



Priority 4

Aeronautics and Space

Strategic Support Action

**SSA5-CT-2006-030933
Contract number: 030933**

AFSAGA

PUBLISHABLE FINAL ACTIVITY REPORT



AFSAGA

African Satellite Communication and Galileo Application

A project supported by funding under
the Sixth Research Framework Programme of the European Union

Dissemination level: public use



PROJECT OVERVIEW

The purpose of this project was to analyse the potential applications that could be open as a combination of Galileo and satellite communications in South Africa and the whole Southern African Development Community (SADC) region which encompasses 14 countries.

South Africa as well as the whole Southern African Development Community area used to be under the coverage of the EGNOS system prototype which is the precursor of Galileo and makes extensive use of satellite telecommunication. EGNOS can easily be deployed again in the region. This would allow Southern Africa to benefit from this signal and enable in the short and medium terms some applications which would not be possible with GPS only. South Africa as well as neighbouring countries have a lot of specificities in the way that it combines urban centres well equipped from a telecommunication perspective together with a large territory with a much lesser telecom infrastructure density making satellite a clear plus towards national development. In addition, Southern Africa is now undergoing an important transformation with rapid development and Galileo combined with satellite applications is clearly an enabler towards sustainable development in the whole SADC region, as well as for the preparation of the 2010 FIFA soccer World Cup.

This project aimed first at developing the awareness for such applications in the Southern African Development Community and capturing from the user communities the applications which bring them the most benefit. Based on these application requirements, the project structured those needs and developed a regional action plan for the removal of barriers for the implementation of such applications both from social, infrastructure and regulatory perspectives. Finally the project disseminated these results both to user communities representatives and to key stakeholders in the Southern African Development Community.

Project Information:

The following list contains a short summary of key project data:

- Call identifier: FP6-2005-Space-1
- Project reference: 030933
- Contract type: Specific Support Action (SSA)
- Start date: 01/03/2007
- End date: 01/03/2008
- Project duration: 12 months
- Total funding budget: 281,000 €
- Consortium:
 - Thales Alenia Space (France), project coordinator
 - Council for Scientific and Industrial Research (South Africa)

Further information can be found on the project web page: www.afsaga.org

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KEY ACHIEVEMENTS

AFSAGA managed to raise awareness of satellite navigation and communications applications in Southern Africa, while in the same time providing a list of potential applications and the barriers to the development of these applications.

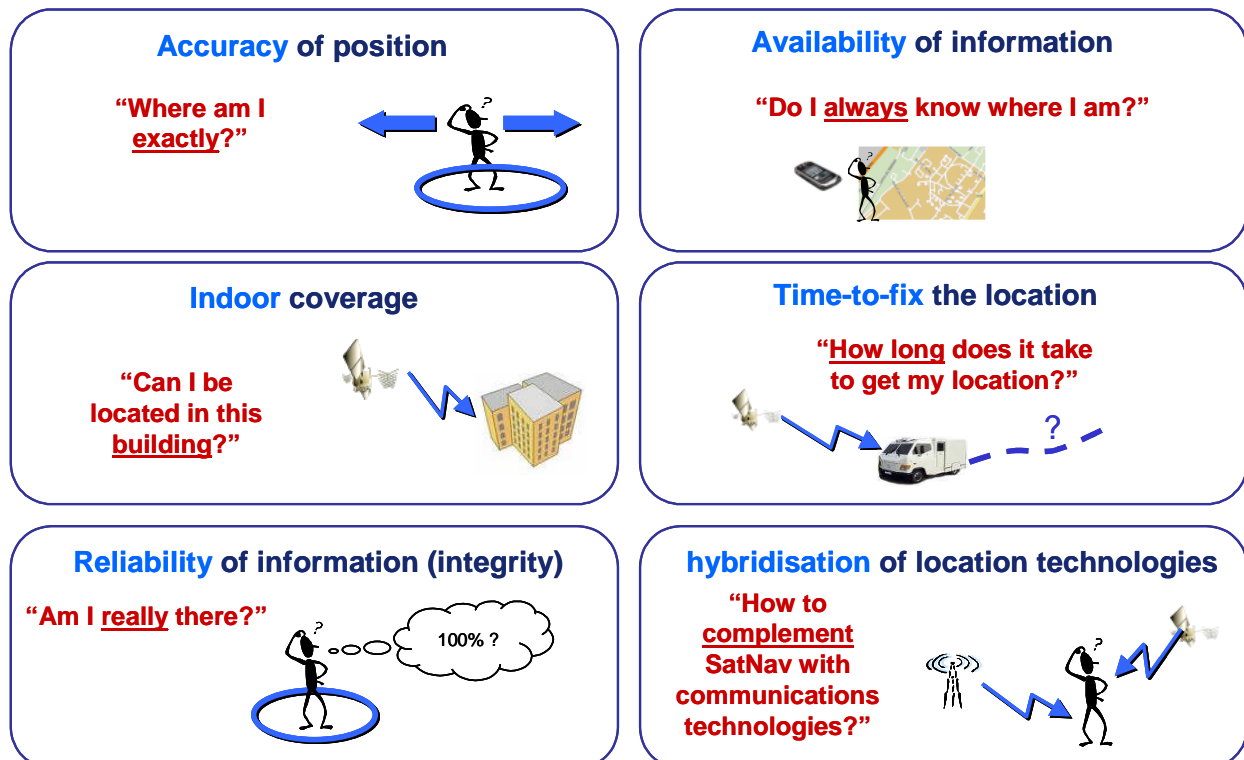
Awareness raising of satellite navigation and communications applications in Southern Africa:

A workshop took place on 7 and 8 August 2007 at the Maropeng Centre, near Pretoria in South Africa. 23 people attended this workshop. The participants came from different backgrounds:

Farming, water, forestry, timing systems, astronomy, space science, tracking, tourism, building, surveys and mapping, roads, civil aviation, earth observation, space systems, media, human capital development, safety security, communication, health.

This workshop aimed at increasing the awareness of the potential range of applications which can take advantage of EGNOS and Galileo, and in particular those related to combined satellite telecommunication with satellite navigation throughout the Southern African Development Community region. Indeed, in order to establish the applications required by the identified possible users and user communities, it was necessary to disseminate to these groups the technical capabilities of the EGNOS enhancement to current and future satellite positioning systems such as Galileo.

A summary of the major challenges addressed by EGNOS/Galileo and combined communications, which were presented during that workshop, is detailed below:





Identification of combined applications:

After the workshop, a structure view of the applications in the specific context of Southern Africa was established. The following combined navigation and communications applications were proposed:

Organ transplant:

Fitting potential organ receiver with PNDs (Personal Navigation Devices) communicating with a central database in order to keep track of their whereabouts should organs become available and communicating messages to them or receiving messages in order to manage the organ transplant process more efficiently.

National parks:

Improving the experience of visitors to the national parks by providing them with real-time position tagged information on current attractions in the parks.

Bicycle navigation for the CSIR campus:

Optimising the journeys on the CSIR main campus in Pretoria, by fitting bicycles with PNDs to analyse the travel usage and trends of employees.

2010 FIFA World Cup personal security:

Fitting individuals with communication enabled PNDs to establish their movement and advise them on the safety of their movements.

Taxi assistance:

Fitting taxis with communication enabled navigation devices to improve the management of the fleets.

Regulation of fisheries:

Tracking fishing fleets to monitor activity, but also as an incentive for providing fishing vessels with updated information on the whereabouts of fishing grounds.

Automated census:

Assistance in census taking with intelligent electronic form on a GPS enabled smartphone. This will also allow for the central database to be updated in real-time with position information.

Road surface monitoring:

Using vibration analysis coupled to GPS and communication to central database, allowing making of map with road surface quality indication.

Road accidents reduction:

The example of the Molotov road stretching from the Limpopo through Mpumalanga to Gauteng provinces of South Africa being a high accident zone as a pilot project road was suggested.

Fenceless livestock:

Selected animals in a herd fitted with tracking devices would help keeping track of these animals and raise alarms when they approach roads. There is already commercial devices of this nature available used by farmers on very large farms to keep track of their livestock.

Overloading control:

Measuring dynamic performance of vehicle to determine load. This would give a better picture of road use as there is only a limited number of load bridges in South Africa with little information of what happens with heavy vehicle loading between these.

Ride Matching/Car Sharing:

Bringing together people wanting to share transport cost and effort for journeys, both long and short.



□ General tracking of animals/pets:

Depending on the size of the animal, minimal possible size of the tracking device, area of deployment and duration of the required tracking, animals could be tracked in real-time with high accuracy using this technology.

□ Bird life Africa:

Depending on practicality, tracking of birds could provide interesting secondary information, especially given that the tracking of birds have recently been linked to climate change.

Barriers to development of these applications:

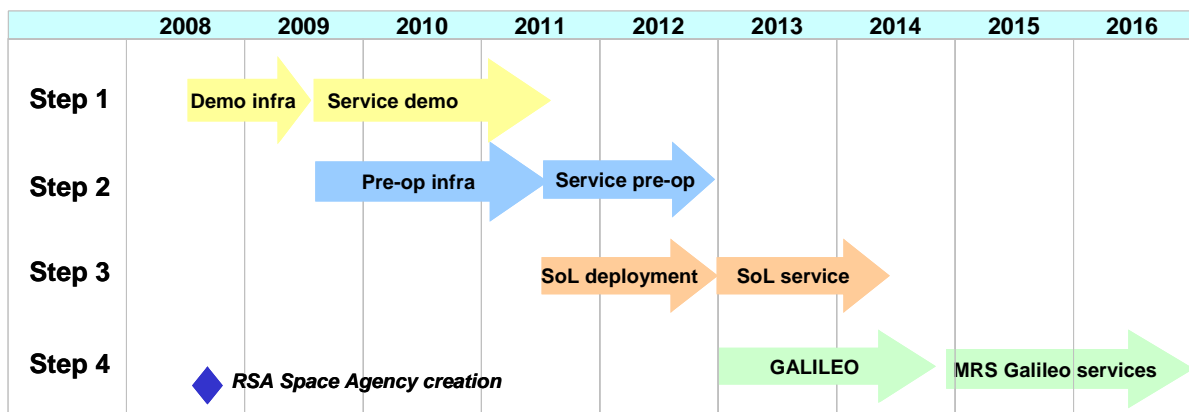
The workshop and the discussion with regional key stakeholders showed that there are many barriers to the development of the combined navigation and communications applications in Southern Africa, like the ones mentioned above. The identified barriers are:

- **Regulation:** different telecom regulations within and among the SADC countries curbs the deployment of the applications (monopoly, duopoly, partially liberalised, fully liberalised).
- **Availability:** some telecom infrastructure, such as the GSM network, have not yet been deployed everywhere in SADC because they are not economically viable.
- **Lack of knowledge and infrastructure:** some early infrastructure is needed in order to trigger knowledge of what is feasible with this infrastructure.
- **Costs:** the cost of end-user terminals required for wide implementation is still too high (both acquisition cost and operating cost).
- **Data sharing:** the regulation for sharing information among the SADC countries can constraint the development of the applications.

The lack of infrastructure, and *de facto* the lack of knowledge, are the main showstoppers to the development of SatNav and SatCom applications. By putting in place an early system allowing first navigation applications, awareness of this technology will increase, and the market will start developing itself (virtuous circle). Consequently, regulation barriers of to development will fall, due to the governments seeing the real opportunities for their economy. Availability will automatically increase, as telecom providers will see the business case for such a technological deployment. Thanks to economies of scale, the costs of navigation receivers, be it GPS/Galileo receivers only or combined cellular/GPS/Galileo, will reach acceptable levels.

Road map to the development of combined applications:

In order to remove the barriers to development and foster combined navigation and communications applications, the following 4-stage roadmap is proposed:





- **Step 1: Early Galileo service over SADC**
Deployment of an early system using an already existing infrastructure (e.g. TrigNet GPS monitoring stations), with broadcast of the GPS augmentation system done via Internet or the GSM network.
- **Step 2 : Pre-operational early Galileo service**
Wider deployment of GPS ground monitoring stations and use of a satellite (with a navigation payload) to broadcast the augmentation signal.
- **Step 3 : Early Galileo Safety-of-Life service (SoL)**
Redundancy of all ground infrastructure and second additional satellite to broadcast the augmentation signal. This would allow the use of the system for safety-critical applications, such as in air traffic management.
- **Step 4 : Multi-constellation Regional Segment (MRS)**
Full use of EGNOS through Galileo and the multi-constellation regional segment (GPS + GLONASS + Galileo).

A national Space Agency is to open in South Africa in 2008; the navigation branch will be supervising the deployment of any combined navigation and communications applications, ensuring the required infrastructure is deployed.

Dissemination of the project findings to the regional key stakeholders:

The AFSAGA project concluded with a dissemination activity, which purpose was to deliver the analysis findings to the regional key stakeholders. The dissemination was performed through one-to-one meetings, the 2nd week of February 2008, in South Africa. These stakeholders were:

- **Industry communities:** road, safety and security, information and communications technology, asset tracking, map making, railway.
- **Civil aviation:** ATNS (Air Traffic Navigation Services), responsible for the efficient running of South Africa's Air Traffic Control Systems.
- **South African government:** Department of Land Affairs, Department of Trade and Industry, Department of Science and Technology.

All these stakeholders recognised and acknowledged the benefits that could result from the combined navigation and communications applications: market opportunity, business development, new regulations, job creations, economic growth and human capital development.

Dissemination to SADC:

During the project, it was not possible to meet directly with SADC representatives, even though these expressed a real interest in combined navigation and communications applications. They wish to be kept updated on any further development. As part of the continuation activities (dissemination of knowledge), the first available opportunity to meet will be used to exchange information with SADC.



IMPACTS OF AFSAGA

The impacts of the project were manifold. Because of the time span of this project (12 months), it was possible to assess the evolution of the navigation market in Southern Africa. The project also gives some developing opportunities: business opportunities for companies willing to embark on the navigation market, and R&D opportunities for further projects under Framework programmes and the like. Finally, AFSAGA strengthened the relationship between Europe and South Africa in the space cooperation, especially with the creation of the South African Space Agency.

Boost in navigation market:

During the execution of this project, there has been a major evolution of the GPS market in South Africa. This has been due to the cost of GPS based navigation devices lowering and the availability of vector maps of the country. There is a much better understanding amongst the general public of the technology and the possibility of using this technology. AFSAGA did expand on this understanding by introducing to many user communities the concept of combined Galileo and satellite communication applications.

Business opportunities with proposed applications:

The combined navigation and communications applications identified in this project can be of interest to any company desiring to take advantage of the booming market of navigation in Southern Africa. For instance, the South Africa National Parks¹ expressed a real interest in the application suggested (in-car navigation aid for visitor). A software company, making use of already available on-board GPS terminal, could easily develop the application.

South African Space Agency:

The Department of Science and Technology (DST) is continuing with the establishment of the South African Space Agency. Navigation forms one of the functional elements of this agency. Much of what has been written into the Space strategy document has been based on the activities and findings of AFSAGA. DST is moving into the implementation plan for the Agency now, and the final outcome and follow on activities for the project is being used as input to this process.

A Joint Africa-EU Strategy:

The last Africa-EU Summit was held on December 8 and 9, 2007 in Lisbon, Portugal. During this summit, a "Joint EU-Africa Strategy", an "Action Plan" and the "Lisbon Declaration" were adopted.

In the strategy, it is clearly explained that Africa and the EU shall strengthen their cooperation in the fields of space-based technology, applications and sciences.

One of the eight strategic priorities identified in the First Action Plan (2008-2010) is Africa-EU Partnership on Science, Information Society and Space, declined in three actions:

- Support the development of an inclusive information society in Africa;
- Support S&T Capacity Building in Africa and Implement Africa's Science and Technology Consolidated Plan of Action;
- Enhance cooperation on space applications and technology.

¹ www.sanparks.org



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The last action clearly states that space-based applications should be developed further:

- Navigation applications such as GALILEO, European Geostationary Navigation Overlay Service (EGNOS);
- Monitoring of climate change, desertification or fires, and water and food resources through earth Observation, such as Global Monitoring for Environment and Security (GMES) for Africa;

This demonstrates that the AFSAGA project was entirely in line with the strategy defined at the Africa-EU summit. It also appears that the proposed way forward is the development of integrated application projects (e.g GMES + Galileo/EGNOS) in Africa.