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QUALITY ASSURANCE PRELIMINAR PLAN – EQUARS MISSION

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SUMMARY

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1 INTRODUCTION

1.1 SCOPE

This document establishes the Product Assurance activities to the EQUARS Mission. It encompasses the disciplines: Quality Assurance; Dependability; Radiation; Safety Assurance; Software Product Assurance; EEE Components and Materials, Mechanical Parts and Processes; and Configuration Management, in accordance with Mission Assurance Requirements [RD-08], EQUARS product assurance requirements [TBD-01] and Plano *Preliminar da Garantia de Missão – Missão EQUARS* [RD-09].

This document is applied to INPE and to the suppliers.

The EQUARS Mission has defined that the risk of mission is classified as Class C, according to the TOR-2011(8591)-21 - Aerospace Report - Mission Assurance Guidelines for A-D Mission Risk Classes [DR1], in order to tailoring for EQUARS Mission the product assurance activities. The [DR1] was used as a Guideline.

According to the TOR-2011(8591)-21, Class C missions are defined as lower national significance, exploratory or experimental missions, with a reduced set of MA standards applied resulting in a **moderate** risk profile. They have moderate to low cost, are of moderate to low complexity with reduced mission scope, shorter mission life, few launch constraints, and some alternatives available.

This Product Assurance Preliminary Plan will be applied to all EQUARS Mission for system level at this phase. However, the final version of this document [TBD-02] will be applied to from system level down to parts and components including both, on board hardware and software. Also, it shall be applied to design, development, production, assembling, integration and test, and launch campaign phases.

1.2 APPLICABILITY

This document defines the Product Assurance Preliminary Plan to EQUARS Mission. It is excluded from this document the Product Assurance Management.

1.3 APPLICABLE DOCUMENTS AND REFERENCES

1.3.1 Applicable Documents

The following documents contain provisions that are considered as part of this document. For dated references, subsequent amendments to, or revision of any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

AD-01:	EQUARS-0000-MS-001-A	Declaração da Missão EQUARS
AD-02:	EQUARS-2000-TS-001-A	Especificação Preliminar de Requisitos Técnicos da Missão EQUARS

Conflicts between documents must be reported to INPE that shall establish precedence

1.3.2 Reference Documents

The following documents contain information that develop, add, or clarify concepts described in this document. For dated references, subsequent amendments to, or revision of any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

RD-01	TOR-2011(8591)-21	Aerospace Report - Mission Assurance Guidelines for A-D Mission Risk Classes
RD-02	ECSS-S-ST-00-01C	ECSS System - Glossary of Terms
RD-03	ECSS-Q-ST-10-04C	Space Product Assurance - Critical Item Control
RD-04	ECSS-Q-ST-20C Rev 1 - 2013	Space Product Assurance - Quality Assurance
RD-05	TOR-2007(8546)-6018	Aerospace Technical Operating Report – Mission Assurance Guide
RD-06	CSS-M-ST-10C	Space project management Project planning and implementation
RD-07	ECSS-Q-ST-10-09	Space product assurance – Nonconformance control system
RD-08	EQUARS-3000-TS-001	EQUARS Mission Assurance Preliminary Requirements
RD-09	EQUARS-3000-PLN-002	Plano Preliminar da Garantia de Missão – Missão EQUARS

RD-10	EQUARS-1170-CMP-001	Plano de Gerenciamento da Configuração
RD-11	EQUARS-3400-PLN-001	Plano de Segurança (Safety) da Missão EQUARS
RD-12	EQUARS-3300-PLN-001	Plano de Dependabilidade
RD-13	EQUARS-3500-PLN-001	EQUARS EEE Parts Preliminary Plan
RD-14	EQUARS-3600-PLN-001	EQUARS MPMP Parts Preliminary Plan
RD-15	EQUARS-3700-PLN-001	EQUARS Software Product Assurance Plan
RD-16	EQUARS-1140-PLN-001	Plano de Gerenciamento de Risco
RD-17	ECSS-Q-ST-10-09	Space Product Assurance – Nonconformance control system

Conflicts between documents must be reported to INPE that shall establish precedence.

1.4 ACRONYMS AND DEFINITIONS

1.4.1 Acronyms List

INPE	*Instituto Nacional de Pesquisas Espaciais*
CGETE	*Coordenação-Geral de Engenharia e Tecnologia Espacial*
SESEQ	*Serviço de Engenharia da Qualidade*
MA	*Mission Assurance*
MPMP	*Mechanical parts, materials, and processes*
GEP	*Product Engineering Group (Grupo de Engenharia do Produto)*
EEE	*Electrical, Electronic and Electro-mechanical Components*
LCC	*Life cycle cost*
SOW	*Statement of work*
WBS	*Work Breakdown Structure*
TRA	*Technology Readiness Assessments*
SRR	*System Requirements Review*
SDR	*Systems requirements document*
PDA	*Preliminary design audit*
PDR	*Preliminary Design Review*
CA	*Corrective action*
EOL	*end of life*
CDRL	*Contract deliverable requirements list*
N.A.	*Non-Applicable*
QA	*Quality Assurance*
PA	*Product Assurance*

1.4.2 Definition List

Acceptance

According to ECSS-S-ST-00-01C, act by which the customer agrees that the product is designed and produced according to its specifications and the agreed deviations and waivers, and it is free of defects when delivered by the supplier. Acceptance is a process that part of the verification process which demonstrates that the product meets specified acceptance margins.

Customer

According to ECSS-S-ST-00-01C, the customer will refer to organization or person that receives a product as part of a business agreement.

NOTE: customer can be internal or external to the supplier organization.

Customer-Supplier Model ECSS [RD-21]

The production of space systems calls for the cooperation of several organizations that share the common objective of providing a product that satisfies the customer's needs (performance within cost and schedule constraints).
All space project actors are either a customer or a supplier, or both.
In its simplest form, a project can comprise one customer with just one supplier; however, most space projects comprise a number of hierarchical levels, where:

- the actor at the top level of the hierarchy is the top level customer;
- the actors at intermediate levels of the hierarchy are both supplier and customer; and
- the actors at the lowest level of the hierarchy are suppliers only.

Review

According to ECSS-M-ST-10-01C, project reviews are examinations of the technical status of a project and associated issues at a particular point in time. Their primary purpose is to provide a comprehensive assessment of the project status against targets and requirements. Through independent participation, they give additional support to the project concerned at crucial stages and give the responsible management confidence in the technical progress being achieved. Additionally, reviews can identify potential lessons learned.

Supplier

According to ECSS-S-ST-00-01C [RD-03], the term Supplier will refer to any organization or person that provides a product as part of a business agreement.
NOTE: A supplier can be internal or external to the customer organization.

1.5 DESCRIPTION

1.5.1 Mission Risk Classification

The EQUARS Mission has defined as Class C the risk of mission, according to the AEROSPACE REPORT No. TOR-2011(8591)-21 Mission Assurance Guidelines for A-D Mission Risk Classes [DR01]. Class C missions are defined as lower national significance, exploratory or experimental missions, with a reduced set of Mission Assurance standards applied resulting in a moderate risk profile.

Table 1 shows the main characteristics of Class C.

Table 1 – EQUARS Mission Risk, Class C [DR01].

Characteristic	Class C
Risk Acceptance	Moderate Risk
National Significance	Less Critical
Payload type	Exploratory or Experimental
Acquisition costs	Medium LCC
Complexity	Medium – Low
Mission Life	≤ 4 years
Cost	Medium - Low
Launch Constraints	Few
Alternatives	Some
Mission Success	Reduced mission assurance standards
Typical Contract Type	Cost Plus Firm Fixed Price

2 PRODUCT ASSURANCE MANAGEMENT

2.1 SCOPE OF PA MANAGEMENT

The prime objective of Product Assurance is to ensure that space products accomplish their defined Mission Assurance Requirements [RD-08] and *Plano Preliminar da Garantia de Missão* [RD-09].

Product Assurance Management ensures the integration of activities from the Product Assurance disciplines, as defined in the ECSS standards, according to *Plano Preliminar da Garantia de Missão* [RD-09].

The items specified in clause 2.3.1 (PA Programme Planning) address the following aspects:

- Definition of a Product Assurance organization with the allocation of adequate resources, personnel and facilities,
- Definition of Product Assurance requirements for lower tier suppliers,
- Definition of a Product Assurance Plan describing the Product Assurance programme and how it fulfils project objectives and requirements.

The items specified in clause 2.3.2 (PA Programme Implementation) address the following aspects:

- Management and control of the PA tasks performed by the PA disciplines.
- Progress reporting of all Product Assurance matters.
- Management of audits, critical items, nonconformances and alerts [TBD-03].
- Support to the risk management, in coordination with the Project Management functions.
- Support to the documentation and data control, quality records and to configuration management.
- Lower-tier supplier control for ensuring implementation of PA requirements by the suppliers.

2.2 MISSION ASSURANCE PROCESS TAILORING

The tailoring PA requirements are accordance with AEROSPACE REPORT No. TOR-2011(8591)-21 Mission Assurance Guidelines for A-D Mission Risk Classes [RD-01].

Table 2 – Extract based in the MA Process Mission Class Summary [DR01].

Mission Assurance Process	Class C
Design Assurance	• Delta: Best Practices based, Funding type programmatic control • Supplier: Design assurance practices • Independent Assessment: Internal TLYF (Test-Like-You-Fly), MIPs • Government (INPE and AEB): Review and concurrence, Audit
Requirements Analysis and Validation	• Delta: Best practices based, Funding type programmatic oversight • Contractor: Mission validation, V&V • Independent Assessment: traceability, effectiveness • Government (INPE): Approval (System)
Parts, Materials and Processes	See the specific Plan [RD-14]
Environmental Compatibility	• Environmental compatibility Vetted for impact to other systems and payloads • Mission requirements decomposed based on INPE best practices • Physical testing only used to satisfy mission requirements • Waivers acceptable with justified risk impact to mission success • Reduced design margins (protoqual levels)
Dependability	See the specific Plan [RD-12]
System Safety	See the specific Plan [RD-11]
Configuration/ Change Management (see Note A, Class A adopted)	• CM plan not a deliverable; rely on INPE best practices • Formal configuration management is usually initiated once subsystems are integrated • Software CM is initiated earlier See the specific Plan [RD-10]
Integration, Test and Evaluation	• Integration: Standard compliance with tailoring, interface internal checkout, final

	integration evaluation, GSE validated simulator checkout, reduced in-process screening • Testing – Requirements Compliance and Validation: Proto-qualification new hardware/acceptance heritage with delta cycles, margins, duration, software best practices validation, operability, partial system test including interfaces, launch support test • Evaluation: Customer review and approval at system level
Risk Assessment and Management	See the specific Plan [RD-16]
Independent Reviews (see Note B, Class A adopted)	• Limited programmatic and technical reviews • SMEs from customer community and contractor • General Standards for compliance review conduction • All issues tracked to closure • Review only for moderate to high risk items
Hardware Quality Assurance (see Note C, based on Class A)	• Greatly reduced customer involvement • Relax processes in purchasing, traceability, verification, and environmental controls • Less frequent audits • First article inspection focused on key design features versus 100% verification
Software Assurance (TBD)	• Contractor SQA process • Heritage reuse model • Critical artifact capture/closeout • Process focused Reliability growth • Major hazard Software Safety • SCCB support • Selective test monitoring See the specific Plan [RD-15]
Supplier Quality Assurance (see Note D, Based on Class A)	• AS9100 certification at contractor and major suppliers desirable with self-report allowable • Reliance on supplier best practices • Contractual QA based on minimum product standards • Quality Standards best practice driven
Failure Review Board (see Note E, Based on Class A)	• Strive for root cause but with a reduced level of control and rigor • FRB meetings based on contractor best practices with results provided to the customer • FRB investigation led by cognizant engineer and suppliers • Less formal presentation of results • Unverified failure processed per contractor policy with eye to cost

Corrective/ Preventative Action Board	TBD
Alerts, Information Bulletins	NA

Legend:

Nota A: Due to the lessons learned issues at previous INPE´s program, the Configuration/Change Management must be more formal, according to Class A.

Class A: Formal configuration management (CM) plans, processes and boards integrated throughout the supplier chain with INPE approval for baseline/change control and configuration audits.

Note B: Due to the lessons learned issues at previous INPE´s program, the Independent Reviews must be more formal, according Class A.

Class A: Numerous programmatic and technical reviews; involvement from customer community and contractor; Full standards compliance for entry and exit criteria; and All issues tracked to closure.

Note C: Due to the lessons learned issues at previous INPE´s program, the Hardware Quality Assurance must be more formal, based on Class A.

Class A: ECSS-Q-ST-20C Rev 1 – 2013 [RD-4] compliance; Minimum tailoring; and Full set of HQA processes to ensure program meets contract and assures mission success.

Note D: Due to the lessons learned issues at previous INPE´s program, Supplier Quality Assurance must be more formal, based on Class A.
Class A: ECSS-Q-ST-20C Rev 1 – 2013 [RD-4] compliance; Full flow down of customer requirements; Formal verification of supplier activities and process/activity artifacts; and Quality Standards customer driven.

Note E: Due to the lessons learned issues at previous INPE´s program, Failure Review Board must be more formal, based on Class A.

Class A: Strive for root cause, seek to eliminate defects in all sibling hardware and verify effective

preventive measures; Formal FRB meetings with customer as voting member; FRB control of investigation; Artifacts well documented; and Unverified failure commonly results in worst case change out.

2.3 PRODUCT ASSURANCE PLANNING

2.3.1 PRODUCT ASSURANCE ORGANIZATION AND RESPONSIBILITIES

This part of document specifies the activities and responsabilities, in accordance with *Plano Preliminar da Garantia de Missão* [RD-09].

2.3.1.1 ORGANIZATION

a. The supplier will identify the personnel responsible for implementing and performing PA activities. According to *Plano Preliminar da Garantia de Missão* [RD-09], this item will be performed by SEQ PA Focal Point and report to the MA Manager.
b. SEQ PA Focal Point reporting to the MA Manager.
c. MA Manager reporting to the Mission Manager.
d. The MA Manager will have organizational authority to establish and implement a product assurance programme, supported by SEQ PA Focal Point, in accordance with the Mission Assurance Requirements [RD-08].
e. The SEQ PA Focal Point will act as the focal point of contact for Product Assurance matters.

2.2.1.1.2 RESPONSIBILITY AND AUTHORITY

a. The responsibilities and the interfaces of the PA functions, either external or internal, involved in EQUARS Mission will be accordance with the *Plano Preliminar da Garantia de Missão* [RD-09].
b. The *Plano Preliminar da Garantia de Missão* [RD-09] define and document the responsibilities and the interfaces of the PA functions, either external or internal, involved in a project.
c. QA Member is responsible by perform QA activities and support the SEQ PA Focal Point [RD-09].
d. SEQ Groups is responsible by perform PA activities within their disciplines and support the SEQ PA Focal Point [RD-09].

2.2.1.1.3 RESOURCES

a. For this phase, the PA resources needed to implement the PA programme are listed in the *Plano Preliminar da Garantia de Missão* [RD-09].
b. For this phase, the PA provide resources capable to perform the PA tasks identified in the PA programme are listed in the *Plano Preliminar da Garantia de Missão* [RD-09].
c. Reviews and audits of the product assurance programme, of processes or of product will be carried out by personnel not directly involved in the work being performed.

2.2.1.2 PA MANAGEMENT INTERFACES

a. The MA manager will interface with mission management, ensuring that the mission provision and schedule planning for the definition and phasing of PA activities are met.
b. The MA manager will interface with all segments for the definition and execution of tasks in which PA activities are involved.

c. The MA manager will interface with risk management, configuration management, engineering, verification and AIT for the definition and execution of tasks in which PA activities are involved.
d. The SEQ PA Focal Point will interface with SEQ Groups for the definition and execution of tasks in which PA activities are involved.

e. The MA Manager will interface with the customer regarding all Product Assurance matters.
f. The SEQ PA Focal Point shall interface with lower-tier suppliers regarding all Product Assurance matters.

2.2.1.3 PA PLAN

a. The supplier will prepare, maintain and implement a plan of the PA activities in accordance with the customer PA requirements (Mission Assurance Requirements [RD-08] and EQUARS Product Assurance Requirements [TBD-01]).
b. This Product Assurance Plan has prepared in conformance with [Mission Assurance Requirements [RD-08] and EQUARS Product Assurance Requirements [TBD-01].
c. This Product Assurance Plan will be submitted to the Mission Manager for approval.

2.3.2 PA PROGRAMME IMPLEMENTATION

2.3.2.1 PRODUCT ASSURANCE MANAGEMENT

a. The SEQ PA Focal Point will ensure that PA disciplines are organized at the beginning of the project according to Mission Assurance Requirements [RD-08].
b. The SEQ PA Focal Point will ensure that the PA disciplines perform the tasks described in this PA Plan in line with the mission schedule.
c. The SEQ PA Focal Point will ensure that the outputs produced by the PA disciplines are consistent and complete, and delivered in line with the mission schedule.
d. The SEQ PA Focal Point will ensure the application of processes defined in applicable mission plans and documents.
e. The SEQ PA Focal Point will control the quality of his supplier's products by:
   - issuing product assurance requirements applicable to the supplier;
   - ensuring the implementation of the PA requirements by the supplier.
f. The MA manager will ensure that PA contributions to verification are defined and provided.
g. The MA manager will ensure that a qualification programme is defined, approved and maintained by the EQUARS Mission.
h. The SEQ PA Focal Point will ensure that the qualification programme is implemented and the qualification results are recorded, evaluated and documented.
i. The MA manager will ensure that a QSL (Qualification Status List).
j. The SEQ PA Focal Point will review and recommends to approval the achieved qualification status.
k. The SEQ PA Focal Point will recommends to approval the product acceptance during the Acceptance or Delivery Review.

NOTE: The SEQ PA Focal Point recommends to approval is based on the outputs of the Acceptance or Delivery Review.

2.3.2.2 PA REPORTING

a. The MA manager, supported by SEQ PA Focal Point, will report at least once each quarter on the status and progress of the product assurance programme implementation, according to this PA Plan (after his completion).

b. The PA progress report may be part of the mission progress report.

c. The PA report will include at least the following items for the reporting period:

- Progress and accomplishment of each major product assurance task including resolved and new problems, future planning of major activities and events.
- Status of PA reviews, Audits and MIPs, Waiver requests, Nonconformances (minor and major), Critical items (including mitigation action plan status), Qualification status, EEE component status, Material and processes status.

2.3.2.3 PROJECT PA AUDITS

a. The supplier will be subjected to INPE's audits at any time, with previous notification.

Note: INPE reserves the right to audit any subcontractor or supplier at any time, giving previous notification to the audited.

b. The SEQ will perform audits biannually on his own performance to verify the implementation and effectiveness of the provisions defined in this PA Plan (after his completion) approved by the Mission Manager.

c. The MA Manager and SEQ PA Focal Point will establish and maintain an Audit Plan for the project, designating the lower tier suppliers to be audited, the current status and the schedule for auditing.

d. In addition to the planned audits, extra audits will be performed by MA Manager and SEQ PA Focal Point (supported by SEQ) when necessary to overcome failure, consistent poor quality, or other problems in all levels of EQUARS Mission.

e. The MA Manager and SEQ PA Focal Point (supported by SEQ) will plan and perform audits using established and maintained procedures. These procedures will be performed by SEQ [TBD-04].

2.3.2.4 CRITICAL ITEMS CONTROL AND PA INTERFACES TO MISSION RISK MANAGEMENT

a. The MA Manager and Mission Risk Management will establish a critical items control programme [TBD-05].

b. The SEQ PA Focal Point will identify and evaluate critical items in support of the overall mission risk management activities.

c. The SEQ PA Focal Point will ensure that a critical item control programme is implemented to eliminate or mitigate associated risks.

2.3.2.5 DOCUMENTATION AND DATA CONTROL

a. The SEQ PA Focal Point will ensure that the applicable issues of all documents and data are available at all locations where activities required for the implementation of the PA programme are performed. The documents updated will be available, according to *Plano de Gerenciamento da Configuração* [RD-10], and the PA members will verify their compliance.

b. The SEQ PA Focal Point and SEQ GCD Group [RD-08 and RD-10] will ensure that invalid or obsolete documents and data are removed from all points of issue or use, according to

Plano de Gerenciamento da Configuração [RD-10] and *Plano da Garantia de Missão* [RD-08]. Furthermore, the PA members will verify the compliance of this item for each PA activity.

c. The MA Manager will identify the project documents requiring by PA [TBD-06].

2.3.2.6 QUALITY RECORDS

a. The SEQ PA Focal Point will establish and maintain quality records to provide objective evidence of complete and successful performance of all PA discipline tasks and to demonstrate compliance with requirements.

2.3.2.7 PA CONTRIBUTION TO CONFIGURATION MANAGEMENT

a. The SEQ PA Focal Point will verify during CCB (Configuration Control Boards) the suitability for release of drawings, plans, specifications, procedures and changes, according to *Plano de Gerenciamento da Configuração* [RD-10].

b. The SEQ PA Focal Point will ensure that the as-designed status is defined and released prior to manufacturing.

c. The SEQ PA Focal Point will ensure that the as-built documentation is properly defined, identified and maintained in order to reflect approved modifications;

d. The SEQ PA Focal Point will ensure that items delivered comply with the as-built documentation.

2.3.3 PA Plan

According to the Class C risk of mission the GGP has defined the following tasks EQUARS Mission:

2.3.4 Organizational Structure, Responsibility and Authority Descriptions, Management Approach

The PA organization structure, authority description and management approach will be performed in accordance with *Plano Preliminar da Garantia de Missão* [RD-09].

The Mission Manager (MM) is responsible for defining the mission risk.

The Mission Assurance Manager and SEQ PA Focal Point responsibilities are 2.3.1 and 2.3.2 for this Plan.

The SEQ PA Focal Point is responsible for flowing down the mission requirements for the PA disciplines.

Each responsible for PA disciplines (SEQ Groups) is responsible for creating their own PA Plan and PA Requirements related with the discipline, in accordance with *Plano Preliminar da Garantia de Missão* [RD-09].

SEQ Members Group are responsible for creating the PA Disciplines Plans and Requirements and also for analyzing the supplier plan, including the Lists.

The supplier is responsible for creating his own plan complying with the requirements of the PA Disciplines Plan and for flowing down the requirements to the sub-suppliers.

2.3.5 Program for Documentation, or Standardization when Applicable, and Control PA Selection

The PA program documentation are listed in *Plano Preliminar da Garantia de Missão* [RD-09], item 3.1.1, however it will be completed in [TBD-07], after more mission detail and definition.

2.3.6 PA Evaluation and Qualification Approach

Several documented process and procedures are typically generated for management of PA programs and qualification approach.

In order to compliance MA requirements [RD-08] and PA Requirements [TBD-08], each process and procedure can be verified by SEQ members, besides for MPMP qualification approach as follow in accordance with [RD-14].

The MPMP will be choose with heritage, when possible, otherwise is required qualification to environment by analysis at a minimum [RD-14].

A PMPCB will be established to control and approve mechanical parts, materials, and processes and EEE parts [RD-14 and RD-13].

2.3.7 Development of MPMP milestones and task Execution by Phase

The documents TOR-2007(8546)-6018 Aerospace Technical Operating Report – Mission Assurance Guide [DR05] and ECSS-M-ST-10C Space project management Project planning and implementation [DR06] define the PA tasks assigned to seven mission phases, Table 5.

Table 3 –Task phases for NASA and ESA programs.

TOR-2007(8546)-6018 (NASA)	ECSS-M-ST-10C (ESA)
Phase 0: Pre-Phase A Concept Studies	Phase 0: Mission analysis/needs identification
Phase A: Concept Development	Phase A: Feasibility
Phase B: Preliminary Design	Phase B: Preliminary Definition
Phase C: Complete Design	Phase C: Detailed Definition
Phase D1: Fabrication and Integration	Phase D: Qualification and Production
Phase D2: Fielding and Checkout	Phase E: Utilization
Phase D3: Operations and Disposal	Phase F: Disposal

In order to match with the requirements of the INPE´s program, that adopted the ECSS standards to guide the Mission Assurance Plan and the other low level documents, The QA plan also adopted the same nomenclature of ECSS. Regarding the phases, besides the differences in some approaches from NASA or ESA, for QA issues can be assumed equivalent.

Table 6 shows the activities in each task program phase.

Table 4 - Reference Set of QA Tasks, [DR05].

Task	ECSS Phases						
	0	A	B	C	D	E	F
Assess contractual implementation of QA requirements	X	X					
Assess quality management system	X	X					
Assess QA processes	X	X	X	X			
Assess program implementation	X	X	X	X	X	X	X

Table 7 shows the QA needs and controls for both sides, INPE and supplier.

Table 5 - Enabling QA Products, [DR05].

ECSS Phases	INPE Enabling Products	Supplier Enabling Products
Phase 0	Request for proposal (RFP), Statement of work (SOW), Work Breakdown Structure (WBS).	Proposal PA Plan and PA technical requirements detailing how requirements will be met.
Phase A	Final Contract, Release of interface control document (ICD). Entrance/Exit Criteria for SRR and SDR.	Completion of integrated baseline review (IBR), SRR, SDR, Program QA Plan, Corporate QMS policy, past QMS registration audit results.
Phase B	Entrance/Exit Criteria for PDR	Completion of preliminary design audit (PDA), PDR. Completion of CDRLs. Make-buy decisions addressed.
Phase C	Entrance/Exit Criteria for CDR, PRR, and MRR.	Completion of critical design audit (CDA), CDR.

	Content requirements for EIDPs, Test, and Integration requirements.	Completion of CDRLs. MRRs, Producibility, and First Article Review Results.
Phase D	Entrance/Exit Criteria for MRRs, TRRs, FCA, PCAs, and HAR activities.	Supplier Quality Audits results. TRR. Engineering Review Board (ERB)/configuration or change control board (CCB), CM records, EIDPs, FCAs, PCAs.
Phase E	Entrance/Exit Criteria for System Verification Review (SVR), Launch Readiness Review (LRR), Flight Readiness Review (FRR), and Independent Readiness Review Team (IRRT)	Launch site QA plan if applicable. Completion of readiness reviews.
Phase F	On-orbital anomaly/failure reports	On-orbit anomaly resolution data. Lessons learned

Table 8 shows detailed how the QA contribute in each phase.

Table 6 - Tasks By Phase, [DR05].

Task	**ECSS Phases**						
	0	**A**	**B**	**C**	**D**	**E**	**F**
Assess contract items such as the Request For Proposal (RFP) and statement of work (SOW) to ensure all contractor tasks and deliverables are included, evaluation criteria consider QA, and QA is adequately addressed by the requirements. Early contractor site visits may include a check for the existence of a robust QMS, especially in facilities developing new technology or contractor sites at which the government does not have prior experience.	X						
Assess contractual implementation of QA in the contract (SOW, contract data requirements lists [CDRL], data item description [DID], RFP, work breakdown structure [WBS]) to ensure all contractor tasks and deliverables are included, and QA is adequately addressed by the requirements. Evaluate QA infrastructure.		X					
Review SRR and system design review (SDR) entrance and exit criteria for QA. As appropriate, review SRR and SDR topics to ensure QA is adequately addressed.		X					
QA should be performing a top-level review of the potential contractor's QMS. Particular attention at this early stage should be dedicated to reviewing corporate vision, quality goal setting, and strategic planning. Superior communication within the organization should be present, so a review of policy deployment, flowdown of information, and strategic planning capabilities is in order. Past performance may be evaluated to determine the contractor's ability to identify product key characteristics, develop measurable process outputs, and produce products that meet the intended requirements. Additional tasks associated with Phase A (such as assessment of the contractor's program quality plan and facility capabilities) are used to support decisions leading to SDR.		X					
Review preliminary design review (PDR) entrance and exit criteria for QA. As appropriate, review PDR agenda topics to ensure QA is			X				

adequately addressed.							
QA is involved in evaluating the adequacy of QA requirements in the contractual requirements documents, associated contract deliverables, and PDR documentation. QA plays a role in more thoroughly evaluating the contractor's QMS. Specifically the approaches to control purchased product, variability reduction efforts, requirements flowdown, change management (in processes and specifications), risk mitigation methods, the transition from development to production, and imbedding quality requirements into contract deliverables must be reviewed for maturity. Finally, an evaluation of the contractor's ability to properly manage its suppliers is accomplished by assessing the contractor's purchasing process, reviewing the supplier control plan, and participating in supplier site surveys, particularly those conducted with new suppliers or at new facilities.			X				
Review CDR and PRR entrance and exit criteria for QA. As appropriate, review CDR and PRR topics to ensure QA is adequately addressed.				X			
As the design phase is completed, QA is more engaged with evaluating the inner workings of the contractor's QMS. Tasks such as participating in internal and third-party audits; reviewing stamp control, engineering and manufacturing systems, standards and specifications; training and certification; calibration of equipment and tooling; workmanship standards; supplier controls; change control; and handling of nonconformities all must be accomplished. Finally QA participation in MRR and producibility reviews results in an understanding of the program's production readiness level and risks.				X			
During the fabrication and integration phase QA is involved with determining if the product was built to specification and if it performs as intended. Hence, QA will participate in manufacturing and assembly process audits, MRBs and FRBs, TRRs, AIT activities, FCAs and PCAs, pedigree reviews, HARs, and CABs.					X		
When HW moves to the launch site, QA reviews the launch site QA plan and monitors the facilities for adherence to process. Should launch or on-orbit failures occur, QA may be involved in root cause determination. Operations.						X	
Disposal phase uses QA support by exception.							X

2.3.8 INPE´s PA and QA Requirements

EQUARS PA and QA requirements will be produced based on ECSS Standards and tailored according to above items, it will be performed for the next review (SRR).

This tailoring process will consider the particularities of the Quality Engineering Service department (SEQ) which split the discipline into different groups, as it has already shown in the document: *Plano Preliminar da Garantia de Missão* [RD-09].

3 QUALITY ASSURANCE PROGRAM

3.1 QUALITY ASSURANCE PLAN

This document shows how prepare, maintain and implement a QA programme.
This QA plan will be submitted to the Mission Manager and Mission Assurance for approval.

3.2 PERSONNEL TRAINING AND CERTIFICATION

The Quality Assurance (QA) Members will have a documented training for the personnel whose performance quality activities.
Personnel performing or evaluating special processes will be trained and certified according to standards accepted by the mission.
The SEQ will maintain records of the training.

3.3 METROLOGY AND CALIBRATION

INPE and suppliers will establish and implement a documented metrology and calibration system to control measuring, inspection and test equipment and standards in order to provide definitive evidence of quality conformance. QA members will verify this metrology and calibration system and the records.
The standards employed will be traceable to recognized international standards. Measurement processes will be performed in accordance with established written procedures. QA members will verify this traceability.
If there is a difference between delivery measure and acceptance measure, it will be solved by mutual consent or by comparison with patterns (INPE and patterns).

3.4 NONCONFORMANCE MANAGEMENT SYSTEM

3.4.1 GENERAL

Suppliers will establish and implement a documented, controlled, closed-loop system for the identification, notification, segregation, disposition, correction and closeout of nonconforming items. This will include all the relevant interfaces with INPE and suppliers.
The system will include provisions for analysis and classification (minor or major) of all non-conformances and for storage of their records for summary and trend reports.
Nonconformance system is employed for software its procedure and interfaces with the same nonconformance system will be defined in the quality assurance plan.
The list of non-conformances will be submitted to progress meetings, technical reviews, tests reviews and acceptance reviews: they shall be incorporated in the end item data package (EIDP) of the concerning equipment.
SEQ PA Focal Point will organize a monthly progress review of major non-conformance under processing.
SEQ PA Focal Point will ensure management and follow up of processing of major non-conformances and report to MA Manager.
Minor non-conformances will be available for consultation by INPE during key points, technical reviews, TRRB and TRB.
All non-conformances (minor and major) relative to a product will be closed before this product delivering.
All non-conformance related to safety is classified as major.

3.4.2 CLASSIFICATION OF NONCONFORMANCES

Two categories of nonconformances are defined: major and minor nonconformances. [RD-17]
Major nonconformances are those that adversely affect:

- Safety of personnel, facilities, flight hardware and environment,
- Technical, operational, functional requirements,
- Reliability, maintainability, availabity,
- Lifetime,
- Functional or dimensional interchangeability,
- Hardware and/or software interfaces between different contractual levels,
- changes to or deviations from approved qualification or acceptance test
- procedures,
- project specific items which are proposed to be scrapped.

All other nonconformances will be considered to be minor.

3.4.3 Detection and Immediate Actions

The supplier's mission PA representative will perform an immediate preliminary assessment of the nonconformance to establish its extent and cause when it is detected.
Based on the preliminary assessment the supplier's mission PA representative will take the following actions without delay:

1. Provisions for the safety of the personnel and of the equipment.
2. Prevention of unauthorized use of the nonconforming items, by marking and, unless otherwise determined by the PA representative, segregation until their disposition.
3. Prevention of the recurrence of the nonconformances on similar or identical items under processing or testing at that time.

The supplier will apply the following actions to the segregation of nonconforming articles:

1. Establish a clearly marked holding area for nonconforming items pending NRB disposition.
2. Limit the access to this area to NRB members or personnel authorized by the NRB.
3. Make provisions to prevent unauthorized removal of any item.

For items whose segregation in the holding area is not practicable the supplier will perform the following actions:

1. Mark the item as "not to be used".
2. Make sure that the item cannot be used by unauthorized personnel.

The supplier will complete the nonconformance report, and submit it to the internal NRB.
The supplier will describe the nonconformance clear, unambiguous and sufficiently detailed that it can be understood by personnel not involved in its detection.
The supplier will ensure traceability between the NCR and the quality and manufacturing records related to the nonconforming item.

Note: For INPE (internal) nonconformance, SEQ member will complete the nonconformance report, and submit it to the internal NRB.

3.4.4 PROCESSING OF NONCONFORMANCES

3.4.4.1 General

The NRB will be the sole technical authority for the treatment of nonconformances occurring in the frame of a business agreement.
All NRB members will make dispositions and decisions by consensus.
The NRB chairman will involve higher management levels in case of conflict.

3.4.4.2 Processing by Internal NRB

3.4.4.2.1 NRB meeting

The supplier will nominate and authorize the internal NRBs core members.
The responsibilities and authorities of each member will be assigned.
The internal NRB will include, at least, core members from the following areas:

1. Project PA (chairman),
2. Engineering.

NOTE Additional members, or experts, depending on the NCR subject can be nominated by the chairman.
Immediately after the reporting of a nonconformance, the chairman will convene an internal NRB.

3.4.4.2.2 Classification

The internal NRB will classify nonconformances as major or minor, based on the severity of their consequences.
In case of several different minor nonconformances on the same item, the internal NRB will evaluate whether the nonconformances remain minor or reclassified as “major”.
In case of doubt, the internal NRB will classify nonconformances as major.

3.4.4.2.3 Analysis of Causes and Consequences

The internal NRB will investigate the cause(s) of the nonconformance.

NOTE: If necessary, a separate group of experts can be assigned for the investigation.

The supplier will carry out physical operation of an irreversible nature on the nonconforming item only with prior approval by the customer.
The internal NRB will analyze whether human error or poor workmanship are the primary or secondary cause for the nonconformance.
In case that human error or poor workmanship are the primary or secondary cause for the nonconformance, the supplier will review all related documents and the competence level of personnel in order to prevent recurrence.
The internal NRB will investigate the consequences of the nonconformance.
The internal NRB will document the results of the investigation in the nonconformance report.

3.4.4.2.4 Disposition of Minor Nonconformances

The internal NRB will dispose minor nonconformances according to the following criteria:

1. Return to supplier
2. Use “as-is”
3. Rework
4. Repair
5. Scrap

The supplier will include minor nonconformances in the nonconformance status list.

NOTE: Unless otherwise stated in the business agreement, the customer is not notified about minor nonconformances.
The supplier will provide the nonconformance status list to the customer, upon request, for the review of the correct application of classification criteria and appropriate processing.

3.4.4.2.5 Processing of Major Nonconformances

The supplier will notify the customer each time a nonconformance is classified as “major” within five working days of their detection.
The internal NRB will submit major nonconformances reports to the customer NRB.
The supplier will provide a nonconformance report in conformance, including:

- Product model;
- Name, part number and serial number of the subsystem/equipment/component or item which is nonconforming;
- Name, part number and serial number of the next higher assembly;
- Initial dispositions;
- Date, time, location, facility, test equipment and ambient environment at incidence of nonconformance;
- First symptom or indication of nonconformance phase of test (if applicable), cause of failure and suspected or confirmed secondary failure effects;
- Preliminary or proposed corrective action taken to prevent recurrence of the nonconformance;
- The Supplier shall perform the initial disposition to;
  - Determine whether the nonconformance submitted should be classified as minor or major;
  - Disposition the nonconformance if they are classified as minor;
  - Submit the nonconformance to a Material Review Board if they are classified as major.

3.4.4.2.6 Customer NRB Meeting

For major nonconformances the supplier will include, at least:

1. Supplier’s PA representative (chairman), and
2. Supplier’s engineering representative.

The chairman will nominate additional members, or experts, depending on the NCR subject.

NOTE: The Supplier’s representatives can invite observers or consultants from higher customer level, depending on the impacts of the nonconformance.

3.4.4.2.7 Assessment of Higher Level Impacts

The customer will assess whether the requirements of the higher level customer are impacted.
In case of actual or suspected impacts, the customer will notify and involve the higher level customer in the ensuing NRB.

3.4.4.2.8 Disposition of Major Nonconformances

The customer NRB will dispose major nonconformances according to the following criteria:

1. Return to supplier
2. Use “as-is”
3. Rework
4. Repair
5. Scrap

When determining a disposition, the NRB will perform the following tasks:

1. Analyze NCRs and provided analyses
2. Review records of any previous similar or identical nonconformances.
3. Assess the feasibility of the intended dispositions.

4. Assess the applicability of dispositions and corrective actions to existing and in-process items.
5. Assess the effect of the nonconformance on the requirements of the business agreement.
6. Assess the effect of the nonconformance on the intended use of the item.
7. Assess whether the item is identified as critical.
8. Assess the need for raising an alert to other users of similar nonconforming items, and activate the related procedures established in the business agreement.

3.4.4.2.9 Request for Waiver or Deviation

The responsible NRB will identify and recommend the need for a waiver or deviation.
Upon request of the NRB, the supplier will submit a "request for waiver" for major nonconformances with the "use as-is" or "repair" disposition for customer approval.
Upon request of the NRB, the supplier will submit a "request for deviation" or a "contract change notice", for follow on production of the unit.

3.4.4.3 NONCONFORMANCE REVIEW BOARD (NRB)

The Supplier will establish and implement a documented procedure for Nonconformance Review Boards (NRB) to dispose about major nonconformances.
For nonconformances related to hardware a Nonconformance Review Board will be established and implemented.
In the particular case of nonconformance related to parts, materials and processes there will established and implemented a Parts Materials, and Processes Control Boards [RD-13 and RD-14].
For nonconformances related to software a Software Review Board will be established and implemented [RD-15].
The NRB procedure will comprise instructions about the composition of the board, which will include members with sufficient authority to dispose about the nonconformance, and specialists in disciplines relevant to the nonconformance being considered as necessary (INPE's representative - when assigned will be a member of this board; however, agreement with INPE's representative or disposition do not give automatic approval on any Waiver or Deviation).
Items and processes that are subject of nonconformance submitted to the Review Board will be withheld from further operations until the decision of Board is obtained.
Nonconformance dispositions require unanimous agreement of all Board Members of the supplier will provide a failure analysis to the Nonconformance Review Board, including proposal for corrective action to prevent recurrence.

3.4.4.4 Internal NRB

The internal NRB investigates the causes and consequences of the nonconformance and classifies the nonconformance either as minor or major.
Minor nonconformances will be disposed as follows:

a) Return to supplier
This disposition only applies to nonconforming procured items.

b) USE "AS-IS"
The item is found to be usable without eliminating the nonconformance. The rationale for making a use "as-is" disposition will be documented.

c) Rework

The item is recoverable to conform completely to all specified requirements. Additional work is performed to prepare the item for the rework (e.g. removal of faulty work and cleaning). In no case should the result of earlier applied processes or the precondition for other processes to be applied later on, be affected.

d) SCRAP
The item is not recoverable by rework or repair, for technical or economic reasons.

e) Repair
The item is recoverable such that it fulfils the intended usage requirements although it does not conform to the originally specified requirements.

The repair procedure is one of the following:

a. Qualified or standard repair procedure: Those repair procedures which have been approved by the customer in advance for defined applications.
b. Specific repair procedure: Those repair procedures which are prepared for the specific nonconformance and are approved by the NRB.

Any repair procedure includes the verifications needed to check the repair result.
Major nonconformances are submitted to the customer NRB.
INPE will be notified of the occurrence of Major nonconformance, into up to 48 hours by INPE SEQ PA Focal Point (INPE case) or the Supplier PA Manager (Supplier case), it needs to be informed as soon as possible.
The following minimum information shall be included in notification to INPE:

- Product model;
- Name, part number and serial number of the subsystem/equipment/component or item which is nonconforming;
- Name, part number and serial number of the next higher assembly;
- Initial disposition;
- Date, time, location, facility, test equipment and ambient environment at incidence of nonconformance;
- First symptom or indication of nonconformance phase of test (if applicable), cause of failure and suspected or confirmed secondary failure effects;
- Preliminary or proposed corrective action taken to prevent recurrence of the nonconformance;
- The Supplier will perform the initial disposition to:
  - Determine whether the nonconformance submitted should be classified as minor or major;
  - Dispose about the nonconformance if classified as minor;
  - Submit the nonconformance to a Nonconformance Review Board (NRB) if classified as major.

Nonconformance classified as minor will be subject to disposition by the Supplier’s PA responsible.
Decisions concerning investigations, corrective actions and closure of a major non-conformance will be analyzed during a NRB (Nonconformance Review Board), which includes the supplier's and INPE's technical and PA managers with sufficient authority to dispose about the nonconformance being considered.
Processing for each major non-conformance will be recorded on a nonconformance sheet containing, at least:

- A description of the nonconformance;
- Investigations conducted and the results;
- Corrective actions;

- Validation tests / inspection etc.; and
- Corresponding documentation (references of memos, reports etc.).

Supplier PA Manager (for INPE, SEQ PA Focal Point) will organize a monthly progress review of major nonconformances under processing.
Supplier PA Manager (for INPE, SEQ PA Focal Point) will ensure management and follow up of processing of major nonconformances.
Minor nonconformances will be available for consultation by INPE during key points, technical reviews, TRRB and TRB.
All nonconformances (minor and major) relative to a product will be closed before the product delivering.
All nonconformances related to safety will be classified as major.

3.4.4.5 Customer NRB

In principle the customer NRB follows the same process as the internal NRB. In addition, an assessment whether requirements of higher level customers are impacted is performed. If so, these higher level customers are involved in ensuing NRBs. The need for a waiver is also identified and recommended by this NRB.

3.4.4.6 Interface With Configuration

The dispositions of major nonconformances by the NRB may result in deviation or waiver action that will be dealt with by the Configuration Control Board (CCB) of INPE, according to [RD-10].
The MRB will state for the dispositions: "use - as - is" or "repair" if a deviation action or waiver action has to be initiated for approval by INPE or for approval by the internal of Supplier Configuration Control Board.

3.4.5 WAIVERS / DEVIATIONS

A request for waiver/ deviation is a request for acceptance of a discrepancy to a specification/ requirement, without product changes. A deviation concerns a request before production; a waiver concerns a request after production.
Any discrepancy to a specification / requirement which is not identified by the compliance matrix to this specification / requirement will be recorded and justified by a waiver / deviation submitted to INPE acceptance.

3.5 HANDLING, STORAGE AND TRANSPORT

INPE and suppliers will draw up procedures and instructions for handling, storing, removal from storage and transporting equipment in order to ensure the integrity of the equipment for which they are responsible, and will ensure that environment conditions are compatible with the specifications for the equipment (humidity, cleanliness, protection against shocks, temperature, pressure, etc.).
All safety aspects to personnel, facilities, flight hardware and environmental when handling, storing and transporting shall be taken into account. When applicable, signs and labels shall be in place and cited within procedures.
Procedures for storage/ packaging, unpacking and handling can be integrated in the user manual.

Note A: Before and after transport INPE's QA member (SEQ) will be performed a Inspection.
Note B: After [TBD-09] time long of item storage that QA will require a new Inspection.
Note C: After [TBD-10] time long of item storage that QA will require a new functional test.

3.6 QUALITY ASSURANCE FOR DESIGN AND VERIFICATION

3.6.1 DESIGN, DEVELOPMENT AND TECHNICAL INTERFACES

The Supplier will ensure the effective application of all design rules during design phase concerning the suitability of the product to be manufactured, reproduced, inspected, tested and operated.
Design and verification activities will be planned according to a logical and consistent sequence described in the development plan and the AIT Plan.
Interfaces will be managed by means of specific Interface Control Documents drawn up for each item of equipment and for the satellite.

Note: QA members will verify this item and it will be documented with a particular report.

3.6.2 VERIFICATION PROCESS

The verification process will be initialized from the beginning of the design phase. For each product, a verification matrix will be prepared to give visibility of the verification process throughout all product phases. This verification matrix will describe the method to be used to verify each technical specifications of the product. It shall include the following items:

- Each technical parameter;
- The method of verification (test, analysis, inspection, similarity) and product model; used in the verification;
- The references for corresponding technical reports which permit to trace the verification;
- Conformance status; and
- Possible comments.

Note: QA members will verify this item and it will be documented with a particular report.

3.6.3 QUALIFICATION PROCESS

The supplier will guarantee that all configuration managed items and their components are duly qualified to the program with correctly sized margins.
For this section, in case of conflict, the applicable document from Product Engineering of INPE, [RD-14] has the precedence.

3.6.3.1 Qualification by Similarity

The Supplier will justify qualification by similarity with another product by demonstrating that the new application falls within the previously qualified design limits.
Any difference in definition with respect to the reference product and its qualification tests will be identified. The need for complementary qualification will be analyzed and submitted to INPE for approval, according to [RD-14].

3.6.3.2 Qualification Tests

The model used for the qualification tests will be produced according to its definition file. Deviations from the flight model will be identified and analyzed to evaluate whether it is representative of the flight model.
Qualification test procedures and means will be defined before the qualification tests begin and will be checked during the Test Readiness Review Board (TRRB).

3.6.3.3 Qualification for Off-the-Shelf Equipment

For existing equipment, which has not been developed specifically for the mission, its capability for achieving the mission will be assessed by the Supplier and reviewed by INPE on the basis of the following elements:

- Performances obtained, evaluation of margins and possible non-conformance points,
- Comparison of operational conditions (environment, robustness, lifetime, etc.),
- Reliability data (available flight experience),
- Qualification program,
- Differences in the configuration of the flight model in relation to the qualification model.

According to the results of the evaluation, an action program (complementary tests or analyses) may be drawn up in agreement with INPE.

3.6.4 QUALIFICATION STATUS REPORT

PA Manager (for INPE, SEQ PA Focal Point) will maintain a list of the satellite qualification status detailing to equipment level, using the information provided by the supplier.

3.7 PROCUREMENT

3.7.1 SELECTION OF PROCUREMENT SOURCES AND RELATED DOCUMENTATION

INPE will assess the capability of suppliers according to their competence in the space domain. In case of uncertainty, an evaluation audit will be set up by SEQ.

Supplier will provide the following information for each procured item:

- Technical specifications for the product or a data sheet,
- “Customer” acceptance conditions,
- Procurement deadlines,
- Certificate of conformance,
- Guarantee of perennially.

The Supplier PA responsible will participate in and approve the choice of procurement sources according to his own specifications and those of the customer.

3.7.2 MONITORING AND INSPECTION OF PROCUREMENT SOURCES

The supplier will set up a system to ensure the compliance of all accepted procurement requirements, including documentation (EIDP or conformance certificate), packing, shipment, storage etc. It will have key points to verify this compliance.

When the product is delivered, the Supplier will check the state and completeness of the product delivered and its related documentation and shall ensure that it is suitably stored (as defined in the user manual).

3.8 QUALITY ASSURANCE DURING MANUFACTURE

3.8.1.1 GENERAL

Suppliers will guarantee that the products have been manufactured in compliance with the as-design configuration, in a way that it has been planned. A well-controlled system will be established during all production cycle to guarantee reproducibility.

The key points involve an inspection of hardware and documentation and will be defined case-by-case. Supplier will prepare a manufacturing flow chart pointing out in-process inspections, critical processes, Mandatory Inspection Points (MIP) and tests.
Control and surveillance for manufacturers of materials not yet space approved will be established and implemented.

3.8.2 CLEANLINESS CONTROL

3.8.2.1 Level of Cleanliness

Each supplier will guarantee that the cleanliness level of his equipment is compatible with the 100.000 level [TBD-11].
The protection means will be identified in the procedures relating to manufacturing, assembly, integration and tests.

3.8.2.2 Contamination Control

Each supplier will indicate and provide during the manufacturing the means for controlling and protecting equipment to be set up to protect items which are vulnerable to contamination. These protection means will be identified in the procedures relating to manufacturing and tests.

3.8.3 RECORDING OF MANUFACTURING AND TEST

A logbook associated to the equipment will be opened as soon as the acceptance procedure begins. It will include all operations and tests performed from the beginning of acceptance.
The logbook will be supplied as part of the EIDP (end item data package) associated to each deliverable product. It will provide at least control for:

- The type of operations performed (unpacking, assembly, disassembly, connections, tests and tests conditions, inspection, cleaning, product shipment, operation time etc.),
- The date of operations and the name of the operator in charge.
- Equipment Logbook shall be updated during the satellite AIT phase.

3.9 QUALITY ASSURANCE DURING TESTS

This section is applicable for equipment qualification and acceptance tests.
The supplier will guarantee that the tests are carried out in compliance with plans and duly completed test procedures.

3.9.1 DOCUMENTATION

Tests will be described by the following documentation:

- Qualification and acceptance requirements test, describing means to be used, test methods, safety requirements and operators qualification level.
- Qualification and acceptance test plans, describing the way tests will be carried out.
- Related test procedures describing the operational mode test and success criteria (pass and fail).
- Test reports including results, highlighting deviations with respect to the expected results, and an evolution analysis.

Note: QA members will verify this item before acceptance.

3.9.2 QUALIFICATION AND ACCEPTANCE TEST REVIEWS

A Test Readiness Review Board (TRRB), a Post-Test Review Board (PTR) and Test Review Board (TRB) will frame each qualification and acceptance test.

The aim of the TRRB is set up to review the configuration of the item submitted for testing, the documentation and the test facilities, non-conformances, opened issues and to pronounce whether tests may begin.

The TRB allows to pronounce the test results conformity and pass the product to proceed to the next planed step or accept the delivery in case of acceptance review.

PA Manager (SEQ PA Focal Point) will ensure that the following tasks have been performed:

- During the TRRB: status of the as-built configuration, discrepancies with the as-design configuration, non-conformance processing reviews, review of the test plan and procedure, configuration and calibration of test facilities, planning, schedule.
- During the TRB: compliance of the test sequence with the procedure, review of non-conformances detected by the test, validity of test results, entirety of the deliverable documentation, examination of the EIDP, planning, agreement for delivery.

INPE reserves the right to participate in all TRRB and TRBs.

Note: After acceptance review the TRRB, PTR and TRB will be performed by INPE's QA member (SEQ).

3.10 QUALITY ASSURANCE DURING ACCEPTANCE AND DELIVERY

3.10.1 END ITEM DATA PACKAGE (EIDP)

All deliverable equipment will be accompanied by its specific End Item Data Package (EIDP), which will contain at least the following documents [TBC-12]:

- Certificate of conformance;
- Equipment no-conformance/waiver/deviation history;
- IDS (AS - BUILT);
- Operation, transportation, storage and handling manual;
- Connector mate/demate control;
- Operation time record control;
- Transportation record control;
- Test verification matrix; and
- Final performance test report.

3.10.2 ACCEPTANCE AND DELIVERY PROCESS

When the product is received, INPE will check if the product is complete and according to technical specification, check the related documentation has been provided accordingly, and also INPE will ensure the product is suitably stored (as defined in the user´s manual).

The supplier will establish a formal acceptance process for all deliverable items, at any contractual level, to ensure that conformance of the items to be delivered is fully assessed and documented.

The supplier will ensure that the preparation of the items for delivery and the physical delivery itself are performed in such a way that degradation is prevented.

a) Acceptance will be achieved through a review process.
b) The acceptance process will include:

- acceptance plan,
- inspection and test procedures, and
- inspection and test reports.
    c. Acceptance may be achieved through a simple inspection process if agreed between customer and supplier.

Note: Before acceptance review the INPE's QA member (SEQ) will be performed a Final Inspection.

LIST OF ITEMS *TO BE DEFINED*		
ID	**DESCRIPTION**	**STATUS**
TBD-1	EQUARS product assurance requirements	Pending
TBD-2	Final version of Product Assurance Plan	Pending
TBD-3	Alerts system	Open
TBD-4	Audit procedure	Pending
TBD-5	Critical items control programme	Pending
TBD-6	Identifying the project documents requiring approval by PA	Open
TBD-7	Final version of *Plano Preliminar da Garantia de Missão* [RD-09]	Pending
TBD-8	PA Requirements for EQUARS Mission	Pending
TBD-9	After how long time of item storage that QA will require a new Inspection	Open
TBD-10	After how long time of item storage that QA will require a new functional test	Open
TBD-11	Cleanliness level of equipment	Open
TBD-12	End Item Data Package (EIDP) documents	Open
LIST OF ITEMS *TO BE CONFIRMED*		
ID	**DESCRIPTION**	**STATUS**
TBC-1	NA	NA