



This project is funded by  
The European Union

# SAWIDRA

Satellite and Weather Information for Disaster  
Resilience in Africa



ClimDev-Africa



Project led & implemented by the  
African Center of Meteorological  
Applications for Development

## ***Statement of Work (SOW) for the provision, installation and maintenance of the PDAP sub-segment of SAWIDRA RARS***

ACMAD

55 Avenue des Ministères, PL 6, BP 13184, Niamey Niger

Fax: +22720723627

<http://www.acmad.net>



## Table of Contents

<b>1</b>	<b>INTRODUCTION .....</b>	<b>2</b>
1.1	Background and Context .....	2
1.2	Purpose and Scope of the document .....	3
1.3	Applicable Documents .....	3
1.4	Terminology – Definition of Terms .....	3
1.5	Locations .....	5
<b>2</b>	<b>FACILITY AND SERVICES TO BE PROVIDED BY THE CONTRACTOR.....</b>	<b>5</b>
2.1	Baseline Service .....	5
2.1.1	Design .....	5
2.1.2	Procurement .....	5
2.1.3	Installation, Integration and Validation.....	5
2.1.4	Warranty and maintenance.....	5
2.2	List of Options.....	5
<b>3</b>	<b>PHASES, MILESTONES AND SCHEDULE .....</b>	<b>6</b>
3.1	Milestones.....	6
3.2	Phases .....	7
3.2.1	Design phase .....	7
3.2.2	Procurement phase .....	8
3.2.3	Installation, integration and validation phase.....	10
3.2.4	Maintenance and Warranty.....	11
<b>4</b>	<b>ADDITIONAL SUPPORT .....</b>	<b>13</b>
<b>5</b>	<b>TRAINING.....</b>	<b>13</b>
5.1	Training Plan, Principles and Methodologies .....	13
5.2	Training needs .....	14
5.3	Training Methods and Means .....	15
5.4	Training Schedule.....	15
5.5	Training Evaluation .....	16
<b>6</b>	<b>DOCUMENTATION .....</b>	<b>17</b>
<b>7</b>	<b>MEETINGS .....</b>	<b>18</b>
<b>8</b>	<b>CUSTOMER FURNISHED ITEMS .....</b>	<b>19</b>
<b>9</b>	<b>PROJECT, CONFIGURATION AND QUALITY MANAGEMENT .....</b>	<b>19</b>
9.1	Project Management .....	19
9.2	Configuration Management .....	20
9.3	Quality Management System .....	20

## 1 INTRODUCTION

### 1.1 Background and Context

The European Commission approved in 2013 the African, Caribbean and Pacific- European Union (ACP-EU) Programme on Disaster Risk Reduction. The programme, entitled “Building Resilience to Natural Hazards in Sub-Saharan African Regions, Countries and Communities” aims to provide the analytical basis and accelerate the effective implementation of an African comprehensive disaster risk reduction and risk management (DRR and DRM) framework.



The result area number three of this ACP-EU Programme, called Satellite and Weather Information for Disaster Resilience in Africa (SAWIDRA), is to be implemented by the African Development Bank (AfDB). SAWIDRA aims to improve the weather forecast and product production capacity of the specialized National Meteorological and Hydrological Services (NMHSs) and regional climate centres (RCCs) in order to allow them to provide the proper inputs to the risk reduction and risk management (DRR and DRM) agencies for their issuing of early warnings. Under this result area, five sub-projects will be supported with one being a continental-wide project and the other four being regional projects for West, Central, Southern and East African regions.

The SAWIDRA continental project will be implemented by the African Centre of Meteorological Applications for Development (ACMAD). A key output of this project is the establishment of the SAWIDRA RARS Ground Segment: a network of four reception stations which will acquire polar orbiting satellite data, process it and disseminate L1 products to ACMAD for NWP and to the South African Weather Service (SAWS) as input to the Global Telecommunication System (GTS).

The SAWIDRA RARS Ground Segment is composed of two major sub-segments: the Payload Data Acquisition and Processing (PDAP) sub-segment and the SAWIDRA Communication Network (SCN) sub-segment.

The PDAP sub-segment is built up by four identical SAWIDRA RARS Direct Broadcast Ground Stations (SGS) located in Niger, Kenya, South Africa and Gabon. The SGS will be hosted and operated by ACMAD in Niger, L'agence d'études et d'observation spatiales en Afrique sub-saharienne – (AGEOS) in Gabon, the African Intergovernmental Authority on Development (IGAD) Climate Prediction and Application Centre – (ICPAC) in Kenya and the South African Space Agency – (SANSa) in South Africa. The SCN sub-segment interconnects the four SGS with ACMAD and with SAWS.

The SAWIDRA RARS Ground Segment will be implemented through two major procurements: one for the PDAP and a different one for the SCN.

## 1.2 Purpose and Scope of the document

This document constitutes the Statement of Work (SoW) for the design, procurement, installation, validation and maintenance of the PDAP sub-segment.

## 1.3 Applicable Documents

- [AD-01] SAWIDRA RARS Africa Technical Overview
- [AD-02] SAWIDRA PDAP Requirements Document
- [AD-03] Hosting Site Infrastructure and Service Specifications

## 1.4 Terminology – Definition of Terms

### Contractor

In this document the term Contractor is used to indicate either (a) the Prime Contractor of a Consortium of industries or (b) the Sole Contractor for this Contract.



## Customer

The term Customer is used to indicate ACMAD. ACMAD has received financing from the African Development Bank through the ClimDev Special Fund to support the cost of the SAWIDRA project implementation, and intends to use part of the agreed amount of this grant to pay for the contract of “Provision, installation and maintenance of the PDAP sub-segment of SAWIDRA RARS”.

## Hosting site

The Hosting Site refers to the organizations that will host and operate the SGS. There are four Hosting Sites: ACMAD, AGEOS, ICPAC and SANSA.

## The preventive maintenance

The preventive maintenance is classified as a fixed part of the maintenance activity as it consists of predefined tasks to be executed at regular intervals on a given number of equipment according to a predefined scheme that is valid for the duration of the contract.

The purpose of the preventive maintenance is to keep the technical equipment in operational condition according to manufacturer recommendations aiming to detect failures at early stage to avoid/reduce the need for corrective maintenance and unplanned operational impact.

## The corrective maintenance

The corrective maintenance is classified as a variable part of the maintenance activity because it will be performed as the need arises. It covers all the unforeseen activities related to the maintenance service.

The aim of the corrective maintenance is to re-establish the usability of an operational system (i.e. fast corrections of system degradation or equipment failure) by means of different levels of intervention that are grouped into three main sub categories: 1<sup>st</sup> level, 2<sup>nd</sup> level and 3<sup>rd</sup> level maintenance.

The 1<sup>st</sup> Level Maintenance is intended to be activated upon request in case the operational status could not be re-established by performing remote corrective actions and having isolated the failure to the maximum extent. The onsite maintenance team will perform corrective maintenance procedures according to operational guides, equipment repair were possible and, if necessary, exchange failed equipment with available spare parts.

The 2<sup>nd</sup> Level Maintenance is called into force if the problem cannot be solved with the above steps; the maintenance team shall initiate all the necessary actions to involve “experts” to conduct in-depth fault analysis and troubleshooting aiming to isolate the problem and eventually correct it as soon as possible.

The 3<sup>rd</sup> Level Maintenance covers repair of defective devices up to and including system failure analysis and system repair, replenishment of consumables and worn parts.

## Warranty

Guarantee issued to the Customer of the PDAP facilities by the PDAP Contractor, promising to repair or replace any defective component during the PDAP warranty period.



## 1.5 Locations

The SGS shall be shipped to and installed in ACMAD (Niger), in AGEOS (Gabon), ICPAC (Kenia) and SANSA (South Africa). Include addresses

## 2 FACILITY AND SERVICES TO BE PROVIDED BY THE CONTRACTOR

### 2.1 Baseline Service

The Baseline Service to be provided by the contractor includes the

- The PDAP Design;
- The PDAP Procurement;
- The PDAP Installation, Integration and Validation;
- The PDAP Warranty and Maintenance;

#### 2.1.1 Design

The Contractor shall provide to The Customer a PDAP design compliant with the [AD-02] requirements and capable of providing the SAWIDRA services as described in [AD-01].

#### 2.1.2 Procurement

The Contractor shall procure/provide a PDAP sub-segment (four identical direct broadcast ground stations) in accordance with the PDAP requirements and the PDAP design.

#### 2.1.3 Installation, Integration and Validation

The Contractor shall ship the SAWIDRA RARS Direct Broadcast Ground Stations (SGS) to The Hosting Sites (ACMAD in Niger, AGEOS in Gabon, ICPAC in Kenia and SANSA in South Africa). The Contractor shall install, integrate and validate the SGS at each Hosting Site in order to obtain a “stand alone working system” ready to be operated. The Hosting Sites will be responsible of the readiness of the site for the installation of the SGS.

#### 2.1.4 Maintenance (including Warranty)

The Contractor shall provide preventive, 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> level of corrective maintenance for two year starting on SGS acceptance by The Customer. This maintenance period corresponds with the required two years warranty of the facilities provided under this Statement of Work. During this two years the Contractor shall replace or repair any defective facility provided under this Statement of Work. [More information about this phase can be found in section 3.2.4 of this document.

## 2.2 List of Options

**Option # 1:** Optional Yearly Maintenance Extension (Preventive and 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Level).

Following the maintenance baseline period, a renewable annual extension of Preventive and 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Level Maintenance identified as baseline service, may be called up by The Customer.



**Option # 2:** Optional Yearly Maintenance Extension (Preventive and 1<sup>st</sup> Level).

Following the maintenance baseline period, a renewable annual extension of Preventive and 1<sup>st</sup> Level Maintenance, may be called up by The Customer.

**Option # 3:** Additional Engineering Support

The support shall be called up by a Work Package system based on a daily rate, identifying the Contractor's personnel required profile, the required tasks and the associated deliverables. The support shall be made available onsite at The Hosting Sites or remotely by the Contractor, as required by ACMAD

**3 PHASES, MILESTONES AND SCHEDULE**

The following phases and milestones are envisioned for the completion of the work.

Phase	Milestones	Time Frame
Design Phase	<b>Start:</b> Kick-Off	To
	<b>End:</b> Design Consolidation	To + 2 months
Procurement Phase	<b>Start:</b> Design Consolidation	To + 2 months
	<b>End:</b> In-factory Acceptance	To + 6 months
Installation, Integration & Validation Phase	<b>Start:</b> In-factory Acceptance	To + 6 months
	<b>End:</b> Onsite Acceptance	To + 12 months
Maintenance and Warranty	<b>Start:</b> Onsite Acceptance	To + 12 months
	<b>End:</b> End of baseline maintenance	To + 36 months

**Table 1: Phases, milestones and schedule**

**3.1 Milestones**

- Kick-Off meeting (KOM), in order to review the proposed work plan and technical approach. For this procurement the major items shall be defined in the proposal, as consequence the design have to be agreed at KOM (at the latest). This is the first project meeting after the Effective Date of Contract. At this meeting all possible phase reviews described below shall be agreed. The KOM meeting shall be held at The Customer Headquarters in ACMAD, Niger.
- Design Consolidation Meeting (DCM), at which the final design and configuration of the hardware, software and interfaces shall be agreed and fixed. The main scope of Design Consolidation is to provide evidence of technical details to the design provided in the proposal, and agree on any further design details which had not been considered in the proposal. The DCM meeting shall be held at The Customer Headquarters in ACMAD, Niger.



- Test Readiness Review (TRR) and Test Review Board (TRB) meetings, to open and close all test campaign; depending on the importance of the test campaign, these boards may take place via teleconference or face to face meeting, in all cases they shall be documented by MoM.
- Factory Acceptance Review, to conclude that the PDAP sub-segment fulfils the requirements [AD-02] and it is ready to be shipped, installed and integrated at The Hosting Sites. The FAT meeting shall be held at The Contractor premises.
- Onsite Acceptance Review, to conclude on the status of the facilities procured and decides on their suitability for the start of the operational phase. If is foreseen to hold one OSAT meeting at each of the four Hosting Sites.

NOTE: The Onsite Acceptance shall be performed with the SGS installed at the Hosting Site. The Onsite Acceptance refers to the acceptance of the station and not the acceptance of the site. The acceptance of the site will be carried out by the SAWIDRA project team prior to the PDAP acceptance and it is out of the scope of this SoW.

## 3.2 Phases

### 3.2.1 Design phase

#### Duration and scope

This phase shall last from the Kick-Off up to the final definition of the interfaces and design of the PDAP in all details and formally agreed by The Customer, The Contractor and The Hosting Sites at the Design Consolidation Meeting (DCM).

The Contractor shall provide to The Customer a PDAP design compliant with the [AD-02] requirements and capable of providing the SAWIDRA services as described in [AD-01].

If the PDAP is provided by a consortium of industries (meaning that different PDAP subsystems will be procured from different industries), The Customer shall confirm the consistency and completeness of the allocation and apportionment of the PDAP requirements to the PDAP sub-systems.

The Hosting Sites will be responsible of the readiness of the site for the installation of the SGS. The Contractor shall make available to The Hosting Sites the requirements for civil and infrastructure services relative to the specific infrastructure to be provided as part of the PDAP, including:

- the antenna foundation kit in order to agree with The Hosting Sites on the characteristics of the antenna foundation and the proper installation of the antenna interface to ensure the fulfilment of the associated PDAP requirements;
- The provision of the necessary information in terms of needs about the Power Distribution (Board/Box layout, location, number of utilities) and grounding;
- The provision of the necessary information to properly dimension the cable trays and their run;
- The definition of the interface for the Antenna Earthing and lightning protection system, at the antenna site.



The Hosting Sites will provide a site free of radio-frequency interferences on the MET L-Band range (1675-1710 MHz) and on the MET X-band range (7750-7900MHz). A radio frequency survey will be carried out outside of the scope of this procurement.

The Contractor shall provide to The Hosting Sites the requirements on the services needed for the installation day, including the availability of cranes, electricians, access permits, customer IT support, etc.

#### Inputs

- PDAP requirements;
- PDAP technical overview;
- Hosting Site RF survey;
- Hosting Site Infrastructure and Service Specifications (draft);

#### Outputs

A data package shall be provided at DCM for The Customer approval and shall include:

- Project Management Plan (including project schedule, lifecycle, risks);
- PDAP detail design;
- List of facilities being procured;
- Complete description of each main equipment;
- Contribution to Hosting Site Infrastructure and Service Specifications;
- ICDs ( for instance, interface definition between PDAP and Hosting Site facilities);
- Integration, Verification and Validation plan;
- In-factory acceptance test and procedures;
- Draft onsite test and procedures;
- Installation day checklist;
- Maintenance plan;

### **3.2.2 Procurement phase**

#### Duration and scope

This phase will start at the DCM and shall end with the In-factory Acceptance. The end of this phase corresponds with the permission from The Customer and the Hosting Sites to The Contractor for shipping and installing the SGS at ACMAD, AGEOS, ICPAC and SANSA.

The Contractor shall procure/provide a PDAP sub-segment (four identical direct broadcast ground stations) compliant with the PDAP requirements and the PDAP design.





The Contractor shall demonstrate to The Customer and The Hosting Sites during the In-factory Acceptance Tests that the four SGS are compliant with the PDAP requirements and the PDAP design.

Four identical In-factory Acceptance Tests shall be conducted for each of the SGS of the PDAP sub-segment. Although the four SGS shall be identical, the acceptance of each of them will be independent processes. For instance, the acceptance of one of the SGS will not imply the acceptance of the other three.

The Contractor shall demonstrate during the In-factory Acceptance Review that each of the four SGS comprising the PDAP sub-segments are compliant with the PDAP requirements and the PDAP design.

If the PDAP is provided by a consortium of industries (meaning that different PDAP subsystems will be procured from different industries), the Contractor may need to carry out several FATs at subsystem level. Nevertheless, the overall compliance of the SGS (as a stand-alone system) shall be demonstrated against the PDAP requirements. In this particular case, the final SGS FAT shall clearly prove the correct interface between the different subsystems accepted independently.

The Contractor shall take the necessary insurance to cover the PDAP shipment, deployment, integration up to the onsite acceptance and prior to any operational use.

The Contractor will be responsible for procuring all the necessary licences such as import licences as required, respecting the national and local regulation. The Contractor shall manage all administrative tasks and interfaces with customs from Niger, Gabon, Kenya and South Africa to enable the correct and timely shipment of the SGS to ACMAD, AGEOS, ICPAC and SANSA. The Contractor shall interface with The Hosting Sites and The Customer prior to the delivery of the SGS in order to clarify issues particular from each country and organization. Nevertheless, the Contractor shall be the final responsible of the shipment and ensure that it is done correctly and on time. This means that the Contractor shall start the administrative tasks to deliver the SGS to its respective country well before the SGS are accepted by The Customer. The management of the SGS shipment shall be clearly provided as part of the Project Management Plan.

Ideally the four SGS should be accepted and shipped at the same point in time. Nevertheless, issues blocking the acceptance or shipment of one of the four stations shall not block the acceptance or shipment of the others.

#### Inputs

- PDAP technical overview;
- PDAP requirements document;
- PDAP design document;
- Integration, Verification and Validation plan;

#### Outputs

- Updated Project Management Plan;
- In-factory Acceptance Test Report;
- Deliverable Item List



- Integration, Verification and Validation plan;
- Onsite acceptance test and procedures;
- Insurance to cover PDAP shipment and deployment;

### **3.2.3 Installation, integration and validation phase**

#### Duration and scope

This phase shall start with the In-factory Acceptance and shall end with the Onsite Acceptance.

The Contractor shall install, integrate and validate the SGS at each Hosting Site in order to obtain a “stand alone working system” ready to be operated. The Hosting Sites will be responsible of the readiness of the site for the installation of the SGS.

At the beginning of the installation, The Contractor shall assist The Hosting Sites in solving any remaining interface problems and shall witness the acceptance tests of the Infrastructure and Civil works which is a mandatory step to fulfil before starting the PDAP integration.

During this phase the installation of the various hardware elements composing the PDAP, shall be undertaken by The Contractor. Onsite test activities might start as soon as a sufficient level of integration is reached at subsystem level.

The Contractor shall ensure that a clear interface is maintained with The Hosting Site and any reasonable request raised by the integration team such as temporary storage facilities, admittance formalities etc. shall be met at the station site during this phase.

During the infrastructure and civil validation activities, the Contractor shall assist The Hosting Sites in performing integrated system tests and in the analysis and solution of possible system problems.

The Contractor shall demonstrate to The Customer and The Hosting Sites during the Onsite Acceptance Tests that the SGS are compliant with the PDAP requirements and the PDAP design. The onsite acceptance of a SGS will be independent from the on-site acceptance of the other SGS.

The Onsite Acceptance Review shall be held at the end of the validation and integration phase, to conclude on the status of the facilities procured and decide on their suitability to start the operational phase.

#### Inputs

- PDAP technical overview;
- PDAP requirements document;
- PDAP design documents;
- Integration, Verification and Validation plan;
- The installation day checklist

#### Outputs

- Onsite Acceptance Test Report;



- Deliverable Item List;
- Training material;
- Operational Guides;
- Equipment Specifications.
- A Facility Maintenance Plan (FMP). The document shall describe the maintenance responsibilities and the processes used to fulfil the obligations.
- Maintenance manuals and maintenance procedures.

### 3.2.4 Maintenance and Warranty

The Contractor shall provide preventive, 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> level of corrective maintenance for two year starting on SGS successful acceptance by The Customer. This maintenance period corresponds with the required two years warranty of the facilities provided under this Statement of Work.

The Contractor shall be compliant with the following requirements during the two years maintenance period:

- All specific hardware and software provided by the PDAP Contractor for any of the SGS as part of the PDAP delivery shall be covered by a warranty period of two years;
- The warranty period shall apply to each of the SGS independently and commence once the SGS is successfully accepted onsite (OSAT).
- During the PDAP warranty period any defective component shall be repaired or replaced with new equipment by the PDAP contractor.
- The PDAP contractor shall provide onsite support if the component cannot be replaced easily with support from the local SGS operator.
- During the PDAP warranty period the PDAP contractor shall perform the upgrades of the third party PDP product processing packages when requested by the SAWIDRA project team.
- The PDAP warranty period shall include two onsite maintenance visits. The onsite maintenance visit shall include as a minimum:
  - Inspection and testing of indoor and outdoor units and fixing of detected anomalies;
  - Verification of antenna alignment;
  - G/T measurement;
  - Operating System and application software update to latest available and delivery of corresponding documentation;
  - Updating and exercising of redundant units as relevant;
  - Training session of one day minimum covering Operator, Administrator and Technician topics;
  - Production of a maintenance report describing the visit and the actions taken.
- The PDAP warranty period shall include off-line support (telephone, email) to the PDAP hosting sites for troubleshooting and anomaly fixing.



- The PDAP contractor shall be able to provide maintenance support once the warranty period is over. The terms and conditions of the PDAP maintenance will be negotiated at a further stage and are out of the scope of the PDAP procurement.

In addition to the above mentioned, the following activities are foreseen:

- a) In case of function degradation, anomaly, or after a request call from The Customer, the Contractor shall:
  - Investigate anomalies, in order to identify the origin of any problem;
  - Support The Customer staff during Facility reconfiguration, in order to minimise the impact of failure on the mission availability;
  - Characterise any hardware failure;
  - Undertake Facility level tests, investigations or measurements when Facility level degradation is suspected but no hardware faults are indicated;
  - Ensure the appropriate technical support from their subcontractors or suppliers whenever this may improve the efficiency and quality of the maintenance service.
- b) The maintenance policy shall include:
  - To identify faulty items or subsystems, and record the problem characteristics before losing the related information;
  - To recover operational status by using spares or redundancies;
  - After reception of repaired equipment, to test the repaired equipment before return to operational service;
  - To issue and record a complete and comprehensive maintenance report for each 1st level maintenance activity;
  - Activate the 2nd and 3rd level maintenance of failed equipment/unit/module.
- c) The Contractor shall ensure availability of skilled resources dedicated to ground station maintenance ( including product processing as described in [AD-01]) over the contract lifetime therefore appropriate training and induction processes shall be foreseen to cope with potential turnover;
- d) Any maintenance activities shall always be performed in close cooperation and coordinated with The Customer;
- e) The Contractor shall perform all maintenance activities in accordance with the maintenance manuals and relevant maintenance procedures;
- f) The Contractor shall provide a centralised point of contact permanently reachable by phone and by e-mail;
- g) The technical baseline of the facilities at the acceptance of the SGS will be considered as the reference for the definition of the preventive and corrective maintenance tasks, but it will evolve as the facility itself evolves. The Contractor shall maintain/update/amend the



relevant processes and documentation accordingly.

- h) The Contractor shall identify within the existing set of facility documentation, a baseline set of documents, which will be updated and maintained for the whole duration of the contract.
- i) Maintain a maintenance record for all each preventive maintenance activity, and check the correctness of the operational configuration before formally close the activity.
- j) If in the course of the preventive maintenance an anomaly is identified and if the spare is available, the Contractor shall ensure replacement as task of the 1st line maintenance and initiate the repair process activating the 2nd and 3rd level maintenance.
- k) The preventive maintenance activities shall be subject to detailed coordination with The Customer, and the schedule shall be arranged at least one month in advance.

Inputs

- Facility Management Plan;
- Maintenance plans and maintenance procedures;
- Operational Guides;
- Equipment Specifications.

Outputs

- Configuration Status Account Report (CSAR). The CSAR shall be updated to reflect the as-built of the asset under maintenance concerning Hardware, Software and Documentation.
- Maintenance reports;

**4 ADDITIONAL SUPPORT**

The Customer might request the provision of additional support according to its operational needs. Such requests shall be made on a case by case basis via a Work Package mechanism, indicating the actual tasks, deliverable documents, location and expected duration of the work. The specific expertise shall be accessible either onsite or off-site.

**5 TRAINING**

**5.1 Training Plan, Principles and Methodologies**

Capacity building is one of the main targets of the SAWIDRA project and hence the Contractor shall pay special attention to this topic. The Contractor shall demonstrate to the Customer the readiness of Hosting Sites SGS Operators (SGSO) to operate the SGS in nominal circumstances and to react correctly to anomalous scenarios.

The Contractor shall provide during the PDAP design phase the PDAP Operations Training Plan, where the methodology to build the training (aiming at the readiness of operational and maintenance personnel) is described in detail. One of the key elements for the success of the



SAWIDRA project is represented by the reliability of the personnel in charge of conducting the associated mission operations.

In order to guaranty the reliability and continuity of the PDAP operations during its whole lifetime, and the preservation of the associated Know-How, the training shall be defined to meet the following principles:

- Reliability, ensuring the full readiness of the training target audience to support the PDAP operations;
- Repeatability, in order to assure that the training could be implemented with the same level of quality by different persons (either to consent redundancy of the Training provision or to face the natural personnel turnover throughout the lifetime of the PDAP) and by a same person at different times;
- Maintainability, to easily adapt the training provisions against changes in the scope of operations necessary to face potential improvements and system changes;
- Scalability, to minimise the diversification of the training provision vs the necessity to address different roles and different responsibilities throughout the lifetime of the PDAP;
- Appeal, essential to assure the effectiveness of the provision of the target audience against the risks to diminish the audience’s capability to absorb concepts throughout the duration of the Training programme as well as of the single lesson.

The Training methodologies object of the PDAP Operations Training Plan are conceived to meet the above principles according to the following major steps:

- To identify the SGSO in terms of capabilities, roles, responsibilities and tasks;
- To define the objectives necessary to address the readiness of the SGSO to perform their duty according to the associated tasks and responsibilities;
- To gather the defined objectives into units of training, to be broken down into modules and lessons, ultimately delivered to the target audience;
- To develop the lesson strategy and the material, in order to meet the associated objectives.

## 5.2 Training needs

The SGS Operators training needs are summarized here after:

- To get a broad understanding of all SGS systems architecture and functionality;
- To get full capability to perform routine operations unattended;
- To be able to support special operations at support of other engineers or at support of the Contractor maintenance personnel, as for instance, SW patches or upgrades;
- To possess the necessary skills to resolve unknown contingencies;
- To be able to report correctly to the PDAP maintenance support personnel about the anomalous scenarios, in order to identify correctly the problems;
- To get the capability to supervise the systems status and provide first line support to the Contractor maintenance personnel.



- To perform routine maintenance tasks;
- To get dedicated training on specific systems/areas: spacecraft acquisition, data processing, products dissemination, the SGS monitoring and control sub-system, etc.

### 5.3 Training Methods and Means

The Operations Training Plan shall be designed through different methods of training. The training method indicates the technique employed to deliver the training. Different methods imply the use of different means to implement them. The Operations Training Plan shall made use of the following training methods and means:

Method	Description	Means
<b>Lecture (L)</b>	It consists in the verbal exchange, mostly one-way, between Instructor and Trainee(s). Knowledge is conveyed orally and with the support of Training aids such as visual presentations, use of boards, drawings, models, etc.	Personal Computers (PCs), Projectors, White-Boards, On-Console-Equipment (OCEs) for instance the M&C GUI.
<b>Demonstration (D)</b>	It consists of a combination of oral explanation and to sequence of events (actually performed and/or simply portrayed) aiming at showing a procedure, process, technique, or operation; possibly followed by assisted hands-on practise allowing the Trainee(s) to exercise the acquired skills under supervision.	OCEs, DOCs
<b>Performance (P)</b>	It consists in putting the Trainee(s) in real environments as close as possible to the actual working conditions at the purpose of performing tasks, making decisions, and solving problems under no/minimum supervision, based on previously acquired skills, such to reinforce them in a learning by doing context.	OCEs, DOCs

**Table 2: Methods of Training and Associated Means**

### 5.4 Training Schedule

The PDAP Contractor shall provide to the Customer all the training material on-line so it can be accessible remotely. The Contractor shall provide the training material as soon as possible and never later than FAT-1 month.

Specific training sessions shall be organized as described in the following table:

Training ID	Timeframe	Audience	Scope	Method
Post-FAT training (at Contractor premises)	1 day	1 SGSO (team leader) per Hosting Site	The FAT it-self will serve as a training session. The SGSO will witness the execution of the tests run by the Contractor. In addition, the Contractor shall organize a training day after the FAT. The Contractor shall provide an end-to-end overview of the SGS equipment, focusing on all its functional and operational aspects.	L,D
Post-OSAT	3 days	4 SGSO (team	The OSAT it-self will serve as a training session.	L,D but



training (at Hosting Site)		leader, ground station engineer, product processing engineer, IT engineer) per Hosting Site	The four SGSO will witness the execution of the tests run by the Contractor. In addition, the Contractor shall organize a three day training session after the OSAT. This training campaign aims at having the SGSO team fully ready and certified to operate the SGS. The Contractor shall prepare and conduct a test (including real scenarios to assess reactions to potential anomalies) to assess if the SGSO's are ready to operate the SGS. It should be noted that the SGSO will support the Contractor during the warranty/maintenance phase for the first level maintenance activities.	mainly P
Post-maintenance-visit training (at Hosting Site)	2 days	4 SGSO (team leader, ground station engineer, product processing engineer, IT) per Hosting Site	The maintenance activities will serve by themselves as a training session. The four SGSO will witness the execution of the activities run by the Contractor. In addition, the Contractor shall organize a two day training session once the maintenance activities are completed. This training campaign aims at updating the SGSO team on operational aspects related to the SGS. The Contractor shall address specific issues and operational behaviours spotted during the operational phase.	L,D,P

**Table 3: Training Schedule**

Remote training sessions (teleconference, Webex) may be requested to the PDAP contractor during the maintenance period via specific work packages.

### 5.5 Training Evaluation

The Training Evaluation has the objective to improve the training with respect to possible breaches in the training provision.

- Tasks not fully identified;
- Training objectives not covering all tasks;
- Need for different training methods to achieve certain objectives;
- Lesson duration not fitting with the objectives of the lesson;
- Topics not covered or not fully reliable in the training material;
- Sequence of lessons not 100% effective;
- Training tools and aids not adequate;
- Instructor not properly delivering the contents;
- Etc.

The Evaluation of the Training is based on multiple inputs, such as:

- Trainees' feedback;
- On the Job performance of the personnel in their initial phases of duty after the training.
- Etc.

The Contractor shall perform a training evaluation after each of the training sessions and provide the results to the Customer.





## 6 DOCUMENTATION

The Contractor shall provide The Customer with set of documents giving a clear and complete description of the PDAP and its implementation; this set of documents shall be identified as Project Documentation. In addition the Contractor shall provide a set of documents to be used for the Operational phase named Operational Documentation.

All documentation, including diagrams and drawings, supplied under this contract shall be generated in electronic format and in the English language. The documents shall be provided in searchable PDF format.

All diagrams and drawings supplied to The Customer shall, as far as possible, be consistent in presentation and in use of symbols.

The detailed provisions of the list below covering documentation for proprietary equipment may be waived by The Customer on a case-by-case basis.

The following documentation shall be provided by the Contractor:



Phase	Documentation
Design Phase	<ul style="list-style-type: none"> <li>• Project Management Plan</li> <li>• PDAP detail design;</li> <li>• List of facilities being procured;</li> <li>• Complete description of each main equipment;</li> <li>• Updated Hosting Site Infrastructure and Service Specifications;</li> <li>• ICDs ( for instance, the interface definition between PDAP and Hosting Site facilities);</li> <li>• Integration, Verification and Validation Plan (V&amp;V);</li> <li>• In-factory acceptance test and procedures;</li> <li>• Installation day checklist;</li> <li>• SGS Operators Training Plan;</li> </ul>
Procurement Phase	<ul style="list-style-type: none"> <li>• In-factory Acceptance Test Report;</li> <li>• Deliverable Item List</li> <li>• Onsite acceptance test and procedures;</li> <li>• Insurance to cover PDAP shipment and deployment;</li> </ul>
Installation, Integration & Validation Phase	<ul style="list-style-type: none"> <li>• Onsite Acceptance Test Report;</li> <li>• SGSO Certification;</li> <li>• Training material;</li> <li>• Operational Guides;</li> <li>• Facility Maintenance Plan (FMP);</li> <li>• Equipment Specifications;</li> <li>• Maintenance manuals and maintenance procedures;</li> </ul>
Maintenance/warranty	<ul style="list-style-type: none"> <li>• Configuration Status Account Report (CSAR);</li> <li>• Maintenance reports;</li> </ul>

**Table 4: Documentation**

The Contractor shall provide status report for visibility of the project on monthly basis including an update of the Project Schedule showing percentage completion of each task.

Either The Customer or The Contractor may request supplementary reviews or meetings at particular points of the project, or to handle any problems that may arise and which are not covered by the regular meetings.

## 7 MEETINGS

During the whole duration of the project execution, the Contractor shall prepare and organise the project meetings and reviews.

All documentation associated with project meetings, including the proposed agenda shall be presented to The Customer at least one week before the meeting.



The chairman of all meetings will be the Customer representative.

Meetings shall be minuted, in English, by The Contractor in real time and in clear writing. These minutes, which shall include the meeting conclusions and list the action items with completion dates, shall be agreed and signed by both parties at the end of the meeting.

An action items list, including responsibility, designations and dates, shall be prepared and attached to the minutes. The Contractor shall keep control of the action items and shall report on their status of implementation. Additional meetings have to be agreed by The Customer and the Contractor.

The following milestone review meetings are foreseen:

- Kick-off ;
- Design Consolidation;
- In-factory acceptance;
- On-site acceptance;

In addition, monthly teleconferences are foreseen to report on the status of the project.

## 8 CUSTOMER FURNISHED ITEMS

The following table shows the items to be provided by The Customer as Customer Furnished Items (CFIs).

Item	Delivery Date
Site Infrastructure	Beginning of installation phase
Temporary power and storage space during installation	Beginning of installation phase

**Table 5: CFIs**

## 9 PROJECT, CONFIGURATION AND QUALITY MANAGEMENT

The following sections define the characteristics required by the Customer for particular aspects of the project such as management plans and associated tasks.

The general approach to project management shall incorporate configuration management and quality management.

### 9.1 Project Management

The management necessary for completion of all the tasks shall be the responsibility of the Contractor. This includes the management of any sub-contractors as well as the control of the Contractor's own resources. The Contractor shall provide complete visibility to The Customer of all technical and management aspects of the work.

The Contractor shall prepare a Project Management Plan (PMP) which shall contain as a minimum:

- Team Structure and Responsibilities



- Project lifecycle;
- Work breakdown structure
- Detailed schedule;
- Risk management;
- Documentation management;
- QA Management
- NCR/AR Management

The Project Management Plan shall demonstrate how the Contractor and all their subcontractors plan to conduct activities in order to satisfy the requirements of their quality systems and those specified in this document. Anyhow the management organisation shall be in accordance with consolidated and well proved standards.

## 9.2 Configuration Management

- a) The Contractor shall carry out adequate Configuration Management, through the implementation of a Configuration Management system in order to provide an accurate record of the configuration of all ground station hardware, software and documentation.
- b) A Change Control shall be established to enable traceability between all products and associated documentation throughout the lifetime of the project.
- c) The methods, standards and tools employed for Configuration Management should be clearly defined in the Contractor's own Configuration Management Plan; however for the particular case of the maintenance contract, the methodology could be described in a dedicated chapter of the Facility Maintenance Plan.
- d) The Contractor shall maintain configuration records to the required level of detail (matching the lowest level of detail of the configured items) and operate an appropriately detailed Configuration Management System.
- e) A Configuration Item List describing the elements of the system and sub-systems shall be created, agreed and formalised with The Customer. The CI List shall comprise Hardware and Software;
- f) The criteria for item identification shall be consistent throughout the project. A unique identification shall be assigned to each Configuration Item referenced in the Configuration Item List;
- g) The Contractor shall maintain the Configuration Status Account Report (CSAR) of their CIs, both for H/W and S/W and documentation throughout the project lifecycle.
- h) The Customer shall be entitled, at any point in the project lifecycle, with appropriate notice given, to perform a Configuration Management Audit for the purpose of verifying that an appropriate Configuration Management system is in place and that it has been adequately applied to the project by the Contractor.

## 9.3 Quality Management System

- a) In order to support the successful fulfilment of the contract, and to meet the requirements



contained in this SOW and its applicable documents, the Contractor shall make use of an effective Quality Management System, which shall make the best use of processes based on ECSS standards.

- b) If the Contractor is certified to be compliant to an internationally recognised Quality Assurance standard (e.g. ISO 9001:2008 with certification granted by an ISO accredited certification body), all products, processes and activities which are part of the service provision could be conducted according to their Company Quality Manual.
- c) However should the Contractor not be ISO certified, he may propose to follow its own quality system that in any case shall implement a set of acceptable standards, controls and procedures to ensure that all products included within the scope of the contract (hardware, software, materials and services) are prepared, delivered, operated and maintained in a disciplined manner, conforming to The Customer requirements.
- d) The Customer shall have the right, in any activity during the project/product life cycle, to call and perform Quality Assurance (QA) Audits, to call QA reviews and perform test witnessing at the premises of its Contractors and its Sub-Contractors.