Table 5.1 – ED Reviews Planning

5.6.2 Procedure to execute the Reviews

The aim of the reviews is to:

- Analyze the documents expected as output from a given development phase;
- Authorize the start of the next project development phase.

The following procedure shall be carried out to execute the internal review:

a) Review preparation

a1) a Review Board is defined under the responsibility of PM; the PQE shall be member of the Board;

a2) the PQE, with the approval of the PM, will organize the review activity;

a3) the PM shall notify the Review to the Board at least 5 working days before the intended Review date and after the completion of a development phase by the software development team;

a4) the PQE shall organize the review assuring that all documentation required for the Review is available to the Review Board at least by the Review notification date.

b) Review activity

b1) the review will analyze the documents in order to check:

- Compliance with documentation standards
- Internal consistency
- Correctness
- Completeness versus upper level documents
- Traceability towards other documents

b2) before the Review Meeting the document Author shall provide the answer to each comment (Accepted, Refused and, in this last case, the related reason) and the PQE is in charge of collecting all raised and reported comments by any member of the Review Board and related Author answers, before the Review Meeting, in order to facilitate Review Board analysis during the meeting.

c) Review Meeting

c1) Review meetings are chaired by PQE

c2) Review Report and the actions, raised by any member, are prepared and issued under the responsibility of the chairman

c3) The Review meeting shall have a formal conclusion, given by the Review Board, among the following:

- *Passed*: documents reviewed are accepted, and the software development team is authorized to move to the next development phase;
- *Passed with actions*: some actions established by the Board require that some modifications shall be implemented in the documentation, nevertheless the software development team is authorized to move to the next development phase;
- *Supplementary Review Needed*: it is necessary to execute again the review after that all the actions established by the Board have been accomplished. The software development team is not authorized to start the next development phase.

c4) A Review Report will be issued, under the responsibility of the chairman, within 5 working days after the meeting. The report shall include the results, the actions established and the formal conclusion.

d) Review follow-up

The PQE is in charge to verify and record the completion of the corrective actions established during the review.

5.6.3 Preliminary Review (PR)

The Preliminary Review (PR), is performed on the documentation produced at the end of the software requirements specification and the Architectural Design phases to verify that the analysis/design is:

- compliant with documentation standard templates;
- correct, from the technical and quality points of view;
- consistent and coherent with all applicable documents;
- internally consistent and coherent.

The documents submitted to the current review are mainly the following:

- HMA Ordering ICD
- HMA Order ICD Test Suite Technical Note containing ATS and ETS
- OPGW Software Requirements Specification – SRS (Order Server Requirements Baseline)
- OPGW Software Design Document – SDD (Order Server Architectural Design).

5.6.4 Mid Term Review (MTR)

The Mid Term Review (MTR), internal (ED Internal review) or not (formal review in front of ESA) is performed on the documentation produced at the end of the detailed design and implementation phase to verify the following:

- correct, from the technical and quality points of view;
- consistent and coherent with all applicable documents;
- internally consistent and coherent;
- complete, i.e. it describes all software units.

The documents submitted to the current review (besides those mentioned the previous review) are mainly the following:

- OPGW Software Installation Document (Order Server Operation Manual)
- OPGW Software Validation Testing Specification – SVTS (Order Server Acceptance Test Plan; Traceability of Acceptance tests to Requirements Baseline).

5.6.5 Acceptance Review (AR)

The internal Test Readiness Review (TRR) is performed on the documentation produced up to the testing phase with the purpose of verifying that the SW is correctly described in terms of content and usage and that, together with the environment is ready for acceptance. After the internal TRR the Acceptance Test shall be performed, at the ESA presence. The software is subject to the Acceptance Review, in front of ESA, which will be executed to verify if the software and its documentation fulfill the allocated requirements.

The documents and software submitted to the current review (besides those mentioned the previous reviews) are mainly the following:

- OPGW SW Delivery (with the Software Release Document)
- Order Server Installation Plan
- OPGW Acceptance Test Reports.

5.6.6 Final Presentation (FP)

As End of Contract the ED will perform a complete Final Presentation. The presentation is intended to convey in about half/one day a detailed overview of the project's objectives, scope, history, results, and suggestions. It may be held through slides, demonstrations, or other appropriate format.

The documents submitted to the current presentation are mainly the following:

- Updated Software Development Plan (SDP)
- Project Executive Summary.

5.6.7 Audits

Internal Audits might be conducted in order to verify if the SW Engineering processes are compliant with the rules defined in the related plans. Audits may be conducted on subcontractor con terra, to verify if the activities are performed in accordance with the approved plans.

To overcome failure, consistent poor quality or other problems, audits will be executed at any moment the project success can be considered jeopardized by risks factors.

They will be documented in quality evaluation records and problems resulted will be reported to higher management with recommended solutions.

External Audits, may be carried out, on the current project, once agreed upon times and modalities (i.e. audit notice, audit planning, subject of the audit) between customer representatives and ED Contractor, in order to verify if the activities are performed in accordance with the contractual applicable documentation.

5.6.8 Methods and Tools

For accomplishing the activities required, the following list of envisaged tools that will be used:

- Evolution of the OGC 06-141 specification:
    - Microsoft Office Word for writing the document
    - Altova XML Spy 2009 for editing the XML schema
    - UML modelling tool – Rational Rose
- Preparation of the ATS
    - Altova XML Spy (2007 or higher)
    - UML tool
    - Microsoft Office Word for writing the document;
- Preparation of the ETS
    - Altova XML Spy (2007 or higher)
    - ERGO TEAM Engine (http://wiki.services.eoportal.org/tiki-index.php?page=ERGO+TEAM+ENGINE+)
    - The web accessible Elsag Datamat Order Reference Server
- Development of the order server:
    - Altova XML Spy 2009 for XML development
    - Sun Netbeans as integrated development environment

- Java JDK 1.5.0.17 or higher
- TOMCAT for deploying the software
- HSQLDB for hosting the OPGW database
- Operating System: Linux Red Hat ES 5.2; Windows XP

- Order Server testing:
  - Linux Red Hat ES 5.2 server

The documentation management tool to be used is wiki. The URL for Task 4 documentation is on the HMA-FO Home Page at: http://wiki.services.eoportal.org/tiki-index.php?page=HMA-FO

The management tool of CR / NCR / SPR for the development, integration and validation phases is PMT (Problem Management Tool) and statistical data on failure occurrences can be derived from there.

The selected software configuration management tool is Subversion (SVN) that is an open source version control system from server side. The Subversion client, implemented as a windows shell extension, is TortoiseSVN that is a really easy to use Revision control / version control / source control software for Windows.

5.7 Procedures and Standards

The main engineering and management processes will be executed in accordance with the following procedures:

Process Performed	Procedure To Be Applied
Project Management	IO-PRO-11
Risk Management	PG-DQA-18
Configuration and Documentation Management	PG-DQA-09, PG-DQA-10, PD-DGI-02
Verification and Validation	PD-DGI-07
Requirements Engineering	PD-DGI-04
Design	PD-DGI-04
Coding	PD-DGI-04
Metrication	PD-DGI-10
Nonconformance Control	PG-DQA-16
Audits	PD-DGI-07, CQ-DQA-02
Alerts	IO-PRO-11
Procurement	PG-DG-07, IO-DAP-02
Delivery, Installation and Acceptance	PD-DGI-04
Maintenance	PD-DGI-06

Table 5.2 – Processes Performed and Procedure To Be Applied

6 SOFTWARE PRODUCT QUALITY ASSURANCE

6.1 Product Quality Objectives and Metrication

A series of Product Quality Metrics have been selected from the Quality Model stated in the ISO/IEC 9126 following ED Divisional Procedure PG-DGI-10 [AED-8]: they will be collected and analyzed by PQE with the technical assistance of Software Engineers (when necessary) and they will be reported in the SPA Reports of the development phase in which they are calculated.

The following Quality Characteristics will be considered:

- Functionality: it is the capability of the software product to provide functions which meet stated and implied needs when the software is used under specified conditions;
- Reliability: it is the capability of the software product to maintain a specified level of performance when used under specified conditions.

In the following, this information is given, for each Product Quality Metric:

- Characteristic-sub-characteristic: it specifies the characteristic and sub-characteristic to which the given metric applies;
- Code & Name: it contains the metric code and the metric name;
- Goal: it specifies the metric goal in terms of a question the metric replies to;
- Method for calculation: it specifies the mathematical formula to be used for calculating the metric;
- Calculation Point: it is the time in which the metric is calculated;
- Source: it represents the object (i.e. documentation or source code) where the raw data is taken for calculating the metric;
- Values and Thresholds: it contains both the mathematical range of the values obtainable from the metric calculation and the threshold to achieve as quality characteristic's goal.

To improve the readability, the table is sorted by "Calculation Point" (from a chronological point of view).

Charact. Subchar.	Code & Name	Goal	Method for calculation	Calculation Point	Source	Values and Thresholds
Functionality - Adequacy	FUN-ADE-FCO Functional Coverage	How much the software requirements are adequated respect to foreseen functionalities specified in the customer specification	A = CRNcr / CRN x 100 Where: CRNcr = number of customer requirements covered by software requirements CRN = total number of customer requirements	PR (Preliminary Review)	OPGW Software Requirements Specification – SRS (Order Server Requirements Baseline)	0% <= A <= 100% Threshold=100% Software Requirements shall cover all customer requirements

Charact. Subchar.	Code & Name	Goal	Method for calculation	Calculation Point	Source	Values and Thresholds
Reliability-Maturity	REL-MAT-TAD Test adequacy	How much test cases are designed to cover the software requirements?	A = NRct / NRt x 100 Where: NRct = number of software requirements covered by tests NR = total number of software requirements	MTR (Mid Term Review)	OPGW Software Validation Testing Specification –SVTS (Order Server Acceptance Test Plan; Traceability of Acceptance tests to Requirements Baseline)	0% <= A <= 100% Threshold=100% Every software requirement shall be verified by at least one test case.
Functionality - Adequacy	FUN-ADE-FCT	How much requirements have been really implemented respect to the foreseen ones	A = WRN / TRN x 100 Where: WRN = number of requirements with anomalies TRN = total number of requirements	AR (Acceptance Review)	OPGW Acceptance Test Reports	0% <= A <= 100% Threshold = 0% All Requirements have to be implemented in correct way
Reliability-Maturity	REL-MAT-EDE Error density	How many tests failed during the related test phase?	A = Tf / Te x 100 Where: Tf = number or Tests failed Tt = number or Tests executed	AR (Acceptance Review)	OPGW Acceptance Test Reports	A >= 0% Threshold=0% In the last test session, all errors shall be removed.
Reliability-Maturity	REL-MAT-ERE Error resolution	How many software errors detected have been resolved?	A = NEr / NEd x 100 Where: NEr = number of software errors resolved NEd = number of software errors detected	AR (Acceptance Review)	OPGW Acceptance Test Reports	0% <= A <= 100% Threshold=100% All errors detected shall be resolved before the software delivery.

Charact. Subchar.	Code & Name	Goal	Method for calculation	Calculation Point	Source	Values and Thresholds
Reliability-Maturity	REL-MAT-ERD Error removal in documentation	What is the proportion of errors removed from the documentation?	A = NEr / NEd x 100 Where: NEr = number of errors in the documentation, resolved NEd = number of errors in the documentation, detected This metric is calculated only on the accepted RIDs.	Review of any document	All documents	0% <= A <= 100% Threshold=100% All errors detected in the documents shall be removed before their issue.
Reliability-Maturity	REL-MAT-ERA Error adequacy in documentation	What is the proportion of documentation errors accepted with respect to the detected?	A = NEa / NEd x 100 Where: NEa = number of errors in the documentation, accepted NEd = number of errors in the documentation, detected	Review of any document	All documents	0% <= A <= 100% Threshold=80% The RID (Review Item Discrepancy) rejected (i.e. not accepted) shall be minimized.

Table 6.1 – Product Quality Metrics

7 COMPLIANCE MATRIX TO SOFTWARE PRODUCT ASSURANCE REQUIREMENTS

This section contains the compliance matrix between the requirements stated in ECSS-Q-80B and the sections of the current SPAP.

ECSS-Q-80B Requirement	Compliance (C=Compliant; NC=Noncompliant; NA=Not Applicable)	Section of this SPAP
5 Software Product Assurance Programme Implementation		
5.1 Introduction		
5.2 Organization and responsibility		
5.2.1 Organization	C	4.1, 4.1.1, 4.1.2, 4.2
5.2.2 Responsibility and Authority		
5.2.3 Resources		
5.2.4 Software Product Assurance Manager		
5.2.5 Training		
5.3 Contractual Aspects		
5.4 Software Product Assurance Programme Management		
5.4.1 Software Product Assurance Planning and Control	C	5.6 and sub-sections
5.4.2 Software Product Assurance Reporting	C	4.3
5.4.3 Audits	C	5.6.7
5.4.4 Alerts	C	Table 5.2
5.4.5 Non-conformances	C	5.7
5.4.6 Software Problems	C	5.4.3
5.5 Risk Management and Critical Item Control		
5.5.1 Risk Management	C	4.4, 5.7
5.5.2 Critical Item Control	C	4.4
5.6 Supplier Selection and Control		
5.6.1 Supplier Selection	C	4.5
5.6.2 Supplier Requirements		
5.6.3 Supplier Monitoring		
5.6.4 Criticality Classification		
5.7 Procurement		
5.7.1 Requirements	C	4.5, 5.7
5.7.2 Selection		
5.7.3 Approval		
5.7.4 Procurement Details		
5.7.5 Identification		
5.7.6 Inspection		
5.7.7 Exportability		
5.8 Tools and supporting environment		

ECSS-Q-80B Requirement	Compliance (C=Compliant; NC=Noncompliant; NA=Not Applicable)	Section of this SPAP
5.8.1 Development Computer Selection	C	5.6.8
5.8.2 Choice Description		
5.8.3 Methods and Tools		
5.8.4 Tool Selection		
5.9 Assessment and improvement process	C	4.6
6 Software product assurance		
6.1 Software Development Life Cycle		
6.1.1 Life Cycle Definition	C	5.6 and sub-sections
6.1.2 Life Cycle Definition Review		
6.1.3 Life Cycle Resources		
6.1.4 Quality Objectives		
6.1.5 Phase Outputs		
6.1.6 Special Characteristics		
6.1.7 Milestones		
6.1.8 Role of Customer		
6.1.9 Validation Process Schedule		
6.2 Requirements applicable to all SW Engineering Processes		
6.2.1 Documentation of Processes	C	5.6 and sub-sections
6.2.2 Software Dependability and Safety Analysis	NA No critical functions have been identified	
6.2.3 Handling of Critical Software	NA No critical SW has been identified	
6.2.4 Software Configuration Management	C	5.4 and sub-sections
6.2.5 Process Metrics	C	5.7, 6.1
6.2.6 Verification	C	5.6 and sub-sections
6.2.7 Reuse of Existing Software	C	5.5
6.3 Requirements applicable to individual SW Engineering processes or activities		
6.3.1 Software Requirements Analysis	C	Figure 5.1
6.3.2 Software Design	C	Figure 5.1, 5.6.3, 5.6.4
6.3.3 Coding	C	Figure 5.1, 5.6.4
6.3.4 Testing and Validation		
6.3.5 Software Delivery and Acceptance	C	Figure 5.1, 5.6.6
6.3.6 Operations	NA No Operation are foreseen within this contract	
6.3.7 Maintenance	C	Figure 5.1, 5.7
7 Software Product Quality Assurance		
7.1 Product quality objectives and metrication		
7.1.1 Assurance Activities for Product Quality Requirements	C	6.1

ECSS-Q-80B Requirement	Compliance (C=Compliant; NC=Noncompliant; NA=Not Applicable)	Section of this SPAP
7.1.2 Deriving of Requirements;		
7.1.3 Quality Models		
7.1.4 Product Metrics		
7.1.5 Measurements		
7.1.6 Measurement Results		
7.1.7 Basic Metrics		
7.1.8 Metrication Process		
7.1.9 Metrics Analysis		
7.1.10 Numerical Accuracy		
7.1.11 Analysis of Software Behavior		
7.1.12 Metrics Trend		
7.1.13 Improvement Actions		
7.2 Product quality requirements		
7.2.1 Technical Specification	C	5.6 and sub-sections
7.2.2 Design and Related Documentation		
7.2.3 Software Intended for Reuse	C	5.5
7.3 Supporting documentation		
7.3.1 Test and Validation Documentation	C	5.6 and sub-sections, Figure 5.1
7.3.2 Reports and Analysis	C	5.6 and sub-sections, Figure 5.1
7.4 Standard hardware for operational system		
7.4.1 Procurement	NA No HW has been foreseen for this contract	
7.4.2 Constraints		
7.4.3 Selection		
7.4.4 Maintenance		
7.4.5 Documentation		
7.5 Firmware		

Table 7.1 – Traceability between ECSS-Q-80B and this SPAP