

**Department of Science and Technology
Philippine Atmospheric, Geophysical and Astronomical
Services Administration**

TERMS OF REFERENCE

For

**Supply, Delivery, Installation, Testing, Training and Commissioning of
Aviation Weather Observation System for Tacloban and General Santos
International Airport**

A. OVERVIEW

To enhance the aviation meteorological services at Tacloban and General Santos International Airports, PAGASA proposed to acquire latest state-of-the-art Aviation Weather Observation System (AWOS) for premiere international airports in coordination with the Civil Aviation Authority of the Philippines (CAAP). This will aid PAGASA in providing adequate and reliable weather forecasts within the airport vicinity. Meteorological sensors will be installed at both runway thresholds sensing air pressure, temperature, humidity, rainfall, wind speed/ direction, Runway Visual Range and cloud base height. The airports shall be provided with CAT II AWOS system.

Integral to the AWOS are the central data unit (CDU), workstations and display units. The CDU collects, processes and transmits raw and processed data to the local PAGASA Aeronautical Meteorological Stations (AMS) and Airport Traffic Control (ATC) tower at the airport. At the AMS, the raw data is processed to produce customized aviation meteorological products for the end-users which includes METAR and SPECI. Display workstation installed at the ATC provides real-time weather conditions and other relevant information to guide the safe landing and take-off of aircrafts. Observations and reports are then forwarded to the PAGASA data archive facility in standard open data format through local network facilities of PAGASA.

PAGASA's role in aviation safety is highly critical, hence, the AWOS should strictly comply with the standards for aircraft operations set by ICAO and WMO. It is therefore necessary that the bidder should have extensive experience in airport installation of the AWOS.

B. APPROVED BUDGET FOR THE CONTRACT (ABC)

The Approved Budget for the Contract is Ninety-Six Million Pesos (PhP 96,000,000.00) inclusive of VAT and all applicable government taxes.

C. BIDDER'S QUALIFICATION

For purposes of determining the Eligibility of prospective bidders to participate in the bidding of this Project, the documentary requirements prescribed under *Section 23* of the 2016 Revised Implementing Rules and Regulation (IRR) of RA 9184, and the specific qualification requirements under this Terms of Reference (TOR) must be complied with accordingly.

Other qualifications.

1. Manufacturer should have at least five (5) years experience in airport installation of AWOS.
2. Local supplier/contractor should have at least five (5) years experience in AWOS airport installation in the Philippines.
3. Manufacturer should have supplied and installed the same for at least five (5) years in an international airport of any country. Bidder should submit as proof of completed/awarded contracts of similar scope.
4. The Manufacturer/Bidder should have a pool of at least three (3) local technicians and engineers. They should have undergone training on the operation, repair/maintenance, troubleshooting, calibration and installation. They should submit as proof their resumé and their certificate of training.
5. Manufacturer and/or Bidder should also provide proof of ICAO certification that previous completed AWOS installation met ICAO standards as well as compliance to existing CAAP CNS/ATM requirements.
6. Both Manufacturer and Bidder should be ISO Certified.
7. Manufacturer should be a member of Hydro-meteorological Equipment Industry (HMEI).
8. Proof of Product Standard and Certificate of Compliances.
9. Coordination and arrangement with the local airport authorities with regards to the installation of the equipment and accessories shall be the responsibility of the winning bidder with assistance from PAGASA.

D. DELIVERY PERIOD AND PLACE OF DELIVERY

The winning bidder shall supply, deliver, install, test, conduct training and commission the AWOS system within seven (7) months from receipt of the Notice to Proceed (NTP) at Tacloban and General Santos International Airport. Delivery of spare parts shall be equally distributed between the two PAGASA Aeronautical Met Stations.

E. BID PROPOSAL CONTENTS

The prospective bidder is expected to comply and respond in accordance with the specific instructions to bidders.

The prospective bidder shall respond paragraph by paragraph and shall clearly indicate compliance to all the required specifications and shall specify the number of days or schedules within which to complete the delivery of all the goods required. The Schedule of Deliverables is attached as **Annex "B"**.

The prospective bidder shall be required also to include in this proposal, original descriptive literatures and un-amended brochures of all equipment/materials to be supplied. If applicable, technical plans, installation drawings / diagrams, configurations, method of installation, list of materials must likewise be provided.

These details will allow the **PAGASA-Bids and Awards Committee** to fully evaluate and determine compliance from the prospective bidders.

F. TECHNICAL SPECIFICATION

The technical specification list shall be applicable for both airports. The quantity listed is for one airport installation.

1. Meteorological Station

- a. Wind Speed Sensor (Ultrasonic type) – 2 sets
 - Measuring range: 0 - 75 mps
 - Accuracy: +/- 0.1 m/s
 - Starting Threshold: 0.1 m/s
 - Resolution: 0.1 m/s
 - Response Time: 250 ms
 - Operating Temperature: 0 - 70 °C
- b. Wind Direction Sensor (Ultrasonic type) – 2 sets
 - Measuring range: 0 - 360°C
 - Accuracy: +/- 2°
 - Starting Threshold: 0.1 m/s
 - Resolution: 1°
 - Response Time: 250 ms
 - Operating Temperature: 0 - 70 °C
- c. Runway Visual Range (2 sets) with Background Luminance Meter (1 set) and Present Weather Sensor (1 set)
 - Visibility, RVR and present weather
 - Sensor Type: Transmissometer
 - MOR Measurement Range: 0 m to 10,000 m
 - BLM Measurement Range: 4 to 30,000 cd/m²
 - BLM Accuracy ± 10%
- d. Pressure Sensor – 1 set
 - Sensor Type: Triple-pressure transducer sensor, Silicon Capacitive
 - Measurement Range: 500 to 1100 hPa
 - Accuracy: ±0.15 hPa
 - Resolution: 0.1 hPa
 - One-year Stability: ±0.1 hPa
- e. Temperature Sensor – 1 set
 - Measuring range: -40 to 60 °C
 - Accuracy: ± 0.2 °C
- f. Humidity Sensor – 1 set
 - Measuring range: 0 to 100%
 - Accuracy: ± 2%
 - Operating temperature: -40 to +60 °C
- g. Rainfall Sensor – 2 sets
 - Sensor Type: Tipping bucket
 - Aperture diameter: 22.5 cm
 - Aperture size: 400 cm²

- Resolution 0.5 mm
- h. Ceilometer – 2 sets
 - Sensor Type: Laser
 - Number of Clouds Layers: 3
 - Cloud Coverage Algorithm
 - Measurement Range 0 to 7500 m
 - Accuracy: $\pm 10\text{m}$ or $\pm 1\%$

2. Central Data Processor

- a. The rack mount hardware for the AWOS system consists of a number of sensor receivers from field sites, an equipment rack and around four workstations which would include: Forecasters Workstation, Observers Workstation, Air Traffic Control Workstation, KVM Rack Workstation. The equipment rack contains all the system data processing modules. It shall include but not limited to NTP Time Server, Ethernet Switches, RVR Disseminator, Routers, Aviation Wind Processor, Serial to Ethernet Converter and two (2) Servers configured to provide redundant operations
- b. Server computer (rack mount)
- c. CPU, RAM, Hard Disk specifications are as required by the system
- d. Dual-server Hot-standby configuration with automatic fail-over
- e. Real-time Database Mirror
- f. Hot-pluggable Hard Disk Drives and Hot-pluggable Power Supply Units
- g. RAID Hard Disk Drive Configuration
- h. SQL-based database type with viewer and data exportable in CSV format through Ethernet (TCP/IP). Data Storage for 1 year
- i. Keyboard (standard), mouse and mouse pad
- j. Ethernet serial port, modems, LAN Switch
- k. AMHS port ready, output: RS – 232 capability
- l. Integrated 10/100/1000 Base-T Ethernet
- m. Color display 14" flat panel
- n. Uninterruptible Power Supply, minimum of 60 minutes' backup power
- o. System software licensed to calculate aviation meteorological products: PTU, wind visibility, cloud, RVR, sky condition, prevailing visibility, and rainfall, etc.

3. Aeronautical Meteorological Station

- a. Display Workstation – 2 units
 - CPU 3.0GHz, 1GB RAM, 500GB HDD (minimum)
 - DVD/CD-RW Drive
 - Integrated 10/100base-t LAN
 - Device drivers for LAN adapter
 - Color LED Display 20" flat panel
 - Software license for the aviation met products
 - Surge arrester
 - UPS, at least 20 mins backup time
- b. Digital Wind Display – 1 unit
 - Display average or instant wind speed in selectable units (m/s, knots, and mph).
 - Display wind direction; instant, average, variance
 - Display modes: 2-minute values (speed & direction), 10-minute values (speed & direction and instantaneous values)

4. Air Traffic Control Office (Tower)

- a. Display Workstation – 1 unit
 - CPU 3.0GHz, 1GB RAM, 500GB HDD (minimum)
 - DVD/CD-RW Drive
 - Integrated 10/100base-t LAN
 - Device drivers for LAN adapter
 - Color LED Display 20" flat panel
 - Software license for the aviation met products
 - Surge arrester
 - UPS, at least 20 mins backup time
- b. Digital Wind Display – 1 unit
 - Display average or instant wind speed in selectable units (m/s, knots, and mph).
 - Display wind direction; instant, average, variance
 - Display modes: 2-minute values (speed & direction), 10-minute values (speed & direction and instantaneous values)

5. Communications

- a. Wireless radio connection shall serve as the primary connection from the sensors up to the PAGASA Meteorological Office
 - The bidder shall provide the best interconnectivity design/ layout for the sensor-processor route / path including necessary radio masts.
- b. Radio Communication- Runway sensors to PAGASA Office
 - UHF radio modems (380 ... 470 MHZ)
 - Directional antennas
 - Antenna cables, mounting brackets and masts.
 - Battery charger, wiring and accessories included
- c. Data from the data logger of runway threshold A is transmitted via UHF radio modem to a receiver at PAGASA office or ATC tower. Likewise, the data from the data logger of runway threshold B is transmitted via UHF radio modem to a receiver at the PAGASA office or ATC tower.
- d. From the PAGASA office, the data from runway A and runway B is transmitted via an IP radio link (unlicensed) to ATC tower. The IP radio link should have sufficient bandwidth to accommodate the required data transfer traffic to and from the PAGASA.
- e. The bidder shall provide the required redundancy method for the transmission of data.

TACLOBAN AWOS :

PARAMETER :	RWY 18	RWY36
Wind Speed	1	1
Wind Direction	1	1
Ambient Air Temperature	1	
Relative Humidity	1	
Barometric Pressure	1	
Precipitation	1	1
Cloud Height	1	1

Runway Visual Range with background luminance	1	
Runway Visual Range with present weather sensor (RVR, Visibility and Present Weather)		1

WORKSTATION :	PAGASA MET OFFICE	CONTROL TOWER
Forecaster's Workstation	1	
Observer's Workstation	1	
Visualization Workstation		1
KVM Rack Mount Console inside cabinet	1	
Wind Display	1	1

GENERAL SANTOS AWOS :

PARAMETER :	RWY 17	RWY35
Wind Speed	1	1
Wind Direction	1	1
Ambient Air Temperature	1	
Relative Humidity	1	
Barometric Pressure	1	
Precipitation	1	1
Cloud Height	1	1
Runway Visual Range with background luminance	1	
Runway Visual Range with present weather sensor (RVR, Visibility and Present Weather)		1

WORKSTATION :	PAGASA MET OFFICE	CONTROL TOWER
Forecaster's Workstation	1	
Observer's Workstation	1	
Visualization Workstation		1
KVM Rack Mount Console inside cabinet	1	
Wind Display	1	1

G. GENERAL NOTES

- Pressure
 - The barometer sensor is installed at the runway. This instrument contains three separate pressure sensors and compares values from each to assess the validity of the readings. If one sensor shows a large variance from the other two, its data is ignored. If all three disagree, all data is considered invalid.

- The pressure sensor can be mounted inside the cabinet or outside but with a pressure head. Differences between QFE and QNH are calculated within the barometer. These are then supplied to the Data Logger, mounted in the Runway Instruments Junction Box. The Data Logger communicates to the system via a modem.
- Temperature, Relative Humidity and Dew point
 - Air temperature, relative humidity and dew point data is supplied which meets all international standards for use in aviation meteorology
- Rainfall
 - The rain sensor shall consist of an outer cylinder, chassis, bucket mechanism, and brackets and other components. The design uses a single tipping bucket principle with a simple analogue output of the switching signal. It has a compact internal structure, and operation and maintenance should be simple. The sensor has direct connection via cable to the Data Logger.
- Cloud Base
 - The system uses a ceilometer which supplies cloud height, cover and layer data. When applicable, it also measures vertical visibility. This instrument continuously measures cloud height (or vertical visibility if the clouds are undefined) up to 7500 m. It should provide accurate data on the height of up to three cloud layers as well as total cloud cover.
 - The transmitter in the ceilometer is a semiconductor laser diode and the output power is limited to a level not dangerous for human eyes. The ceilometer has an integrated air-blower system to keep the optics free of contamination. No adjustments are needed after installation. The embedded software includes service and maintenance functions and gives continuous status information from internal monitoring. The equipment should have self-test and validation system which would not require calibration.
 - The ceilometer field site enclosure contains all of the electronics and services necessary for the instrument.
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- Sensor Field Sites
 - The AWOS sensor field sites are designed in accordance with CIMO-WMO and international standards for installations. There are separate field sites for each visibility sensor, each anemometer and ceilometer. There is also a sensor field site for the barometer, temperature, humidity sensor and rain gauge. The instrument cabinet also contains the Data Logger which has a separate back-up battery. Wind sensor height is ten (10) meters.
 - Each field site provides all the necessary power and communications services for its sensor(s). All sensors and field site equipment is made of rust-proof and anti-corrosion materials, waterproof and are sealed against dust, insects and animals.
 - All field equipment shall be designed to operate in the harsh outdoor tropical environment with operating temperature up to +55°C and humidity levels up to 100%.
 - The field site enclosures are EMC-shielded units designed to protect equipment from interference and which also prevent any unwanted EMC emissions. RVR, visibility sensor, anemometer and Met Garden

- field sites should have frangible masts to mount the equipment.
 - All field site equipment and sensors are protected from voltage and current surges, short circuits and lightning strikes. They are also earthed and tested on installation to ensure the safety of any engineering personnel working on them. All lightning protection system shall be properly grounded using exothermic bonding for all grounding rods. Minimum grounding impedance should be 1ohm or better. Obstruction lights shall be provided.
 - All field sites are designed to self-start automatically as soon as power is applied, so if power is cut they automatically re-start as soon as possible without requiring manual attention
- Civil, electrical, cabling and networking works
 - The winning bidder shall conduct all necessary work in the installations. This include application for permits wherein PAGASA shall provide assistance.
 - Bidders shall comply with the recommended civil works design as reflected in **Annex “A”**.
 - The electrical system shall be 220V/60Hz, single phase.
- Bidders must conduct actual site survey to have accurate information and assessment and must be certified by the PAGASA Aviation Met Office thereat.

H. MAINTENANCE VEHICLE – 2 units

The project installation is located at the runway thresholds at both runway end. Maintenance concerns, particularly, the conduct of regular maintenance and corrective maintenance requires regular site visit. A service maintenance vehicle is necessary in order to provide reliable operations of the AWOS. Scheduled calibration and regular ground keeping / cleaning requires services of a dedicated vehicle which is authorized by the local airport authority. The service vehicle should be equipped with a warning beacon and a VHF transceiver to communicate with the ATC control tower for runway-crossing permission. These requirements are a necessity as mandated by airport Aircraft Movement Area policy and restrictions.

Specification:

- Engine size: 2.5Liter
- Displacement: 2500 cc
- No. of cylinders/ valves: 4 cylinder / 16-valve
- Transmission: 5-speed, 2 x 4 Manual Transmission
- Fuel type: Diesel
- Fuel capacity: 75 liters
- Air-conditioning system
- Power windows, power steering
- Driver and Front passenger air bags
- Electronic Brake Distribution, ABS
- Color: Metallic Silver
- Equipped with mobile VHF radio transceiver, amateur band (140MHz, 25W)
- Equipped with warning beacon light
- PAGASA logo sticker at side doors

I. SPARE PARTS

The bidder shall include in the bid, provisions for recommended spare parts and maintenance test equipment. The spare parts to be supplied shall be items that are considered as critical and have lower life expectancy or duration. These are essential items that will ensure operations and sustainability. The supply should also include portable calibration and test equipment that are essential to the accuracy and reliability of the sensor data. The whole proposal should include one (1) set of spares and test equipment for the two AWOS installations including maintenance laptop for the two airport AMOs. These shall not be limited to: power supplies, modems, switches, fan blowers, filters, data loggers, data cables, power cables, surge protections, LED transmitters, etc.

J. TESTING PROCEDURE

The bidder shall submit a detailed procedure or methodology in the conduct of test procedure and the same shall be fully validated and tested on site. Bench test procedures for alignment for circuits in modules, etc. shall be provided. The procedure shall be such that it can be easily accomplished using standard test equipment and external power supplies. Test procedure should be conducted for data reception at workstations. All parameters shall be assessed and verified by PAGASA representative at site and should be properly documented. A Test Procedure Manual must be provided during the Acceptance Tests.

K. ACCEPTANCE TESTING

Factory Acceptance Testing (FAT) shall be conducted at the factory site. The purpose of the test is to verify the performance of the system in accordance with the specifications and functional requirements. Any defect or deviation discovered during the factory acceptance test shall be rectified by the winning bidder immediately or within a maximum period of one (1) month from the completion of the test. After such rectification, another testing shall be made to verify the rectification. Perpetual license on all software licenses shall be provided upon completion and acceptance.

The Factory Acceptance Test (FAT) shall be witnessed and accepted by three (3) PAGASA personnel and shall be conducted within a total of five (5) calendar days excluding travel time. All related expenses, such as, round trip air fare, transportation, lodging/accommodation and allowable travel expense based on the prevailing UNDP-DSA rates for each participant shall be shouldered by the winning bidder.

L. FACTORY AND SITE TRAINING

The winning bidder shall conduct a Factory Technical Training to be attended by four (4) qualified technical personnel of PAGASA for five (5) calendar days excluding travel time, that will be trained on the software and hardware configuration and setup. All related expenses, such as, but not limited to the training materials, round trip airfare, local transportation, lodging/accommodation and allowable travel expense based on the prevailing UNDP-DSA rates for each participant shall be borne by the winning bidder.

A three-day On-Site Training (for each airport sites) for six (6) personnel (from

PAGASA Main office and local Airport Met office) shall also be conducted by the winning bidder. Travelling expenses for personnel coming from the PAGASA Main office shall be borne by the winning bidder. Training courses shall cover operation and maintenance, actual equipment and system software. The objective of the training course comprises lessons on working principles of the equipment and practical hands-on training. The objective of the training course is to familiarize the personnel to the architecture, main components, calibration and features of the system. Training materials and meals shall be provided to the participants by the winning bidder. The winning bidder can provide additional training subjects as deemed necessary and shall form part of the training syllabus.

- System Operations and Maintenance Training
- Meals shall be served during the course of the program. Morning and afternoon coffee breaks and lunch. These will be borne by the winning bidder.
- The winning bidder shall provide the appropriate certificate to the participants.
- The winning bidder must secure a certificate of compliance as proof of the trainings conducted. This certificate of compliance shall form part of deliverables prior to the issuance of Certificate of Acceptance and Completion.

M. WARRANTY AND AFTER SALES SUPPORT

All workmanship, materials and equipment shall be warranted by the winning bidder for two (2) years. Any materials or equipment that fails to provide satisfactory operation during this warranty period shall be replaced at the winning bidder's expense. While the equipment is undergoing repair, a spare unit will be supplied to PAGASA. Repair of the defective material or equipment shall be permitted provided that the repaired item meets original specifications.

- The contents of the warranty certificate shall include but is not limited to the following:
 - Warranty period of every equipment
 - Responsibilities of all parties
 - Scope of technical assistance specifying different levels of service
 - Contact Details of all technical personnel
- The winning bidder will provide all parts and labor during the warranty period at no additional cost to the customer. Delivery to manufacturer/factory and subsequent re-installation shall be at the expense of the winning bidder.
- Parts of all major equipment must be available in the market for at least a period of 10 years.
- Should provide 24/7 technical support help desk.
- For severe or critical issues on the system, an SLA of 8 hours' response time during the warranty period should be available.

N. SYSTEM DOCUMENTATION

The successful bidder must provide a complete documentation for every deliverable which must be submitted to PAGASA for approval. PAGASA shall own all documents and shall reserve the right to reproduce at no additional cost. The documentation shall include inventory of all materials, equipment including serial numbers for every installation site. Pictures should also be provided detailing installations for every site. A picture should also be provided for the whole installation

setup (station profile). The as-built network plan should include AutoCAD rendition of the physical setup. The bidder should include manufacturer's original documentation such as catalogues and manuals for the equipment proposed. The documentation must be written in English of durable construction with concise and high quality presentation to include but not limited to the following:

- Technical / Reference Manuals
- As-built Plans in AutoCAD format
- Station Profile including pictures

All documentation for each installation must be in two (2) hard copies and soft copy accompanied in a compact disk/USB media on Microsoft Word for Windows or PDF format and delivered to PAGASA. Each AWOS site shall have one (1) set of manuals while the Engineering Division shall have the other set of manuals.