Transition to Automated Ground-based Measurements

Workshop Day 4
Options for Transition

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

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What's coming

- Reflections on 'Transitions to Automation'
- Summaries from Workshops
- Members Experiences

Overall Aim to show there is a

Wide variety of options which can be discovered by good discussion and lessons learned

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Never the same twice

It’s generally understood that AWS are better than manual sites (most of the time!)

But a transition can take many routes

In the UK we haven’t ever moved from entirely one system to entirely another.

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Option that clearly won't work

These do (but have challenges)

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Discuss what you want and how to proceed

Then discuss it again (and again!)

- How far are you going to automate?
- How many new stations will be introduced (and retired)?
- Who will do what in the new system?
- More operating budget or less
- Is the technical solution defined by you or constrained?

These conversations are never wasted!

Learn lessons from others…

Summaries from workshops

Class	Item	Algeria	Benin	Burkina Faso	Burundi	Central African Repl	Comoro Islands	Congo, DR of the	Côte d'Ivoire	Ethiopia	Gambia	Ghana	Guinea	Guinea-Bissau	Liberia	Madagascar	Mali	Mauretania	Namibia	Nigeria	Rwanda	São Tomé & Príncipe	Senegal	Seychelles	Sierra Leone	South Africa	South Sudan	Tanzania	Togo	Tunisia	Uganda	Zambia	Zimbabwe
E	sabotage/vandalism by men or animals, theft of solar pannels and sensors		x	x		x									x						x						x	x				x	
E	unsafe sites for maintenance;					x																						x					
E	remote site access is limited or too costly																							x									
F	high comm costs gprs/3g; bill not paid by government						x				x																x						
F	no access/comm to database 3rd party								x																								x
F	costly 3rd party data																						x										
F	AWS too expensive									x																							
I	calibration not OK								x				x			x																	
I	lack of maintenance		x	x																													
L	No WIGOS ID																															x	
M	no spare parts		x														x			x								x					
M	procurement																											x					
M	bad life cycle and system management											x									x												
M	poor tendering procedure																				x												
M	devellopment partners (also w networks) ineffective																																x
M	(poor) quality determined by donors																																
N	no optimal network design																											x					
P	competency of personnel, not trained staff; lack of knowledge SW/HW/data acquisition		[x]						x			x			x		x			x	x	x											
P	lack of technicians						x			x		x							x										x				
P	social impact man--->auto																														x		
T	corrosion, humidity												x							x													
T	rapid changing techn																			x								x					
T	too many different brands/types of aws, cannot been integrated	x										x								x											x		
T	datalogger software problems																			x													
T	network comm down, bad data comm, bad internet			x							x		x	x			x				x	x						x			x		

Snippets of history from the UK

The receiving station. The receiving station is housed in a single-pedestal desk and is illustrated in Figure 3.

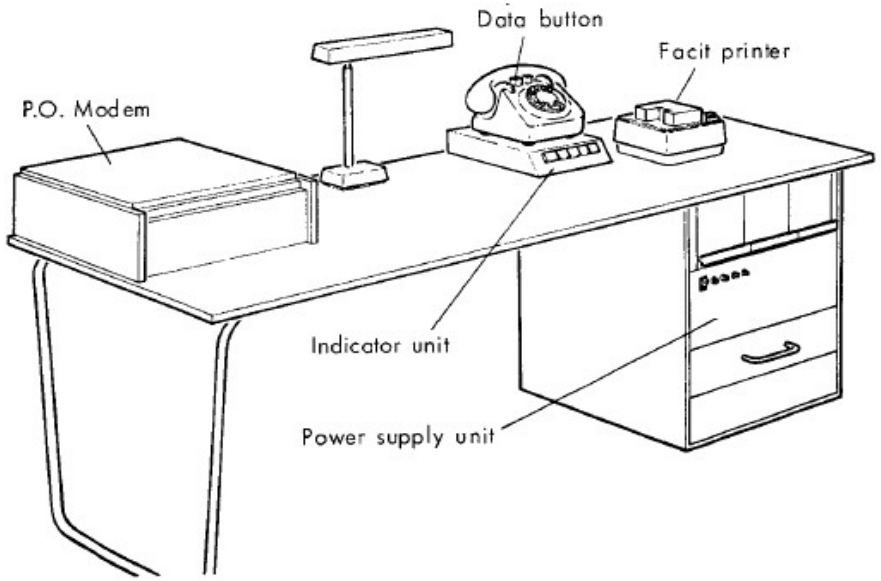

FIGURE 3—MOWOS RECEIVING STATION
Modem is an acronym for modulator and demodulator unit.

The network of measurement sites in the UK has a long history

Manual up to 1960s
Then various automatic solutions

70s -	MOWOS
80s – 90s	SAWS
	E-SAWS
	CDL
	SAMOS
Mid 2000s	MMS

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We still have lots of people!

- Distributed engineering team
- Forecasting Staff who supplement the measurements at Aviation sites
- Central management team
- Central QC team monitoring for quality and faults
- Central R&D Team (me and my staff!)
- Central Calibration Lab
- Stores Staff

But numbers have dropped over the years

For approx. 500 stations

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Some more experiences

a. Manned station

station consists of 120 meteorological stations, 27 climatology stations. 33 geophysics stations, and 3 GAW stations
Until now, only 62 stations have been implemented, so many are still conventional.

- From the 62 stations that have been automated, there are still many obstacles, and some of them are not yet fully used because there are still some stations that prioritize their conventional equipment for synop data for several reasons.
- Conventional equipment for measuring Helman rain (strip chart) still does not have an automated version. Many parameters must be removed from the chart reading so that the automation is not yet operational.
- Sensor equipment used for automation at the manned station is

other operational equipment.

What was the requirement (or project) for automating surface observations?

- Build observational capacity to reduce hydrometeorology-related risk that was sustainable and provided reliable and systematic observations.
- Provide solutions to communicate weather and climate information to rural communities
- Expand observation networks that could be used in applications to provide early warning and reduce weather related risk

What was the solution?

The solution was to develop the 3D-printed automatic weather station. The benefits include:

- Use 3D printers – inexpensive technology
- Use low-cost, reliable micro-sensors

country

What was the requirement (or project) for automating surface observations?

ICAO requirements specifies use of a complete automated system or an automated system but with options for manual input of some parameters not well measured using auto systems e.g. cloud height amount, present wx

What was the solution?

Looked around for a system that could fulfil this (never did a user requirement analysis hence we were offered an AWOS with a full range of climate sensors – pyranometer, sunshine hours sensor etc. and yet we never use them this being a purely AERONAUTICAL station, on hindsight we could have bought a cheaper AWOS with sensors specifically for Aviation purpose if we did a user requirement analysis hence saving funds)

nd maintaining observation

comprehensive

plan. A phased transition

ase and operational phase. In

utomatically to begin with and

in this phase then expanded

ficient trainings and

pport weather forecasting and

ensure data transmission.

How was the project funded?

We set up special observation automation funding to support the transitio

If the project calls for the supplier to carry out installation and training:

Prepare the installation toolkit so that you have spares and tools to remedy issues in the field as the customer does not usually have enough tools of good quality that you may need – making sure that you can get them through customs without loss or paying duty!

Try to set up a good rapport with the Technical Officer in charge of the installation on behalf of the customer – This is very important – I have experienced situations where I meet the official for the first time on arrival and have found it sometimes difficult to strike up a good relationship. This can be for many reasons – sometimes there is resentment because the equipment purchased may not have been what the Technicians actually wanted – Unless resolved this can result in it becoming much more difficult than it needs to be to complete the installation, commissioning, training and sign off of the project.

Try to ensure the qualifications of the Customers Technical Team match the level required to achieve a successful hand over with all of the trainees able to use the diagnostic and operational software applications and able to grasp the Metrology involved in maintaining the equipment to the manufacturers/WMO Guide No8 requirements.

Assume that the installation will not go to plan – there may be challenges such as transport to site, access to site, lack of mains power on site (if required) - The environmental conditions on site can also be challenging to work in and may contribute to a slower installation than planned.

What was the requirement (or project) for automating surface observations?

There were two similar projects: replacement of three aging and defunct AWS for the provision of Synoptic observations; and four new AWS for the provision of climate services and products. Ground water and water quality measurements were also required at some locations.

network of 559 conventional, manned, surface observatories since 1875. The observatories are located at every 100-200 km for meteorological representativeness. More number of observatories and weather radars are located along the coastline for weather monitoring during passage of tropical cyclones. Transition to automated surface observations was planned and implemented to increase the spatial density of the observational network. Manned observatories are also operational to uphold data continuity for long term climatological data.

What was the solution?

n early pioneer with installation of 100 Automatic Weather Stations (AWS) in the early 1980s to over 700 AWS functional in 2021. The network is gradually increased based on user-specific and weather forecasting applications. Mercury barometers have been phased out. The observatories and aerodrome meteorological offices use 200 digital and 100 portable digital barometers. Over 4000 mercury thermometers are still used in the observatories because of long term stability, reliability, accuracy, less drift, simplicity, less cost and ease of maintenance.

The solution has been a phased transition of over 25 years. The network a mix of manual and automated stations. The were developed in house using proprietary equipment, sensors and instruments from a range of established and well recognised vendors. Our core systems have remained the same throughout with changes being due to various models being superseded and as newer technologies have evolved, for example soil moisture. Not all AWS have the same configuration and variables range from the core air temperature, relative humidity and rainfall, to also those that include some, but not all of wind, pressure, solar radiation, sunshine, soil temperature, grass minimum and soil moisture. For all configurations, the core data logger system remains the same. Communication methods include cellular, satellite, ethernet. Landline and radio are no longer used.

funds. This is a significant challenge and was a reason for the previous AWS to be non-operational.

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Thank you
Merci

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