AFREF First GNSS Station : Lessons learnt
Building up a Continental Reference Frame

Joel van Cranenbroeck, Director of Technology and Project Development
Leica Geosystems AG, Geomatic Division
CH-9435 Heerbrugg, Switzerland

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Cape Town, July 2006 – AFREF Workshop
Kick off meeting and technical review meeting

Suggestions have been made to consider second hand GPS receivers and outdated academic equipments while the specifications from UNAVCO mentioned "top class" instrumentation …

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Cape Town, July 2006 – AFREF Workshop
Leica donates the first AFREF Stations

Leica Geosystems agreed to donate the three first AFREF GNSS Reference Stations to promote the project and build the capacity on the most representative African centres such RCMRD, Kenya and RECTAS, Nigeria.

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Leica and AFRICA
A long history of trust and experience …

Leica (and before WILD) operates in AFRICA since a very long time starting to provide instrument for the fundamental Geodetic Networks.

Leica Geosystems is one of the privileged professional partner for geodetic projects such GNSS Networks and Monitoring …

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Personal experiences in AFRICA
Several geodetic missions …

- 1986 MALI – project of irrigation in the region of San. Doppler campaign and densification using Inertial technology (Ferranti FILS 2)
- 1988 RWANDA – Photogrammetric preparation for the Ruzizi Hydro Power Station 3 project. GPS surveying on Rwanda, Burundi and Congo. DGPS post processing to survey the Burren's track along the border between Rwanda and Tanzania
- 2006 SOUTH AFRICA Kimberley Big Hole. Design and installation of GPS L1 monitoring network
- 2007 AFREF – GNSS Reference Station in Kenya and Nigeria
- 2007 CONGO Goma. Design and installation of the active volcano monitoring network

Leica donation for AFREF under Pre-requisites
Creating the conditions for a successful setup …

Previous experiences proved that donating equipments is not enough if the conditions are not fulfilled for guaranteeing an effective setup such :

1. **Prior the delivery, a pillar must be erected on a solid bedrock foundation with the adaptor for the antenna, the trench for the cable and an ideal site free of obstruction.**
2. **Also a PC computer must be reserved and dedicated to install Windows™ OS in order to install the software with UPS for powering safely all the installation.**
3. **IT responsible must be prepared to open a socket to stream out the measurement to IGS RT using NTRIP format**
4. **An FTP server must be configured in order to archive and transfer the RINEX files to the AFREF processing centre in Cape Town**
5. **A member of the institution must be selected as a qualified person to care about the long term operations.**

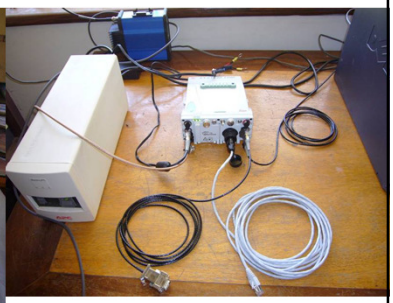
Leica donation for AFREF at no compromise
Commitment for delivering the best in class …

There is no reason to deliver downgraded equipments or only GPS based receiver and antenna under the pretext that is for Africa :

1. Leica committed to deliver the best in class GNSS Receiver and Antenna with the software, free maintenance and firmware updates including all the accessories such cables and power supply.
2. Leica committed to delegate expert people to supervise the installation and to lead the necessary training course free of charge (including travel fees and accommodations).
3. Leica wanted to hand over the donation through an official ceremony to ensure that on the governmental level AFREF will benefit for the highest support.
4. Leica wished to be considered as effective partner for the AFREF project.
5. Leica wanted to have the donated AFREF GNSS Stations operating 24/7 to ensure the highest visibility for other potential donators …

Installation at the RCMRD, Nairobi in Kenya

Installation at the RCMRD, Nairobi in Kenya



Leica GRX1200 GNSS, AT504, Leica Spider Site server and Spider Network server software's with power converter and cables

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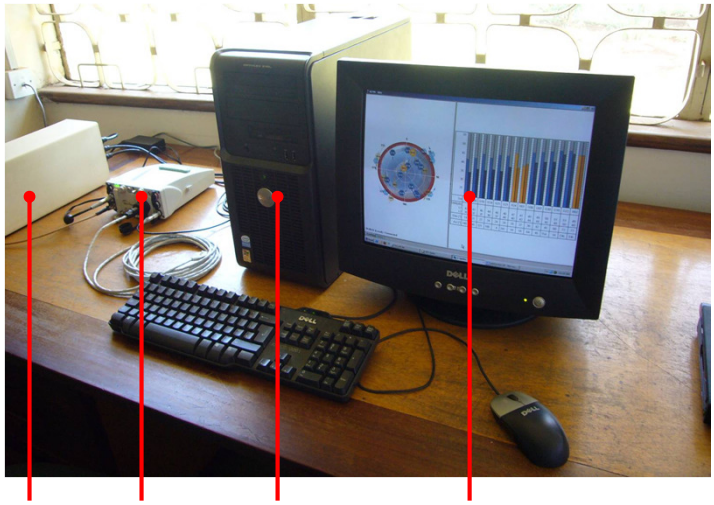
Installation at the RCMRD, Nairobi in Kenya



UPS Receiver PC Software

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Installation at RECTAS, Ile-Ife in Nigeria

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Installation at RECTAS, Ile-Ife in Nigeria

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Installation at RECTAS, Ile-Ife in Nigeria

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Installation at RECTAS, Ile-Ife in Nigeria

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Some of the lessons we learnt …

GNSS Reference Station is only the building block

1. Today the setup of a GNSS Reference Station is as easier than to setup a PC computer. The HW and SW can track all satellites in view and deliver accurate measurements where collateral effects (such multipath's) are mitigated by antenna design and digital processing firmware.
2. It's far more challenging to ensure uninterruptable power source and access to Internet. IT managers are sometime the worst person to keep sockets allocated.
3. Proper coordinates (ITRF, ETRF, …) are just the side results of being integrated into the IGS network.
4. Africa has all the capacity in term of human resources to carry out such GNSS Reference Station, they have excellent IT specialists and surveyors …
5. But that is only the building block …
6. For few investment a single GNSS Reference Station can broadcast DGNSS and RTK corrections over a large area using mobile communication (GSM, GPRS, 3G) such in Marrakech …
7. Automatic post-processing centralized service is just as easy as to setup a web based service …

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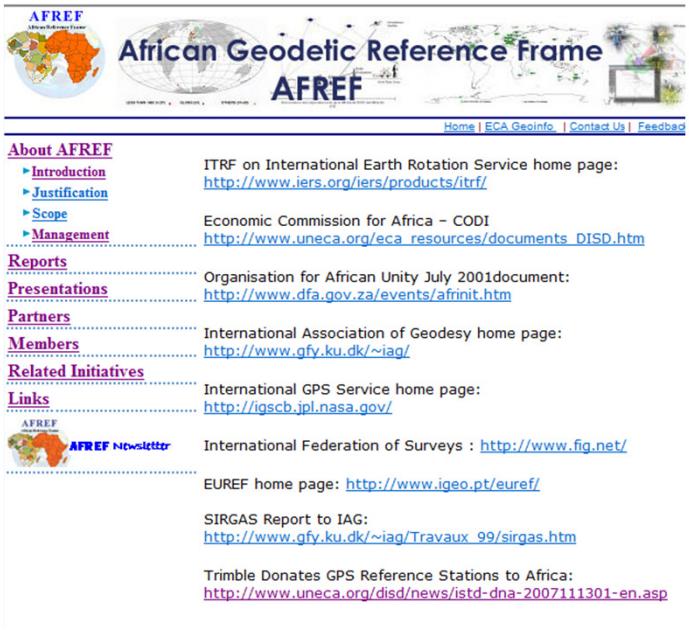
Conclusions and Lesson learnt …

GNSS Reference Station is only the building block

1. GIS and Spatial Data Infrastructures centres are not necessary the Geodetic Institutes who are legally in charge of the Geodetic Network …
   - GNSS is about "Navigation" not Satellite Imagery …
2. The transformation from "local geodetic reference systems" into ITRF, ETRF must be carried on a proper planning … No transformation = useless !
3. A GNSS Reference Station or even GNSS Network without the GNSS geodetic equipment (surveying) will fade away such a bridge or an highway without any traffic !
   - Bridging the gap … but between what ?
4. We do know the reason to succeed and also the reason to fail in such project and Leica pre-requisites have been appropriated for leading a prompt and effective setup to start AFREF …
5. We are very grateful for the enthusiasm raised during the setting up of the two first AFREF GNSS Reference Stations … How about the third one ?
6. Leica Geosystems has expressed its *humble support* to the AFREF initiative and has been glad to contribute to kick off donation actions …



Leica Geosystems → Solutions → Cadastral → AFREF

AFREF

First GNSS Reference Station Launched

AFREF is conceived as a unified geodetic reference frame for Africa. In March 2007, the first permanent GNSS reference station was launched in Kenya. Leica Geosystems supports the project with its knowledge, as well as via donation of a complete system.

The African Geodetic Reference Frame (AFREF) is conceived as a unified geodetic reference frame for Africa - the fundamental basis for the national and regional reference networks. In March 2007, the first permanent GNSS reference station was launched in Kenya. Leica Geosystems supports the project with its knowledge, as well as via donation of a complete system.

Trimble Donates GPS Reference Stations to Africa

November 13, 2007

Trimble, the world leader in professional GPS equipment manufacturing and positioning solutions, has donated equipment for five GPS reference stations to Africa through ECA. The donation was first announced during a workshop in Nairobi in August 2007 on the "African Reference Frame" (AFREF) and confirmed during the just-concluded (5 - 7 November 2007) "Trimble Dimensions" user-conference in Las Vegas, USA.

The reference stations will form part of the GPS network that will define a uniform African (Geodetic) Reference Frame (AFREF). So far, each African country has its national geodetic reference system for producing maps and other geoinformation products - some countries even have more than one. The result is that representation of cross-border features on maps cannot be done accurately. For example, roads, watershed and ecosystem boundaries and wildlife reserves may appear disconnected when national maps are joined together for regional planning and decision analysis. Work on large infrastructure projects is normally undertaken in sections and a uniform mapping surface is required to ensure that the sections join up. To unify the reference systems, parameters of the best fitting surface for map projections need to be determined and used by all countries.

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Many thanks for your kind attention and to support the AFREF initiative … AFRICAN Surveyors and Geodesists NEEDS YOU !

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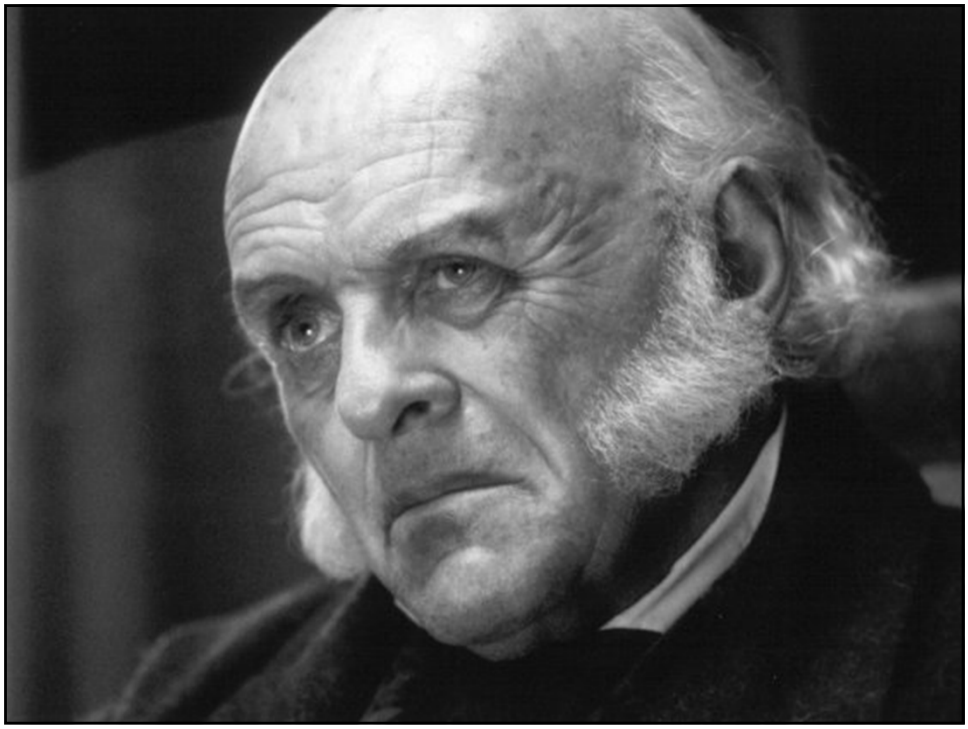
HELP



I have still some questions …

Is AFREF is good "story" to tell to potential supporters ?

Do we learn lessons from the ADOS failure ? Why it fails ?

EUREF (RETRIG) has been setup under the pressure of the car and radio industry to develop car navigation system (unified geodetic system to ensure digital maps over Europe allowing drivers to navigate smoothly from Amsterdam to Madrid) – EEC Project DRIVE, PROMETHEUS, …

GALILEO – actually the mass of papers published weights more than a GALILEO satellite ! Needless to underline the contribution granted to academics …

What is the economic justification of AFREF ? A surveyor (FIG) is looking first to get easy to deliver coordinates ! Cameroun (FUGRO redo the geodetic network with benchmarks …) … Congo did the same …

And a wish …

FIG Working Week 2011 is about "BRIDGING the GAP Between Cultures" and FIG stands for Federation Internationale des Geometres …

My wish is that AFREF responsible understands that there is still a gap to bridge between the generous initial concept, the present stage and the effective benefit to the African surveyors and the street people … or it will be the biggest Virtual Reference System

At the end every one of us wants to help AFRICA …

E-mail : joel.vancranenbroeck@leica-geosystems.com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Partial coverage
Connecting roads
Coverage of Europe 45 countries:
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Ireland
Italy
Liechtenstein
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Vatican City
Partial coverage
Bulgaria, Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovenia, Slovakia, Hungary, Croatia, Russian Federation.
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