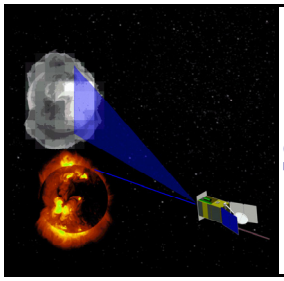

Istituto di Fisica dello Spazio Interplanetario

Product Assurance Plan

SCENARIO
NSWD
(Neutral Solar Wind Detector)

SOLAR ORBITER

prepared by	AMDL Team		
approved by	Stefano Orsini, Principal Investigator (INAF-IFSI)		
endorsed by	Enrico Flamini (Agenzia Spaziale Italiana)		
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CHANGE LOG

date	issue	revision	pages	reason for change
Nov 2007	1	0		1st Issue

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1 General

1.1 Scope

This Product Assurance (PA) Plan defines the PA programme, policy, procedures and practices relative to the activities to be used during definition, design, procurement, development, manufacture, assembly, test, and delivery phases (B/C/D) of the SCENARIO NSWD programme.

The SCENARIO NSWD PA Manager (PAM) is responsible for the release, distribution, and control of this PA. Revisions and changes will have to be discussed with SCENARIO NSWD Team and ESA and documented on a Transmittal Notice.

Compliance with the requirements of the Solar Orbiter programme is essential to ensure the successful accomplishment in an efficient and cost effective manner.

1.2 Applicability

This document defines the policies and methods for PA activities in the SCENARIO NSWD programme to be applied to all HW and to associated SW and GSE's.

The SCENARIO NSWD PM Team has the responsibility to implement these policies during all phases of the Programme, in accordance with Solar Orbiter requirements.

The SCENARIO NSWD Team will also be responsible to impose the same policies to all Subcontractors.

ESA will overview all activities and has the right to approve and participate to definition and implementation of policies and methods.

1.3 Applicable documents

EIDA	Experiment Interface Document – Part A

1.4 References

The following documents have been used as guidelines:

ECSS-10-04 A	Space Environment replacing [PSS-01-609] Radiation Design Handbook
ECSS-Q-20 B	Quality Assurance
ECSS-Q-20-09 B	Template for Non Conformance Report

ECSS-Q-30-02 A	Template for FMECA
ECSS-Q-40 A	Safety
ECSS-Q-60 A	EEE Components Control
ECSS-Q-60-01 A	European Preferred Parts List and its Management
ECSS-Q-70 A	Materials, Mechanical Parts and Processes
ECSS-Q-70-02 A	Thermal Vacuum outgassing test for the screening of space materials
ECSS-Q-70-08 A	The manual soldering of high-reliability electrical connections
ECSS-Q-70-28 A	Repair and modification of printed circuit board assemblies for space use
ECSS-Q-70-36 A	Material selection for controlling stress-corrosion cracking
ECSS-Q-70-37 A	Determination of the susceptibility of metals to stress-corrosion cracking
ECSS-Q-80	Software Product Assurance
ECSS-Q-70-01A	Contamination and cleanliness control
PSS-01-301	Derating Requirements applicable to Electronic, Electrical, and Electro-Mechanical Components for ESA Space Systems
PSS-01-605	Capability Approval Programme for Hermetic Thin Film Hybrid Micro-Circuits
PSS-01-606	Capability Approval Programme for Hermetic Thick Film Hybrid Micro-Circuits
PSS-01-608	Generic Specification for Hybrid Micro-circuits
PSS-01-701	Data for the Selection of Space Materials

1.5 Terms and Definitions

1.6 Acronyms

ADP	Acceptance Data Package
AIT	Assembly Integration and Test
CCB	Configuration Control Board
CDR	Critical Design Review
CIDL	Critical Item Data List
CSL	Configuration Status List
DCL	Declared Component List
DML	Declared Material List
DPA	Destructive Physical Analysis
DML	Declared Part List
DRB	Delivery Review Board
DVM	Design Verification Matrix
EEE	Electrical, Electronic, Electromechanical
EIDP	End Item Data Package
EQ	Engineering Qualification
ESD	Electro-Static Discharge
FM	Flight Model

FMECA	Failure Mode Effect and Criticality Analysis
HSIA	Hardware/Software Interaction Analysis
KIP	Key Inspection Point
LAT	Lot Acceptance Test
MIP	Mandatory Inspection Point
MRB	Material Review Board
NCR	Non Conformance Report
PAM	PA Manager
PAP	Product Assurance Plan
RFA	Request for Approval
RFD	Request for Deviation
RFW	Request for Waiver
SPF	Single Point Failure
SOW	Statement of Work
TR	Test Review
TRB	Test Review Board
TRR	Test Readiness Review
TRRB	Test Readiness Review Board
WCA	Worst Case Analysis

2 Product Assurance Requirements

2.1 General

Purpose of the PA planning and control is a structural and effective organisation and implementation of the required PA functions and responsibilities.

2.2 Product Assurance Management

2.2.1 General

The SCENARIO NSWD Principal Investigator (PI), Stefano Orsini (INAF-IFSI), is responsible for ensuring the compliance of the PA with the contractual requirements.

He will appoint a SCENARIO NSWD PA Manager (PAM). The PAM will be responsible to the PM and to the PI for preparation, management and implementation of the approved PA Plan.

He will be the key person within the project for all PA matters, including those involving Subcontractors.

The PAM will be supported by a staff of specialists from PA disciplines.

The SCENARIO NSWD PAM is the interface with ESA PA Manager for all the matters related to PA disciplines, and will be responsible to report to ESA the status of the PA activities, in accordance with the Programme requirements.

The SCENARIO NSWD PAM will also have direct interface with the Contractors' PA Managers. He will coordinate the tasks to be performed by each Contractor concerning the PA activities.

The PAM is responsible for the following activities:

- implementation and maintenance of the PA tasks according to the contents of the present plan
- planning of PA activities
- verification that the required PA activities are covered
- directives and instructions to the Subcontractors PA Managers
- reviews and audits on processes and manufacturing procedures
- reporting on the status of PA activities
- implementation of a non-conformance processing system
- provision of support to Solar Orbiter representatives involved in PA work
- control of Subcontractors PA activities

- control of PA schedule

2.2.2 Organization

Each organisation shall nominate a person to be responsible for product assurance activities including:

- Monitoring of in-house product assurance system.
- Witnessing of tests etc.
- Preparing deliverable documentation.
- Co-ordination of activities with the SCENARIO NSWD Manager.

The organisation chart of PA in the SCENARIO NSWD programme is provided in APPENDIX A.

2.2.3 Product Assurance Plan

PA tasks will be planned consistently with the programme schedule and taking into account the product characteristics.

PA planning is a direct responsibility of PAM.

2.2.4 ESA/Prime Contractor Right of Access

Authorised representatives of ESA, Prime Contractor and PI Team will have unimpeded right of access to all in-house facilities of consortium members, to relevant documentation and records.

The access shall have he objective of test observations, documentation reviews, hardware examination and participation at the Mandatory Inspection Points (MIPs).

2.2.5 Contractor Supplier Surveillance

All Subcontractors will be selected according to the characteristics of the products to be provided, and their capability to meet relevant PA requirements.

The PA requirements to be imposed to Subcontractors will be tailored to the criticality of the product, and will be given in the Statement of Work relevant to the subject of the subcontract.

The Subcontractor will state its compliance to these requirements by means of a Compliance Matrix.

2.2.6 Reviews and Audits

The status and results of the PA programme shall be included in all major project reviews.

To ensure that PA requirements are met during all phases of the program, Subcontractors will be subjected to control activities.

Subcontractors will allow access to their facilities to the SCENARIO NSWD Team PA representatives in charge of the control activities. ESA PA will be notified of these activities.

Subcontractors control will be accomplished by performing the following tasks:

- Review and approval of the subcontractor PA Plan,
- Approval of subcontractors documents, including:
  - EEE Part List
  - Materials and Processes list
  - Manufacturing and Inspection Plan, including MIPs
  - Test procedures
  - Documentation
- Periodical meetings, review and qualification of critical processes
- Tests
- Audits on areas considered of potential criticality
- Participation to MRB
- Scheduled formal events, such as TRRB; TRB; DRB, Design Review.

It is essential to remind that each Subcontractor participating to the Programme is directly responsible of the Quality of its own products and guarantee that their products meet the PA requirements, and are congruent to performance and schedule.

2.2.6.1 PA meetings

Periodical PA meetings will be planned and scheduled, to assess the status of activities and identify critical areas where dedicated corrective actions are necessary.

2.2.6.2 Documentation and Reporting

Reporting of the progress and status of PA activities will be part of the project reporting procedure. Reports will provide information on:

- Progress for each major PA task
- Current problems and corrective actions
- Status of FMECA and hazard analysis

- Status of EEE parts programme if applicable
- Status of materials and processes control programme
- Status list of major non-conformances
- Status of contamination control programme
- Overview of major events in the forthcoming period.

The flow of the documents and their release will be defined by the Configuration Management.

2.2.6.3 Design Reviews

The PAM will participate to the design reviews that will be planned and held to verify that the design meets the specified requirements. Main tasks during design reviews are the following:

- Provide the PA part of the review Data Package
- Participate to the discussion of technical points involving PA
- Present and discuss the PA aspects
- Follow-up of the PA actions resulting from the reviews.

2.2.6.4 Audits

A PA major task is to identify potential critical areas. These areas, defined as processes, materials, personnel, procedures, will be subjected to Audits to evaluate the effectiveness of the policies adopted to reduce their criticality, and to notify to the Programme Management their deficiencies, and the corrective actions to be adopted.

The audit contents will be the following:

- Review of documentations relevant to the subject of auditing
- Definition of the control to be performed, in the form of a checklist
- Evaluation of the operations as they are performed in the audited area
- Identification of discrepancies, and corrective actions
- Definition of preventive actions to avoid recurrence
- Survey over the implementation and effectiveness of corrective actions
- Reporting to Management

Tailored audit checklist may be prepared for particular cases.

2.2.7 Critical Items identification and Control

A Critical Item List (CIL) will be maintained current and presented at each design and readiness review. The CIL has to contain the following information:

- identification and risk evaluation

- activities for risk reduction
- report of the risk reduction implementation and the corresponding verification measures.

2.3 Quality Assurance Management

A Quality Assurance (QA) comprehensive programme will be implemented in compliance with EIDA requirements. QA activities will be planned and carried out in accordance with Programme schedule.

The involved QA personnel will work under the directions of the PAM.

2.3.1 General Requirements

The requirements issued in EID-A, section 6, will be applied to all HW and to associated SW and GSE's.

2.3.2 Traceability and Logbook

Logbooks will be used to provide traceability and verification of hardware, software, and associated GSE during assembly and tests.

Each part, material or product shall be identified by a unique and permanent identification number.

The logbook will also provide a record of work, inspections, etc. As a minimum, logbook entries are to chronologically contain date, time, description of event or activity and name of individual performing the activity.

Logbooks have to remain within the designated work area or with the assigned hardware.

The logbooks will be part of the End Item Data Packages (EIDP) to provide a full visibility of the product history.

2.3.3 Metrology and Calibration

Metrology control will be implemented, under QA supervision, to ensure that all equipment used for tests are in calibrated status.

Measuring and test equipments will be checked at scheduled intervals based on type, quality, history of the equipment to ensure their calibrated status, and their suitability for the intended use. The QA tasks are the following:

- verify periodic calibration of measurement equipment by internal or approved external calibration laboratories
- check calibration status of inspection and test measurement devices before use

- start immediate corrective and verification actions when results indicate potential calibration error

Tools, gauges and other fixtures for measuring dimensions, contours, locations will be checked prior of use, including safety for the hardware to be measured and safety of personnel, whenever applicable.

All measurement devices calibration data will be filed to maintain record of previous calibrations, and to schedule the activities for the future ones.

2.3.4 Non-Conformance Control

A particular effort will be given to maintain an effective non-conformance reporting system in order to keep non-conformances under control during all phases of the manufacturing and test flow.

The control of non conformance will ensure that all items or materials failing to meet the applicable requirements are identified and withdrawn from the manufacturing cycle until the anomalies have been removed or alleviated by rework of the items, and the relevant corrective actions on areas involved with the anomaly have been identified and implemented.

Figure 2.3.4-1 shows the NCR procedure flow chart.

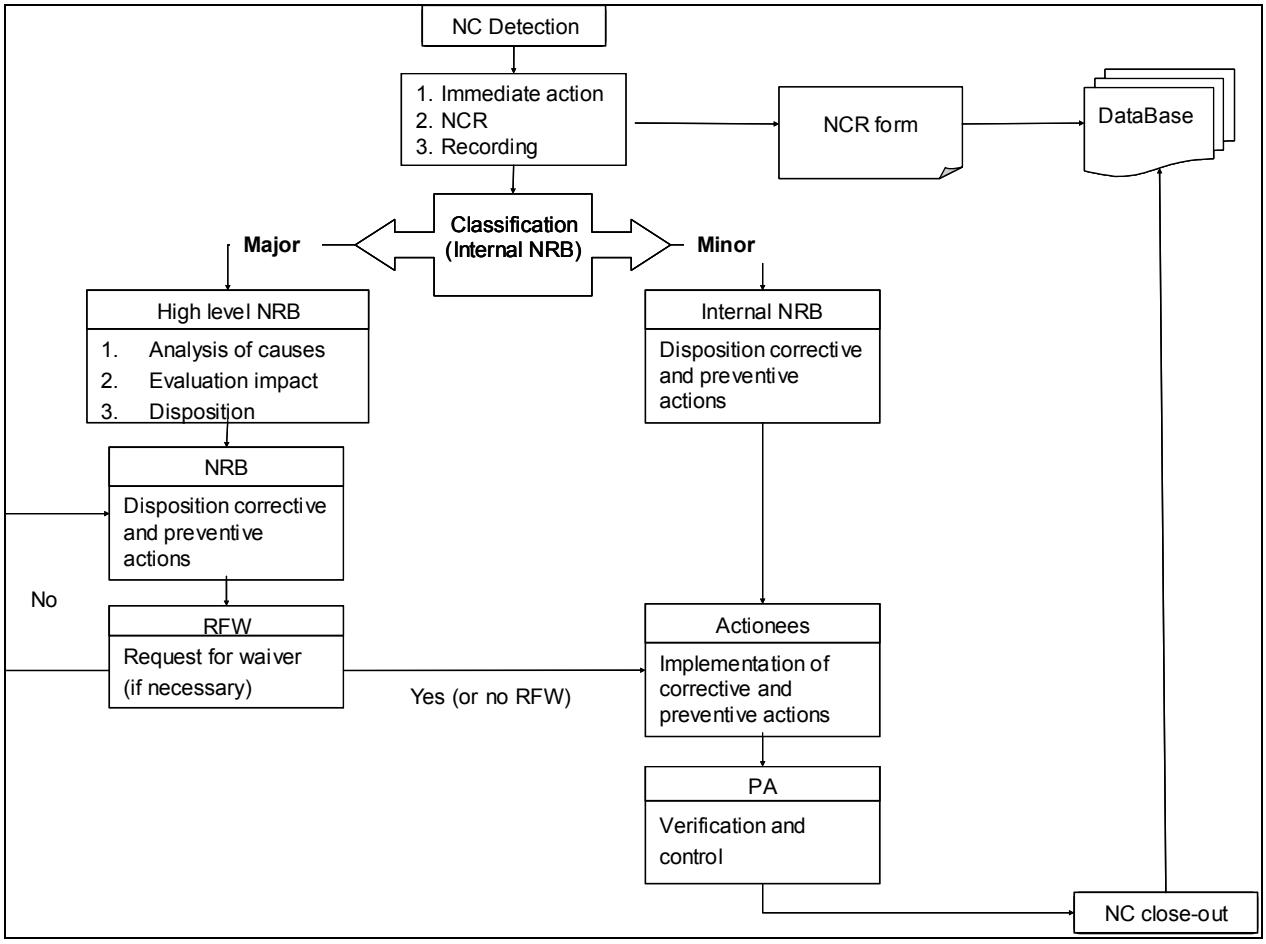


Figure 2.3.4-1. NCR procedure flow chart**.**

2.3.4.1 Non-conformance classification

Non-conformances will be classified as major or minor.

2.3.4.1.1 Major NCR

Any non-conformance that can have an impact on one of the following parameters will be classified as major:

- performance
- interfaces
- reliability
- mission life
- maintainability
- weight
- health
- safety.

In addition, all NCR occurring on already delivered items, and on EEE parts supplied by ESA or by a procuring Agency for Solar Orbiter will be classified Major.

All Major NCR's will be processed in the frame of a Nonconformance Review Board (NRB).

Major NCR notification will take place via telefax within 48 hours from detection. As part of the notification, the proposed date, place and time for NRB will be included.

2.3.4.1.2 Minor NCR

Minor non conformance are those which does not affect points defined as major.

Minor NCR's are processed and dispositioned by the issuing subsystem. They will be maintained and filed for SCENARIO NSWD Team and ESA review.

2.3.4.2 Non- Conformance Reporting

The NCR will be notified and circulated by means of a dedicated form. The form to be used for NC reporting is given in Appendix B.

The information contained in the form will be, as a base, the following:

- NCR number, allowing identification of the originating company
- date of issue
- identification of the affected item
- identification of the step where the anomaly occurred
- identification of violated requirements
- description of the non-conformance
- non-conformance category (Minor or Major)
- presumed or identified cause
- proposed corrective actions / dispositions
- call of MRB, if necessary
- reference to any previous similar NCR
- signature of PA and Technical responsible (and PM if necessary)

All NCR's, independently from their classification, will be the subject of a periodical list to be circulated to SCENARIO NSWD Team and ESA.

A statistical control will be maintained on NCR's, in order to identify the critical areas within the QA and Manufacturing flow, and identify the proper corrective action to avoid recurrence of the anomalies.

The results of statistics will be given as appendix of the periodical NCR list.

2.3.4.2.1 Nonconformance Review Board (NRB)

The NRB shall consist of at least one representative of the Product Assurance Team and one representative of the Project. Specialists may be invited and consulted.

The NRB objectives are:

- Identify the causes of the con-conformance
- Evaluate the consequences
- Propose corrective and preventive actions, including:
  - "scrap"
  - "use as is" (if a formal specification requirement remains violated, preparation and acceptance of a Request for Waiver or a specification change can be recommended. They are both subject to approval.
  - "repair": qualified or standard repair procedure to be defined.
  - "rework".
- to perform re-verification after repair or modification which may consist of re-inspection, re-test (a late modification may also affect the validity of previous qualification tests) and updating of previously established design analyses.

These action propositions are mentioned on the NCR.

2.3.4.2.2 Non-conformance closure

Once the appropriated actions are realized and controlled, the NCR is formally closed.

2.3.5 Alert System

All participants to SCENARIO NSWD Programme will circulate any problem notification and/or alert received from external sources - or found in the Programme - and relevant to quality and application problems on parts to be used or in use in the programme.

It is a PAM task to verify that the alerts are notified to all partners, subcontractors and discuss and suggest the appropriate corrective actions.

ESA will be notified of the alerts.

2.3.6 Handling, Storage and Preservation

PAM will verify that the manufacturing and test documentation contains the relevant handling instructions, or that dedicated procedures are present, whenever necessary. Handling requirements shall be clearly displayed on all equipment and packaging.

The visual inspections to be performed through the manufacturing flow will verify that the correct handling policies are implemented and followed. Eventual non-conformances constitute the basis for handling procedure modification.

PAM will witness all critical steps to ensure that all items are adequately protected against deterioration provoked by mishandling.

Whenever special handling tools are necessary, these will be maintained and checked to ensure that they are adequate and safe for their intended use.

Protective film, wrapping or special containers will be used in each case where a potential deterioration danger is identified.

Handling procedures for all equipment and packaging will be annexed to the EIDP.

2.3.7 QA Requirements for Design and Verification

It is a QA main task to obtain at the end of design phase objective evidence that the deliverable hardware is fully compliant with the requirements specifications.

The activities to be performed will assure that the design engineers take into account during their work requirements applicable to parts, materials, processes, reliability, safety etc.

The following activities will be performed:

- Close survey and review of the adequacy of design documents
- Scheduling of formal design reviews throughout design life
- Issue of Design Verification Matrix (DVM)
- Qualification testing survey

2.3.8 QA Requirements for Procurement

All requirements applicable to procured materials, parts or services will be clearly defined in purchase orders and associated specifications.

A Statement of Work (SOW), detailing all aspects of the tasks to be carried out by the subcontractor, will be issued for orders involving critical and/or complex technical aspects and having schedule impacts,

2.3.8.1 Selection of Procurement Sources

Manufacturers and suppliers will be selected for their proven capability to supply materials and component parts to the required specifications, within scheduled dates, together with the documentation to verify that the requirements of the procurement specifications have been met.

2.3.8.2 Procurement Documents

The purchase orders will be reviewed to verify that the required items and/or materials are in accordance to the approval Declared Component Lists (DCL) and Declared Material list (DML).

Auditing on procurement documents, prior of release of purchase orders, will include:

- latest revisions of drawings
- specifications
- inspection and test instructions or procedures
- reliability and quality requirements

After the procured parts or materials have been received, the following controls will be done:

- manufacturing date and shelf life information and data
- parts marking and identification
- accompanying documentation (Test reports, etc.)

2.3.8.3 Surveillance of Procurement Sources

PA Manager carries out surveys of facilities and Product Assurance Systems for critical materials and/or processes when required

Contracts, purchase orders etc. shall include a statement indicating the requirement for quality control and traceability and the appropriate standard. Conformance documentation shall be requested and act as a point of entry into the manufacturer's traceability system.

Items manufactured in-house shall be subject to the same controls, traceability will be required and only approved materials and processes shall be permitted.

2.3.8.4 Incoming Inspections

All received items will be subjected to Incoming Inspection in accordance with their quality requirements.

All received items will be identified, individually or at lot level, depending on applicable requirements, by means of an incoming inspection number allowing traceability of the item throughout the manufacturing process and after delivery.

Additional inspection activities may be requested in the event of problem areas detected on the item in previous programmes, or in case of criticality.

Incoming Inspections include:

- Review of the Certificate of Conformance and of delivered documentation with inspection/test results.
- Visual inspections for completeness and freedom from obvious damage or deficiencies.
- Sample testing or testing of all items for compliance of the most critical parameters.

Age sensitive items will also be notified by PAM to the Incoming Inspection, to avoid any damage due to wrong storage conditions. These items are marked with their expiration dates, and are used on the basis of first-in / first-out concept.

2.3.8.5 Procurement Requirements for EEE Parts

2.3.9 QA Requirements for Manufacturing

Items which are manufactured or assembled by Contractors or by their subcontractors, will be subjected to QA inspection and test programmes, in order to ensure that the applicable requirements are met.

The Quality Assurance tasks will be to ensure that:

- the items inspected are compatible with drawings, specifications and procedures - the documents in use are under configuration control and are at the latest issue
- the inspection records and historical records are correctly filled-in
- the as-built configuration of the item is reflected by the accompanying papers

Redlined documents are allowed, when the issue of upgraded version is not feasible within scheduled dates.

2.3.9.1 Manufacturing and Inspection Flow Chart

In close association with Historical Records, Manufacturing Flow Charts will be prepared to give graphic evidence of manufacturing and assembling operations.

These Flow charts will take into consideration elementary parts, or part lists, subassemblies and main assemblies, making reference to the processes involved with the manufacturing and assembling operations.

Inspection points will also be indicated and referenced.

2.3.9.2 Key and Mandatory Inspection Points (KIP/MIP)

In order to give a complete evidence of the status of works and quality of workmanship, planned and content-defined inspection points, requiring SCENARIO NSWD Team and ESA agreement, will be established prior to proceed with the subsequent steps of the manufacturing flow.

The MIPs will be indicated in the Manufacturing Inspection Plan and in the correlated Flow Charts.

The MIPs will be performed by a representative of the group involved, the PA manager and ESA. When necessary, specialists shall be employed.

The PA manager will ensure that ESA receives timely notification on proposed MIPs with reference to the item to be inspected; type, time and location of the inspection.

2.3.10 Integration and Testing

After completion of assembling and integration activities, QA will inspect the hardware prior of release for further steps.

This inspection has the scope to:

- assess quality of processes and workmanship used for manufacturing,
- verify that all documentation is under control and correctly completed
- identify discrepancies to expected configuration
- verify that all non-conformances are traced, implemented and closed, unless specific and agreed exceptions.

Qualification/Acceptance tests will be conducted following the instructions of the Test Plans and Test Procedures applicable to the item under test.

These documents will be reviewed and approved by QA to verify their compliance with programme requirements.

The test plan and test procedures will be submitted to SCENARIO NSWD Team and ESA for review and approval before starting the Qualification/ Acceptance tests.

For Qualification and Flight items, a Test Readiness Review (TRR) will be conducted before starting of test activities.

The tests will be monitored by QA, with the following tasks:

- ensure that the applicable test procedures are followed
- verify that test facilities are under the calibration system
- verify that the obtained data are correctly reported
- ensure that the detected non-conformances are reported and processed
- verify that the required test environmental conditions are respected
- stop the test in case of danger for personnel, or major damage to the item

After completion of tests, Quality Assurance will review the obtained data for compliance with applicable requirements.

All detected discrepancies will be reported following NCR procedure.

2.3.10.1 Test Planning

Dedicated test procedures will be prepared for each test to be performed on the hardware.

2.3.10.2 Test Procedures

The contents of the test procedures will allow to identify:

- test items configuration
- detailed test methods
- test set up and equipment
- environmental test conditions
- test limits and tolerances
- pass/fail criteria

Test procedures will be submitted to SCENARIO NSWD Team for review and approval in due time prior of their use. ESA will review the test procedures only at instrument level.

2.3.10.3 Test Facilities / Equipment

Test facilities will be specified in the AIT plan.

All test equipment including commercial test equipment will be calibrated as required.

2.3.10.4 Test Witnessing

Development tests and formal qualification and acceptance tests will be monitored by QA personnel to ensure that procedures are followed, and that adequate records of the activities and test results are documented.

2.3.10.5 Test Reviews

A set of Test Reviews will be planned in order to cover all test activities on main items and equipment, and to give evidence to SCENARIO NSWD Team and ESA of the status of works.

2.3.10.5.1 Test Readiness Review (TRR)

A TRR will be held prior of beginning of each test session on main items and equipment. The scopes of the TRR are the following:

- Identification/Verification of the As-built configuration
- status of non-conformances
- status of Requests for Waiver (RFW)
- Review and approval of Test Procedures
- Test facilities and equipment review
- Test schedule assessment
- Release for testing

2.3.10.5.2 Test Review (TR)

A TR will be held after the conclusion of each test session. The scopes of the TR are the following:

- Verification of test completion
- Review of test results
- Review of out-of-limits/non-conformances
- Completeness of test data and reports
- Release for the following activities

2.3.10.6 Test Reports

Upon completion of each test, a test report will be prepared, evidencing the results and any non-conformances detected.

The contents of the test reports will allow precise identification of the conditions at which the tests are conducted, of the set up and equipment used, and finally of the behaviour of the item under test.

2.3.11 QA Requirements for Acceptance and Delivery

The PI will establish a formal acceptance process and a formal Delivery Review for all items to be delivered.

2.4 Safety Assurance

2.4.1 General

The objectives of safety program are the minimisation and control of all potential and/or verified hazardous conditions or operations accident that can cause safety hazard to personnel or damage to equipment or property.

2.4.2 Safety Requirements

The guidelines for Safety of space applications are expressed by ESA PSS 01 40.

2.4.3 Safety Assurance Tasks

The tasks of Safety Programme are directed to:

- identification of the hazard sources

- determination of corrective actions to be implemented to remove or control the hazard;

- introduction of an effective programme of design and test review to ensure that hazards have been identified and eliminated where possible, and that the unit design is compliant to safety requirements.

In order to allow immediate identification of hazard level, the following categories of hazardous events are defined:

I. CATASTROPHIC
loss of life,
life threatening or permanently disabling injury or
occupational illness;
loss of an element of an interfacing manned flight system;
loss of launch site facilities;
long term detrimental environmental effects;

II. CRITICAL
temporary disabling, but not life-threatening injury, or temporary
occupational illness;
loss of major damage to flight systems, major flight system elements, or
ground facilities;
loss of, or major damage to, public or private property; or
short term detrimental environmental effects.

2.4.3.1 Safety Programme

As for Reliability programme, to which it is strictly connected, the Safety Programme activities will be started in the very early phase of design, and will be maintained updated during the design evolution.

Each activity of design, manufacturing, testing and transportation will have to take into account all potential hazard sources when defining technical solutions, and relevant manufacturing processes.

The goals of the Hazard analysis will be the following:

- identification of all hazards areas that the unit can encounter and/or generate;

- incorporation of design features or operational procedures to eliminate or compensate such hazards;

- introduction of an effective programme of design review and tests to ensure that hazards have been identified and eliminated whenever possible, and that the safety requirements are met.

The contents of the Hazard Analysis will cover all phases from ground operations to flight mission life.

2.4.3.2 Hazard Reduction And Control

The identified hazards shall be eliminated or controlled to assure compliance with Safety standards and regulations.

The main tools to be used to reduce critical areas are the following:

- Minimum Hazard Level Design, intended as selection of appropriate design features
- Failure Tolerant Design, as design solutions tolerant of failures and/or operator errors
- Design precautions and margins, for all situations where pure redundancy is not practicable or effective.

In all cases where preventive actions or design solutions are not practicable, the use of automatic warning devices, capable of detection and signalling of the hazard to personnel, will be used.

2.4.4 Fracture Control

The safety aspects will be taken in consideration during the following activities:

- design reviews

- review of RFW, RFD, NCR.

The Implementation of safety policies is responsibility of the PAM, assisted by reliability and design engineers.

These functions will closely coordinate their efforts for Safety programme planning, to ensure that duplication is avoided.

2.5 Dependability Assurance

2.5.1 General

The Failure Modes Effects and Criticality Analysis (FMECA) will be generated starting from design early stage, and maintained updated throughout all design phases.

Failure Modes and effects will be analysed to determine the need for design changes or other actions.

Eventual failure modes or effects requiring corrective actions will be notified to the design engineers, and the relevant design changes will be discussed and introduced.

The main scopes of the FMECA are the following:

- to determine the effects of each failure mode on the performance of the unit/subsystem under analysis;

- to establish the criticality of the particular failure mode;

- to identify potential interface problems;

- to identify failure modes resulting non tolerable to the design conceptual configuration, in terms of established redundancies and operative modes.

2.5.2 Dependability Analysis: Failure Modes Effects and Criticality Analysis (FMECA)

The FMECA will be conducted at functional block level, taking as reference the reliability block diagram and the unit / subsystem functional block diagram.

The FMECA will be conducted at component level on:

- the critical parts, to identify potential failures whose effects exceed the technical requirement specification
- the cross coupling of power/ground and signals lines, to evaluate that no failure mode can compromise the redundancy concept
- the interface circuits, to verify that failure propagation to the external hardware connected functions is not possible

The following Failure Effect Severity Categories will be used in the FMECA to allow immediate identification of Failure criticality:

- Category 1: The failure effects are not confined to the unit subject of the FMECA, but are propagated to the connected units / systems

- Category 2: The failure shall not result in loss of more than 20% of the instrument data throughput

- Category 3: Minor internal unit failures

Furthermore, the following code letters will complement the criticality categories:

- R: the design affected by the failure contains redundancy that can perform the same functions

- SH: the failure is source of safety hazard

- SPF: the failure is caused by single point failure

2.5.3 Hardware/Software Interaction Analysis (HSIA)

The FMECA to be performed on the items will take into account the associated on-board SW, and its interaction with the HW.

The goal of this activity is to avoid damage or overstress caused by SW commands, and to prevent increase of criticality of HW failures due to SW resulting actions.

2.5.4 Single Point Failures

The FMECA will allow the identification of single point failures existing in the design. A dedicated section of the FMECA will give their list.

For each identified Single Point Failure, a rational evidencing design characteristics, probability of occurrence, and methods to eliminate or at least to alleviate SPF effects will be given.

All eventual remaining SPF will be the subject of Request for Waiver to SCENARIO NSWD Team and ESA.

The FMECA will be submitted to SCENARIO NSWD Team and ESA for review and approval during the scheduled Design Reviews.

The form to be used for FMECA reporting is given in Figure 2.5.4-1.

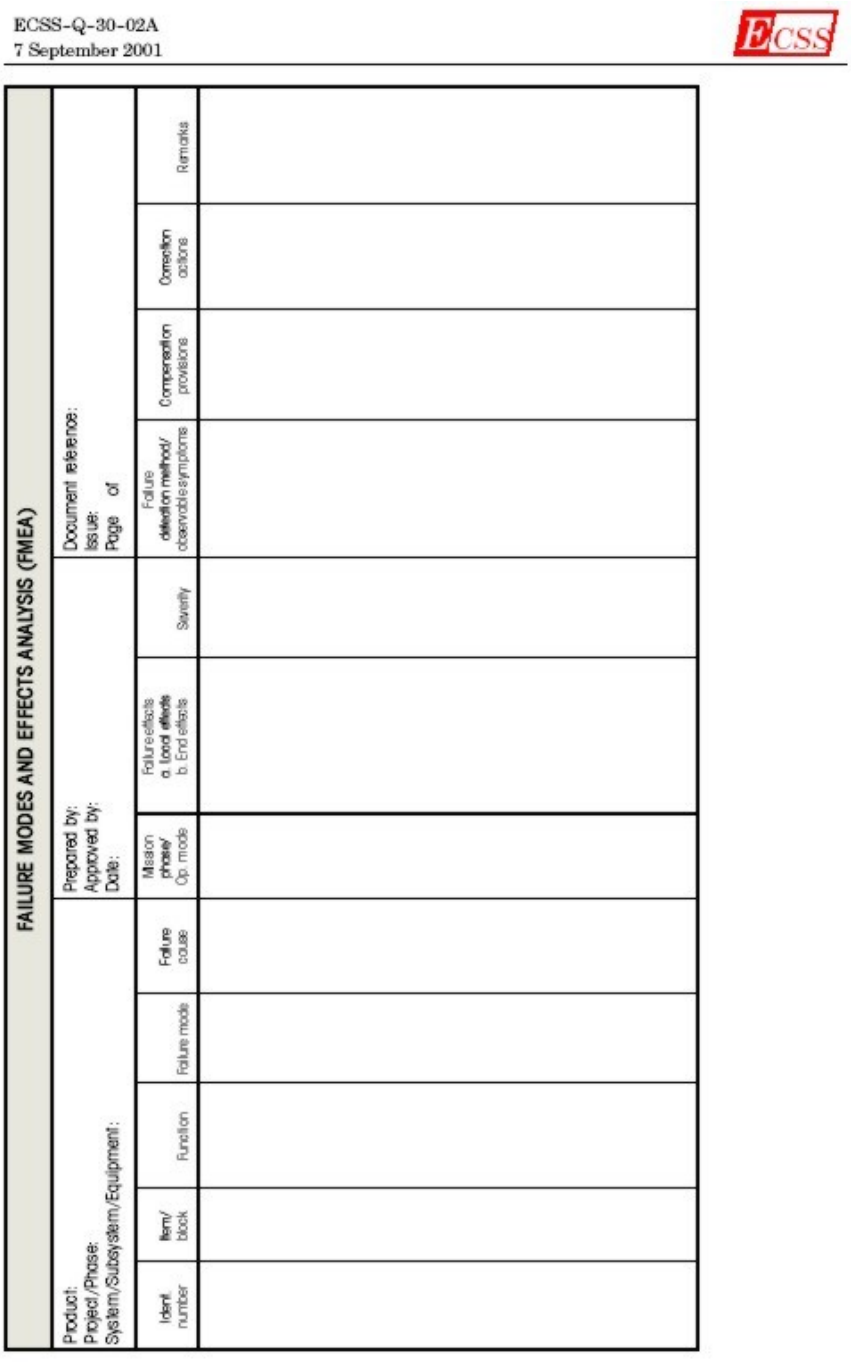


Figure 2.5.4-1. FMECA.

2.5.5 Reliability Prediction

Reliability prediction, in first issue, will be started at the beginning of the design, based on a review of design data existing at that stage.

Numerical assessment will allow the determination of design reliability with respect to the applicable numerical requirements expressed by specifications.

Reliability trades will be used to identify the impacts of alternative design solutions, and to assist in problem solving.

Computation will be made on the failure probabilities, starting from the elementary parts, and progressed up to the complete unit by application of the appropriate reliability theory.

The prediction will be performed for the nominal mission duration and the mathematical model assumed will be the exponential one.

The Reliability Prediction will be formalised in a document showing in detail:

- the reliability model used
- the related formula
- the reliability block diagram.

The Reliability Prediction will be updated according to design modifications, to ensure that mission reliability target is maintained.

As minimum, a new issue of the document will be released at each design review.

If the reliability target with the part count method is reached, no further method will be applied.

If the target is not reached by part count method, a more detailed analysis will be conducted considering the real stress on part, since this approach gives in general an improvement of the reliability figures.

The reliability block diagram will be correlated with the unit / subsystem functional block diagram defined by design engineers.

2.5.6 Worst Case Analysis

The Worst Case Analysis ensures that the product electrical and/or mechanical performance is in compliance with the applicable specifications under worst case operating conditions.

Worst case analysis will be conducted by design engineering, with support from reliability engineer.

It will be performed on the unit critical elements, and/or on elements subject to accuracy performance requirements, or sensitive to environmental conditions.

The following parameters will be taken in account to prepare the Worst Case Analysis (WCA):

- Part parameter variations
- Normal and contingency operating modes, including unit turn on and turn off
- Full range of input voltages, currents and frequencies, and their rate of:
- application over mission life
- Thermal stress
- Circuit Loading
- Circuit stimulus
- Aging and radiation effects
- Potential mismatch in delay times

All sources used to obtain data for calculation in WCA shall be mentioned and justified, as well as the implemented analytical methods.

Allowed design margins will be demonstrated by analysis or test.

The Worst Case Analysis will be submitted to SCENARIO NSWD Team and ESA for review and approval.

The PAM is responsible for ensuring that WCA is effective and complete, and for the introduction of corrective actions generated by the analysis.

2.6 EEE Parts Selection and Control

2.6.1 General

The following describes the activities necessary to assure utilisation of reliable Electrical, Electromechanical and Electronic (EEE) components, its procurement and control programme.

2.6.2 Component Programme Management

The PI shall define the responsibility for the component engineering and procurement activities.

The PA manager shall monitor component quality, selection and procurement, and shall report to the progress meetings when necessary.

The PA manager shall be responsible for the preparation of a detailed EEE Component Control Plan which will describe the organization and the procedures to be compliant with the EIDA.

He shall be the interface between the consortium members and ESA Project Office.

2.6.3 Component Engineering

The PA shall be responsible for the selection of components that are capable of meeting the performance, lifetime, stability, safety7, quality and reliability required.

2.6.3.1 Prohibited Materials and Components

Materials which could cause safety hazard or contamination during all phases of the programme will not be selected and used, unless preventively approved by SCENARIO NSWD Team and ESA.

The guidelines for identifications of materials to be avoided are given by ESA PSS 01 701. Examples of materials not to be used are:

- Beryllium - Oxide
- Cadmium
- Zinc
- Mercury
- Radioactive materials, not specifically required
- PVC

Should one of these materials be necessary for use on SCENARIO NSWD, dedicated plans will be prepared and established to minimise the effects on safety and contamination.

2.6.3.2 Radiation Sensitive Components

Components shall be reviewed in order to evaluate their sensitivity to radiation. Preference shall be given to components with a low sensitivity to radiation.

The EIDA, par. 6.6.3.2, defines component resistance to the radiation environment. The components shall be radiation resistant to 100 Krad. The use of components which can withstand radiations lower than 100 Krad but not less than 25 Krad may be considered after analyses and a sufficient shielding.

On components for which available data indicate sensitivity to the expected radiation environment, additional shielding and/or lot acceptance testing may have to include radiation testing to demonstrate that the batch of components (or wafers) intended for flight-application is acceptable.

If no radiation data are available for specific components, sample shall be subjected to Radiation Lot Acceptance Testing.

2.6.3.3 Component Derating

Critical components shall be stressed to the derated values specified in PSS-01-301.

Specific stresses, such as temperature, radiation, etc., shall be reviewed in order to assess the derating requirements.

2.6.4 Component Selection and Approval

2.6.4.1 Preferred Components

The ESA Preferred Parts List (PPL), ESA PSS-01-603, the ESA / SCC Qualified Parts List, the GSFC-Preferred Parts List and MIL-STD-975 (NASA) shall be used as the primary bases for component selection.

For each component selected, which is not listed in one of the ESA- or NASA-PPL / QPL's, detailed justification and supporting information shall be provided on a Part Approval Document.

2.6.4.2 Non PPL Listed Components

The selection of all non-PPL-listed components shall be based on the knowledge regarding technical performance, qualification status or qualifiability and history of previous usage in similar applications.

Preference shall be given to components from sources which would necessitate the least evaluation / qualification effort.

2.6.4.3 Component Approval

All parts used shall be submitted for ESA approval by a Declared Component List (DCL).

Component approval includes approval of the manufacturer, the procurement specification with definition of all technical requirements, applicable screening and lot acceptance tests and the evaluation/ qualification programme if applicable.

A Part Approval Document (PAD) shall be prepared and submitted for approval for all parts. The PAD shall include:

- Non-repetitive PAD number (with revision if needed).
- Identification of experiment / experiment unit for which the part will be applied and numbers used per flight model.
- Part number(s), type, family (plus commercial equivalent).
- Generic specification, detail specification and amendments if applicable (with revisions).
- Proposed manufacturer and back-up if available.
- Radiation hardness data.
- Present qualification status (with reference).
- Results of preliminary evaluation.
- Proposed delta evaluation or full evaluation / qualification programme, if applicable. Test results are to be provided when available.
- Applied screening level.
- SEM / Precap Inspections if applicable.
- LAT levels.
- Destructive Physical Analysis (sample size and by whom).
- Signatures of requesting party and approval signatures.

An approval reference shall be entered on the DCL to maintain traceability.

2.6.4.4 Component Evaluation and Qualification

In case a valid and acceptable qualification cannot be demonstrated, a component evaluation and qualification test programme shall be implemented.

The programme shall cover the following elements:

- Design and application assessment for the parameters of the component which are essential for the intended application and which justify the use of a non-preferred part.

- Constructional analysis of the selected part (minimum three components) to assess the standards of fabrication and assembly, potential failure modes, materials and processes which may lead to deterioration or malfunction.

- Manufacturer assessment to assure that the organisation, facilities, production control and inspection system are adequate.

- Evaluation and qualification tests corresponding to those defined in the ESA/SCC specifications for similar technologies.

If necessary, consultants or procurement agents may be used to perform these tasks.

2.6.4.5 Declared Component List (DCL)

The PA manager will establish and maintain a declared components list, which will contain the following information:

- part designation
- commercial components designation, characteristics(if necessary, like package, tolerance, etc.)
- qualification status
- procurement specification
- quality level
- lot acceptance test level(only components for safety critical application)
- manufacturer
- total quantity including the attrition(for information only)

The DCL should be approved prior to start the procurement activities.

2.6.5 Procurement Requirements

Each type of component will be controlled by a procurement specification.

2.6.5.1 Procurement Specifications

Standard specification will be used as applicable.

If procurement specification have to be established they will be approved by SCENARIO PM department and PA procurement specifications will be sent to ESA PO for approval.

The procurement orders are reviewed and approved by PA in front of the above requirements.

2.6.5.2 Component Screening and Burn-In

The following ESA/SCC test levels for the screening of components for the instrument shall be applied:

- Level B: for active components and critical passive components like crystals, filters, cermet-fuses, relays and switches;

- Level C: for other passive components not listed above.

SSC Testing levels:

- testing level 1: applicable for critical flight-standard hardware

- testing level 2: applicable for maintainable, non-critical flight hardware or single Instruments

Alternative acceptable levels are:

- JAN S, for active components;
- MIL failure rate R or S for passive components.

In any case lot traceability shall be assured.

2.6.5.3 Lot Acceptance Test (LAT)

All components shall be subjected to Lot Acceptance Testing (LAT) as defined in the ESA/SCC specifications, or QCI (Quality Conformance Inspection) as defined in the United States Military specifications.

- Level LAT1 or QCI compatible: the component is neither ESA/SCC nor United States Military qualified at the time of the procurement and level LAT2 is not applicable.

- Level LAT2 or QCI compatible: the component is not space qualified but has successfully supported other long life and/or high reliability space programmes and the reliability/evaluation data are still valid for the current design.

- Level LAT3 or QCI compatible: all cases not included in level LAT1 or LAT2. Level LAT3 tests may be replaced by incoming inspection. Level LAT3 tests may be omitted for qualified ranges of components (e.g. 54HC).

2.6.5.4 Hybrid Circuits

Hermetic hybrid circuits shall be procured according to relevant detail specification from sources which are 'capability approved' for space use.

They will always be entered on Part Approval Documents (PAD) for their approval by the PI and ESA.

2.6.6 Component Quality Assurance

2.6.6.1 Manufacturer Surveillance

Manufacturer surveillance shall be carried out as necessary with audits or participation at critical processing/inspection steps, e.g. with customer (or procurement agent) participation in visual inspections or witnessing of some acceptance tests.

2.6.6.2 Incoming Inspections and Destructive Physical Analysis /DPA)

Receiving inspection of flight and flight spare components shall be carried out by the user or a procurement agent who is independent of the manufacturer. This shall include:

- Review of the manufacturer delivered documentation
- External visual inspection
- Electrical measurement of critical parameters
- Destructive physical analysis
- Magnetic screening.

Where components require upgrading these inspections and tests shall be performed at the test house.

Receiving inspection shall be carried out on a sample of parts. The batch acceptance criteria is zero failures where a batch can be identified as a set of parts from the same production run, e.g. date code. Sample size is as follows:

Batch Size	Sample Size
1-20	100%
21-280	20 parts
280-1200	80 parts

DPA is not required on components with valid ESA / SCC qualifications or equivalent and on components which have no interface with the S/C.

If for any reason it is not possible to carry out individual part electrical testing, performance testing of the parts when built into the operational circuit shall be acceptable. However, it must be recognised that if parts do not meet specification, schedule impacts and costs may be serious and problems may arise with the supplier due to the time between delivery and fault identification. Therefore if at all possible long lead or critical items should be tested on receipt.

Grouping of DPA for certain families of components is permissible. For expensive items the number of DPA-samples may be reduced. Destructive physical analysis shall be carried out on samples from each date code of the component categories listed below:

- Discrete semiconductors
- Integrated circuits
- Filters
- Ceramic capacitors
- Relays
- Crystals
- Hybrids
- Switches
- Hi-voltage components
- Hi-frequency components
- Opto-electronic components

If so requested three samples shall be supplied to ESA for DPA for approval of the part with the PAD or DCL.

2.7 Materials and Process Selection and Control

2.7.1 General

2.7.2 Evaluation Programme

The present Plan defines the policies applicable for materials and processes to be used in the deliverable hardware, to ensure that they meet the programme requirements for design, quality and performance.

The PAM is responsible of the activities, with support from PA specialists and project team

2.7.3 Materials and Process Selection and Approval

The basic tasks are to control the selection, procurement, and qualification of materials and processes.

In order to keep these aspects under control, dedicated lists will be prepared and maintained consistent with the hardware design, starting already in the very early stage of design activities.

The PA materials and process specialist prepares these lists, defining the evaluation and qualification plan for those items that are not known or qualified.

These lists are the basic work tools for the activity.
Three different lists will be prepared:

- Declared Material List (DML)
- Declared Mechanical Part List (DMPL)
- Declared Process List (DPL)

The guidelines for preparation and update of the lists are those defined by ESA PSS 01 700.

Each material and process will be identified, with its applications and qualification status in space field.

The lists will be submitted to SCENARIO NSWD Team and ESA for review and approval.

A new issue, implementing design updates, and the comments received to the previous one, is released for each of the design reviews.

Whenever a Mechanical parts, a material or a process has to be used, for which limited or no test and qualification data are available, and has therefore to be considered not qualified, a Request for Approval (RFA) will be issued and sent to SCENARIO NSWD Team and ESA for evaluation.

Critical processes, identified as those that:

- can have an effect on integrity and safety of the mission
- have never been used in space missions
- their quality cannot be assessed only by final visual inspection of end product

will also be the subject of RFA, containing the suggested means, in terms of controls and qualification tests, to be carried out to minimise their criticality on the flight hardware.

Once all activities foreseen in the RFA's are completed, the SCENARIO NSWD Team and ESA signature will state their approval.

Whenever possible, precedence will be given to materials and processes already used with success in previous space programmes, or qualified in the framework of a formal qualification programme.

The peculiar mission environment will be taken in any case into account, and all selected material and processes will be evaluated for their mission application.

Materials will be selected in accordance with design, quality and performance requirements applicable to the mission.

Particular care will be given to avoid specific areas of concern, such as:

- corrosion
- safety
- susceptibility to mission environmental conditions
- outgassing
- flammability
- galvanic effect
- radiation

The possible impact of the above effects will be evaluated prior of material selection, referring to ESA ECSS documents for specific arguments.

The acceptance criteria for outgassing are:

- less than 1% in terms of TML (Total Mass Loss)
- less than 0,1% for CVCM (Collected Volatile Condensable Material), after test.

Due to critical effects of deposed contaminants on detector surfaces, more stringent requirements may arise as the design evolves.

Avoidance of materials having poor outgassing qualities in the SCENARIO NSWD programme is a main task.

2.7.4 Materials Control

Each material will be defined and controlled by a detailed specification, or a standard.

These specifications identifies the material properties, the applicable requirements, the methods for their use, the tests and the relevant acceptance criteria.

Materials having a limited life will be marked with their expiration date.

Expired materials can be re-qualified if they pass the applicable tests and demonstrate to possess still their required properties. Trace of these re-qualification will be filed by QA.

The incoming inspection controls will be tailored to the material characteristics and criticality.

Lot or individual test documentation will be kept in file to SCENARIO NSWD Team and ESA review.

Detected anomalies will be treated by NCR and MRB.

SCENARIO Team and ESA will be called to participate to MRB dispositions, in case of major problems.

Materials will be procured from sources which have demonstrated to be reliable in previous space programmes. Whenever possible and practicable, second source policy will be followed.

2.7.5 Process Control

Processes are selected on the basis of their compatibility with the materials to which they have to be applied, and their capability to meet the specified requirements for quality and performance.

Precedence will be given to well established processes, already used in previous space programmes.

Should it be necessary, due to the SCENARIO NSWD programme peculiarities, to use not qualified processes, dedicated evaluation and qualification specifications will be prepared and submitted to SCENARIO NSWD Team and ESA for approval.

These specifications will detail all tests to be carried out to obtain confidence in the process performance prior of application on flight hardware.

Each process will be covered by a detailed specification, or a standard.

These specifications will be reviewed and approved by SCENARIO NSWD Team and ESA prior of process application.

The process specifications will define all parameters to be maintained under control to ensure that the final product meets design requirements.

Manufacturing and control tools will be evaluated and maintained according to their schedule to guarantee proper results.

The environmental and cleanliness conditions of the areas where the processes have to be exploited will be specified and monitored to avoid contamination.

The personnel certification for processes requiring particular skills will be verified

Materials to be used for the process will be included in the Declared Material List, and their suitability for intended use will be proven.

Special processes, identified as critical in the Declared Process List according to the ESA PSS-01-70 definitions, will be subjected to strict survey.

Special plans and checklists will be prepared, and recalled in the Manufacturing and Inspection Plan, to evidence the periodicity and the contents of the controls to be carried out on critical processes.

The Manufacturing and Inspection Plan to be submitted to ESA and SCENARIO NSWD Team will contain the list and the schedule of the process audits that each subcontractor will perform at its own facilities.

ESA and SCENARIO NSWD Team will be allowed to participate to the audits, by advanced notification.

Critical areas identified in the manufacturing flow during production of the deliverable items will be the subject of dedicated audits.

2.8 Software Product Assurance

2.8.1 General

A comprehensive QA programme will be established to cover all phases of SW life cycle. This programme will cover all in-house or subcontracted activities.

Progress meetings, official reviews, key points and inspections will be planned and scheduled to ensure a close follow up on the activities.

2.8.2 Software Product Assurance Activities

All the activities related to S/W Quality Assurance will be described in the document "S/W Quality Assurance Plan" to be issued for the SW associated to SCENARIO NSWD items and their dedicated GSE's.

The document will be based on ESA-PSS-05-0 taken as guideline document.

The applicability of all parts of this ESA PSS will be defined, for the test SW associated to GSE, in accordance with its intrinsecal criticality.

2.8.2.1 Product Assurance for EGSE

The Product Assurance for the EGSE development is based on a system developed for earlier ESA projects and is compliant with the requirements outlined in the EID-A.

The project manager for this work package acts as safety representative for the Electrical Ground Support Equipment. In the preliminary risk analysis no hazardous risks or safety relevant issues were identified. In any safety related issues the EGSE team will support activities of the project.

For the interface box with spacecraft interface functionality, all quality assurance measures for space electronics development will be observed. For the rest of the EGSE only standard industry equipment will be procured.
.
Handling and installation will be defined in the documentation accompanying each EGSE model. For configuration control logbooks will be maintained.

Failure tolerance: The EGSE is based on standard computer and network equipment. In case of failure a replacement device with compatible configuration will be kept available and can be supplied on short notice.

2.8.3 Software Product Reviews and Inspections

As baseline, the following Reviews will take place:

- System Requirements Review (SRR);
- Preliminary Design Review (PDR);
- Critical Design Review (CDR);
- Qualification Review (QR);
- Acceptance Review (AR);
- Operations Readiness Review (ORR)
- Software Inspection on Source Listing;
- Review of Test procedures and test plans;
- Witnessing of tests;

Complete traceability will be ensured in all Reviews, and a formal acceptance release will be considered mandatory prior to proceed to the following phases of SW development and test.

2.8.4 Hardware / Software Interaction Analysis (HSIA)

The FMECA to be performed on the items will take into account the associated on-board SW, and its interaction with the HW.

The goal of this activity is to avoid damage or overstress caused by SW commands, and to prevent increase of criticality of HW failures due to SW resulting actions.

2.8.5 Software Configuration Management

The contents of the SW QA Plan (SWQAP) will be, as minimum, the following:

- SW QA management and organisation description
- Standards, practices and metrics in use
- Verification and test control reviews
- Audits
- Problem reports and related corrective actions
- Tools and techniques
- Code and media control
- SW Configuration management
- Subcontractors and suppliers control

2.8.6 Software Problem Reporting

SW nonconformances will be treated, classified and reported as the HW ones. Dispositions and corrective actions will be defined in concurrence with SW specialists.

2.9 Cleanliness and Contamination Control

The environment conditions, with respect to cleanliness and contamination control, will be maintained adequate to the requirements applicable to the product.

As basic definitions, all electronic units, starting from part level to complete unit, will be stored, handled, assembled and manufactured in FED STD 209, 100000 Class conditions.

Detectors, and other items associated to them, will be handled and assembled in areas with better cleanliness conditions, to be defined in the Cleanliness Control Plan that will be prepared and submitted to SCENARIO NSWD Team and ESA for approval.

This Plan will define the policies for prevention from contamination of critical surfaces.

The contents of this Plan will be as minimum the following:

- Handling instructions for critical parts. If necessary, dedicated procedures will be prepared and implemented.
- Cleaning methods, with the definition of the points within the manufacturing flow where cleaning is required.
- Purity requirements for the cleaning agents to be used
- Prevention methods to avoid contamination, such as Cleanroom clothing, gloves, etc.
- Cleanliness level measurement and monitoring of all areas involved in the manufacturing process.
- Detection methods for the measurement of the contamination level on the critical surfaces
- Means to prevent contamination during the phases of Manufacturing, Assembling and Test.
- The final expected cleanliness budget

Stores, assembling, test and inspection areas will be equipped in order to meet the requirements set forth in the Cleanliness Control Plan.

Whenever necessary, operations critical for cleanliness aspects will be carried out under laminar flow hoods.

3 Compliance Matrix

The responsible of each subsytem will be asked to present a Compliance Matrix to the paragraphs of the present plan.

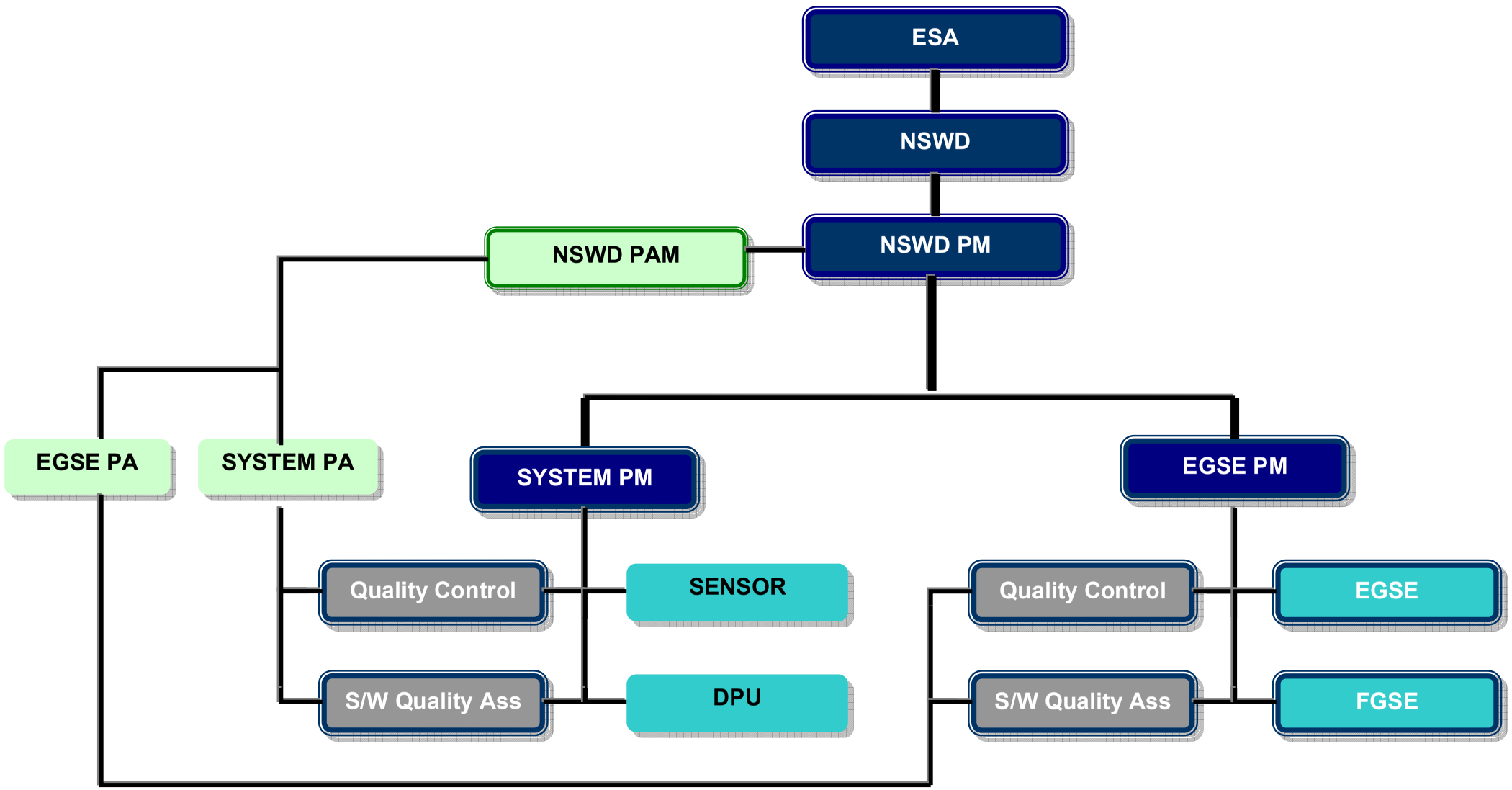
This Compliance Matrix will give to SCENARIO NSWD Team and ESA clear understanding of the level of compliance status, plus all necessary remarks, notes and references that the Contractor retains necessary.

Par N°	EIDA	REMARKS

Figure 3-1: Compliance matrix form.

APPENDIX A: PRODUCT ASSURANCE ORGANIZATION

	SCENARIO NSWD PRODUCT ASSURANCE ORGANIZATION	Reference: SO-BSW-PL-004
		Date: Nov 2007
		Issue: 1 Rev.: 0



APPENDIX B: Nonconformance Report Sheet

Nonconformance Report

Company 1	**Project Name** 2 **SCENARIO NSWD**	NCR-N°: 3 _____ Revision: 4 _____ Related internal NCR-N°: 5 _____ Critical Item: 6 Yes ☐ No ☐ Page 1 of Attachments: 7 _____

NCR Title: 8

NC Item Identification: 9 Name: S/N: CI-N°:	Drawing N°: 12
Next higher Assembly: 10	Procedure N°: 13
Subsystem: 11 Model:	Supplier: 14
NC Observation 15 Date: Location:	NC detected during: 16
Description of Nonconformance: 17 Requirements violated: 18	Initiator: Date, Name and Signature 19

Internal NRB Dispositions: 20	Ref. to MoM 21	Classification: 22 **Minor**: ☐ **Major**: ☐ Customer Notification per: 23
Cause of NC: 25 Ref. to Failure Report: 26	Corrective/Preventive Actions: 27	Verification: 24

Date: Name. Signature:	**PA** 28	**Engineering** 29	30	31

Customer NRB Dispositions (Class major only) 32	Ref. to MoMs: 21	Verification: 24
Finally determined cause of NC: 33 Ref. to Failure Report: 34	Corrective/Preventive Actions: 35	
Request for Waiver: 36 No ☐ Yes: ☐ Reference:	Alert: 37 No ☐ Yes: ☐ Reference:	Other related Documents: 38

NRB Approval: Organisation, Name	Chairman 39	40	41	42	43	**NCR Close out** 49 Date, Signature, Stamp
Date, Signature	44	45	46	47	48	

Nonconformance Report
- Continuation Sheet -

Company 1	Project Name 2	NCR-N°: 3 _____ Revision: 4 _____
	SCENARIO NSWD	Page 1 of Attachments: 7 _____

NCR Treatment Sequence / Statements / Actions 50	Verification 24

NCR Data Requirements

Box	Field	Description
1	Company	Identification of the originator of the nonconfor-mance report
2	Project Name	Project under which the item is procured
3	NCR-NO.	Unique identification and registration number according to section 4.2.3
4	Revision	Numerical identification of updated issues
5	Related internal NCR	Reference to internal report which might have been issued previously
6	Critical Item	Yes or No as identified in the project CIL
7	Attachments	
8	NCR Title	Short description (it should be the same as used in the Nonconformance Summary Status Report)
9	NC Item	Identification of the nonconforming item per name, serial number (if any), lot/batch number (if any) and CI number according to the Product Tree
10	Next higher Assembly	Identification of the assembly group affected by the NC
11	Subsystem Model	Identification of the subsystem and model affected by the NC
12	Drawing-No.	Document which defines the affected product
13	Procedure-No.	Procedure in execution when the nonconformance occurred
14	Supplier	Name of the supplier of the nonconforming item
15	NC Obervation	Date and location of the nonconformance observation
16	NC detected during...	Activity being performed when the nonconfor-mance occurred, e.g. Prod.- / Inspection Step, Test
17	Description	Description of the noconformance, location on the product, means of detection, condition for observation, to be supported by sketches and attachments as appropriate, environmental conditions pertaining to the product at that time
18	Requirements violated	Identification of the detailed requirement to which the product does not conform
19	Initiator	Name, Date and Signature of the person raising the nonconformance report
20	Internal NRB	Dispositions as per section 3.3 and actions agreed by the NRB
21	Ref. to MoM	Identification of minutes of meeting drafted during the NRB meeting
22	Classification	Minor or Major as per internal NRB decision
23	Customer Notification	Date and reference of written notification
24	Verification	Individual close-out statement by PA personnel for all actions determined by the NRB
25	Cause of NC	Basic fact and/or circumstances which causes the nonconformance
26	Ref. to Failure Report	Document identification number of the failure analysis report
27	Corr./ Prevent. Actions	Corrective/preventive actions agreed by internal NRB for minor NCRs
28	PA	Date, Name and Signature of PA representative in the internal NRB
29	Engineering	Date, Name and Signature of the engineering representative in the internal NRB
30	blank	Date, Name and Signature of additional NRB members of the internal NRB
31	blank	Date, Name and Signature of additional NRB members of the internal NRB
32	Customer NRB Dispositions	Dispositions as per section 3.3 and actions agreed by the customer NRB
33	Finally determined Cause of NC	Basic fact and/or circumstances which cause the nonconformance as confirmed by the Customer NRB
34	Ref. to Failure Report	Document identification number of the failure analysis report on Customer NRB level
35	Corr./Prevent. Actions	Corrective/preventive actions agreed by Customer NRB for major NCRs
36	Request for Waiver	Yes or No based on Customer NRB disposition and the identification number of the RFW in case of Yes
37	Alert	Yes or No as per Customer NRB decision and notification reference number
38	Other Documents	Identification of other related documents according to the NRB decision
39	Chairman	Names of company and person chairing the customer NRB
40 to 43	blank	Names of members of the customer NRB and respective companies
44	blank	Date and signature of the customer NRB chairman
45 to 48	blank	Date and signatures of the customer NRB members
49	NCR Close-out	Date, Signature and Stamp of the originator PA/QA responsible for final closure
50	Additional Info/Continuation Sheet	Any additional information and actions with clear link to the NCR