XI th European Interparliamentary Space Conference (EISC)
United Kingdom London 2009

Space for Europe

A special collection of space missions from around Europe – for today and tomorrow

Commissioned for the UK Presidency of the
XI European Interparliamentary Space Conference

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WELCOME TO THE XI™ EUROPEAN INTERPARLIAMENTARY SPACE CONFERENCE

LONDON 2009

This brochure was commissioned by Astrium for the UK Presidency of the XI European Interparliamentary Space Conference, hosted by the Parliamentary Space Committee, 26–27 October 2009, London.

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BNSC

The Parliamentary Space Committee is grateful for the generous support of the British National Space Centre (BNSC) in supporting the 2009 conference. BNSC is at the heart of UK efforts to explore and exploit space. BNSC is a partnership of six Government Departments, two Research Councils, the Met Office and the Technology Strategy Board. It co-ordinates UK civil space activities and represents UK interests at the European Space Agency and to other international space organisations.
For more information, visit www.bnsc.gov.uk

Welcome

This brochure is produced to celebrate the tenth anniversary of the European Interparliamentary Space Conference, by bringing together a collection of space solutions, from today and tomorrow.

These case studies are drawn from across Europe and we hope they demonstrate the many social, economic and political benefits stemming from Europe's world leadership in space activities – the theme of this year's conference.

Welcome
from Ian Taylor MP

The UK is proud to hold the Presidency of the European Interparliamentary Space Conference (EISC) this year.

My colleagues and I in the UK Parliamentary Space Committee warmly welcome all delegates and representatives who are attending the XIth Conference on 26-27 October in London.

In the space sector, cooperation across borders is essential for taking full advantage of space science and technology for the benefit of citizens and the economy. At the same time, each nation must be prepared to create the right conditions at home for exploiting the enormous potential offered by the upstream and downstream potential of applied satellite technology for innovation, growth and wealth creation.

The conference takes place against the backdrop of a wide-ranging review of British Space Policy and how best it can be strengthened. The UK has a long tradition of focusing on practical and scientific benefits of space activity through technological advances.

Other nations have different and compatible emphases. Collectively, this provides a rich heritage and potential for EISC countries. Together we can show how space can help solve problems and deliver policies not easily addressed by terrestrial approaches alone. Hence problem-solving through space applications is the guiding theme of this year's EISC Annual Conference.

Space technology has reached the point where it supports reliable, continuous services for a wide range of public and private users. Satellite-derived services are often more affordable, more timely and of higher information value than traditional terrestrial alternatives.

This trend creates many new opportunities for commercial innovation, economic growth and wealth creation for the benefit of all. It also provides us with valuable tools for improved policies and for sharing the advantages of new technology more effectively with the vulnerable and disadvantaged, both at home and worldwide.

In line with the problem-solving theme, each of the EISC delegations was asked to propose two case studies of current and future projects that illustrate the value of our space activities.

The resulting Europe-wide body of highly interesting case studies is presented in this brochure. It is an inspiring document of the variety, ingenuity and above all the immense practical, down-to-Earth importance of space.

As I am going to retire as an MP at the general election next year, I should like to take this opportunity to wish the EISC well in the future. This institution enables Parliamentarians to work together to show that space activity constitutes a vital part in solving some of the problems facing our troubled world and in understanding the wider universe.

Ian Taylor MBE, MP
Chairman of the XI[th] EISC

Galileo image source: ESA

Welcome
from Dr David Williams

XI EISC supported by BNSC

Space in the UK is going through an exciting time – what our Minister Lord Drayson has called a 'space renaissance'.

The UK has a dynamic space sector which contributes to society by making positive impacts to the economy; on the environment; to education and through inspiration.

Now – more than ever, long term investment in skills and knowledge, in creating new services for the citizen and in building tomorrow's economy are priorities for Europe.

All of these goals are shared by the British National Space Centre. And we have real successes to show for our work. You can read about two of them – delivering broadband from satellite to bridge the digital divide and also the remarkable Disaster Monitoring Constellation – in this brochure. It is no accident that the world's most profitable mobile satellite communications company is based in London; or that the UK is second only to the US in the quality of our space science. It is the result of careful investment by BNSC over many years.

Most of what we do is through our active participation in the programmes of ESA, the European Union and EUMETSAT. This strategy is symbolised by the opening in July this year of ESA's first centre in the UK at the Harwell Science and Innovation Campus near Oxford.

This centre is a new start for the Agency, because ESA will be embedded in an existing hub of world-class science and technology, where four thousand researchers are working in areas as diverse as climate change, medical physics and fusion energy.

The ESA centre at Harwell will work on developing new applications from space, in using space data to understand climate change, and in helping prepare Europe's future space exploration programmes.

So, as I said, this is an exciting time. Thus, it gives me great pleasure to welcome you to the UK and to wish you a successful and enjoyable conference.

Dr David Williams
Director General
British National Space Centre

Source: BNSC

The new ESA centre at Harwell.

Background: The Harwell Science and Innovation Campus in Oxfordshire.

BNSC is at the heart of UK efforts to explore and exploit space. BNSC is a partnership of six Government Departments, two Research Councils, the Met Office and the Technology Strategy Board. It co-ordinates UK civil space activities and represents UK interests at the European Space Agency and to other international space organisations.

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Key to case studies

- Space science
- Earth observation and mapping
- Communications
- Launchers
- Navigation and timing
- Security
- Small satellites

TTS-4

Receiving highly accurate time from navigation satellites

TTS-4 is a new Polish time transfer system that provides time information of nanosecond accuracy to many important applications on the ground, including power supplies, financial transactions and communications networks.

This low-cost project, built on science/SME technology transfer, strengthens Poland's and the EU's industrial base in a field hitherto dominated by US companies. It enables Europe to take best advantage of Galileo's potentials.

The time transfer system TTS-4 is a national project that has been realised in 2003-09 by the Polish Space Research Centre in partnership with PikTime Systems. It achieved the development, manufacture and commercialisation of a time receiver capable of processing signals from all available navigation satellites at the highest level of accuracy.

TTS-4 provides time transfer for a wide range of civil and military applications including the synchronising of national and international key infrastructure. Its services are needed for the operation of power grids, fixed-line and mobile communications networks, banking, police and military networks, satellite navigation, time stamping and electronic signatures. TTS-4 services enable the construction and maintenance of national atomic time scales and the international atomic Coordinated Universal Time (UTC).

The receiver can be used to observe signals from all types of Global Navigation Satellite Systems (GNSS): satellites such as GPS (United States), GLONASS (Russian Federation), Galileo (European Union), WAAS (United States), EGNOS (European Union), QZSS (Japan), Gagan (India), Compass (China) and IRNSS (India). It is the most universal time receiver available. It is also one of the most accurate, with an accuracy that can reach one nanosecond. It is the first time receiver for Galileo that provides data in standard formats for a wide range of applications.

TTS-4 is recognised for its robustness and simplicity of use in an industrial environment. The system is of interest to a large and diverse community including civil and military agencies, private companies, national time laboratories and space agencies around the world. Tens of laboratories are already equipped with TTS-4 receivers and are fully satisfied. One of the two Precise Timing Facilities (PTF) of the Galileo system will be equipped with a TTS-4.

The project's success supports enhanced industrial activity in the field of time metrology in the EU as a whole. There is a growing need for time measurements related to Galileo applications, but industrial activity in this field remains significantly smaller in the EU than in the United States. For Poland, the project enabled acquisition of top-quality knowledge on the manufacture of the most accurate, certified time receivers. It helped to establish one of the European and worldwide leaders in this field in Poland.

This is especially relevant in the context of the EU's growing Galileo industry and the distribution of certified time by Galileo to millions of users around the world. High-accuracy timing receivers contribute to the creation of the Galileo industry infrastructure that is likely to lead to the production of billions of pocket satellite navigation and time receivers. Small navigation and time receivers are expected to have a major impact on society, similar to that of mobile phones, PCs and the Internet. TTS-4 will contribute to the rapid integration of the new Galileo services in our societies.

The TTS-4 project is a good example of high-technology transfer from the research environment to a practical application in small industry. This compact high-tech manufacturing product was developed in Poland in the framework of European space activities. It demonstrates the possibility of developing industrial activities without large investment. It is also an excellent example of a value-adding downstream activity in the ground segment of the space sector. ■

AmerHis

Switchboard in space initiates new services and markets

This Spanish-led ESA project represents a major breakthrough. It pioneered a new era of onboard processing technology in communications satellites and opened the door to a multitude of new, flexible applications of high-performance satellite communication.

It connects many dispersed users with each other and the Internet. It has been an operational and commercial success and attracts strong interest in various user communities, including the defence sector.

AmerHis is an advanced communications payload with on-board processing, operated commercially by Hispasat since 2005 (as satellite operator and service provider).

It was developed in a three-year international project that was funded by the Spanish Centre for the Development of Industrial Technology (CDTI) and ESA, with Thales Alenia Space España as prime contractor.

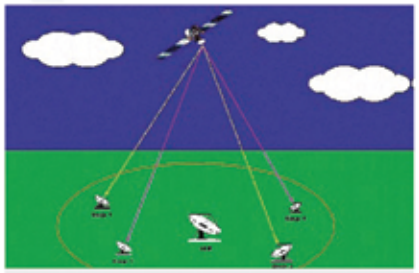
AmerHis is embedded in Hispasat's Amazonas-1 satellite. It broke the ground for a new generation of communications satellites that do not simply relay signals back to Earth but are equipped with onboard intelligence and versatility. It can flexibly allocate resources (data rates, coverage, connectivity) and switch between various types of services (real-time, interactive, multiplexing, multicasting, etc.).

Such systems permit a whole new set of high-value satellite-based services that attract new users and spawn new markets. AmerHis stands at the beginning of a trend towards increased integration of satellites with terrestrial solutions by building a network of routers in space that is fully integrated with the Internet of the future.

The project created a cost-effective, high-performance solution for meshed communications via satellite. This is particularly useful in the context of security-related applications. It supports direct satellite communication between dispersed institutional, professional and private-sector users in a number of scenarios such as corporate communications, emergency response and tactical communication. In essence, AmerHis offers the same performance quality as a terrestrial network, but independent of the position in the coverage area.

AmerHis proves the feasibility of accessing the full portfolio of Internet applications including real-time services via satellite by using small and cheap terminals that access the system in a flexible and efficient way. This will allow many new small and home office users in remote or isolated areas to access satellite Internet services at an affordable price.

Hispasat uses AmerHis for its own intercontinental data links to its different offices. CNES draws on the system for the communications between their sites in France and in Guyana. The Fraunhofer Institute has created a Telemedicine application in South America based on AmerHis. Defence users from Spain, Germany and the US have performed pilot experiments with a view to using AmerHis technology in the near future.



Source: ESA

The AmerHis mesh network with a regenerative payload permits users to communicate with each other without the need for a hub station.

The positive performance and market reaction has triggered a second, purely commercial order from Hispasat for another AmerHis payload on the recently launched Amazonas-2 satellite.

AmerHis benefited from a set of pre-planned exploitation projects and the use of existing open standards that permitted partners to develop terminals early on. However, this high-technology development project, which required large investment before it generated market revenues, would not have succeeded without the initial institutional support and international cooperation that enabled a balanced sharing of risks and opportunities. ■

Proba-1

A little miracle made in Belgium

The Proba-1 satellite was developed in ESA with Belgian industrial leadership as a demonstrator for onboard operational autonomy. Eight years after its launch it is still operational.

The instruments on board, including for hyperspectral imaging of Earth and its atmosphere, have proven to be highly valuable tools for scientists in many fields of investigation and for various practical applications. The satellite's resources have also been made available to schools for educational projects. Proba-1 involved many SMEs and helped to increase Belgian expertise in space technology.

Proba (Project for On-Board Autonomy) is a series of in-orbit technology demonstration projects within ESA's optional General Support Technology Programme (GSTP). The Proba mini-satellites are among the smallest and most advanced spacecraft ever developed in ESA.

Proba-1 is the first satellite in this series. It was launched in 2001 after 3 years of preparation. Designed for a 2-year lifetime, it is still operational today, serving an ever increasing user community.

Backed by the subscription taken by the Belgian Federal Science Policy Office, one Belgian company (Verhaert) was prime contractor and others contributed (Spacebel, SAS, OIP, IMEC, Vitrociset), along with partners from other countries. Proba-1 has considerably increased the Belgian expertise in space technology.

The Proba-1 platform was the first attempt to realise a satellite with on-board operational autonomy capable of translating a user request into the technical commands needed to fulfill the request with the satellite's instruments. Operational autonomy of a satellite is a huge advantage for users, and it allows simpler, dispersed ground stations.

Proba-1 hosts seven instruments, including important optical Earth observation instruments — the hyperspectral Compact High Resolution Imaging Spectrometer CHRIS, developed by SIRA Electro-Optics in the UK with BNSC support, and OIP's panchromatic High Resolution Camera (HRC) with 5 metres spatial resolution and Wide-Angle Camera (WAC).

In addition, Proba-1 carries several instruments for studying the space environment around the spacecraft — the Standard Radiation Environment Monitor (SREM), the Miniaturised Radiation Monitor (MRM) with a new quartz-scintigraphy method, Smart Instrument Points (SIP) that measure total radiation doses and temperatures, and the Debris In-orbit Evaluator (DEBIE) for detecting sub-millimetre space debris.

After having completed its main mission objectives — successful demonstration of automatic functions, both onboard and in the mission ground segment — Proba-1 was handed over to the ESA Earth observation community where it proved to be a valuable operational tool.

Source: Verhaert

The Proba-1 consortium provided opportunities for many SMEs.

Source: ESA

Proba-1/CHRIS image of sediment disposal at the Rhine dam in Lake Constance.

Its use is not restricted to scientists. The EDU-PROBA programme makes the resources of the satellite available to schools for educational projects.

The instruments return not just visual information but also a wealth of biophysical and biochemical data. Typical fields of investigation are atmospheric aerosols, coastal and inland waters, land surface processes and disasters. Practical applications supported by Proba data include environmental monitoring, crop forecasting, forest cataloguing and marine science. ■

Disaster Monitoring Constellation

The power of small imaging satellites

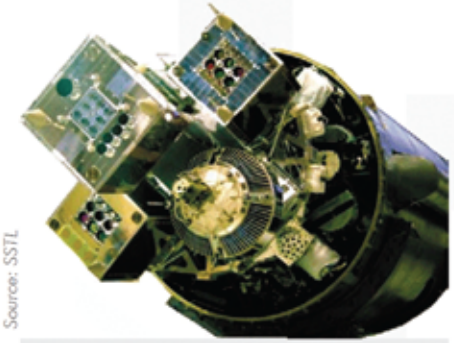
The DMC combines a number of small satellites owned by operators in several countries in a single constellation, co-coordinated by SSTL. It permits worldwide image acquisition within 24 hours at extremely low cost. This capability is very useful for international disaster response. The DMC's commercial success highlights the strength of small satellites.

The Disaster Monitoring Constellation is an international cooperative project initiated in 2001. It is funded by government organisations in the UK (BNSC), Algeria (ASAL), Nigeria (NASDRA) and Turkey (Tubitak) and commercial companies in Spain (Deimos Imaging), China (BLMIT Ltd) and the UK (SSTL).

The project involved the design, build, launch and operations of a set of very low-cost, but highly capable small satellites. Associated with the project, engineers from Algeria, Nigeria and Turkey received training to raise their nation's space capability. Algeria and Nigeria now have space agencies of their own.

Each partner operates its own satellite. The UK-DMC is operated by Surrey Satellite Technology Ltd (SSTL).

SSTL's subsidiary DMCii performs co-ordination of the entire constellation and acts as its commercial arm. It also co-ordinates DMC membership of the International Charter on Space and Major Disasters.



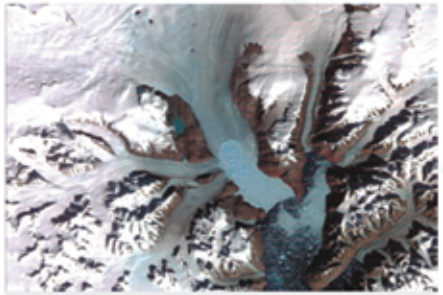
Source: SSTL

Three DMC satellites (UK, Nigeria, Turkey) mounted on a Cosmos launcher in Plesetsk.

In 2003 the UK, Nigerian and Turkish DMC satellites joined the Algerian satellite launched in 2002. In 2009 UK-DMC2 and Deimos-1 became operational. In 2010 two Nigerian follow-on satellites will be launched. The new satellites provide long-term continuity of data.

The DMC provides participating nations with a valuable tool that is able to deliver useful land-monitoring data for their indigenous applications. Beyond that, it has created a unique framework of international collaboration. Participating nations fund a single satellite but can reap the benefits of a whole constellation. This illustrates that by working together, a group of nations can achieve far more if they pool their aims and efforts.

DMC data and products have proven their worth to the agricultural sector, e.g. for precision farming, and scientific users such as university groups. In addition, the system is a high-value source of information for humanitarian and disaster response organisations, including UN agencies, following major natural and man-made disasters. Feedback from users has been very positive. For example, for disaster monitoring in Darfur, DMC's information was among the most timely and useful.



Source: DMCii/UK-DMC

Iceberg calving from a glacier in Greenland. Monitoring of such events helps to understand the effects of climate change.

Commercially the system has also been a success – so much so that the two most recent satellites to be launched (UK-DMC2 and Deimos-1) have been commercially funded, based on the system's ability to generate sufficient revenue to justify the investment.

The DMC system can image very large areas in relatively short time. Each year, it images the whole Amazon basin at good resolution. This allows the local authorities to monitor legal and illegal logging. The orbital configuration brings each point on Earth in the field of view of one of the DMC satellites each day during the morning. Following disasters such as floods, DMC can image the affected area very quickly after the event and the data can be used in relief work, e.g. to construct maps that take account of the flooding.

The DMC proved that low-cost, small satellites targeted at specific applications can provide an extremely cost-effective solution. DMC satellites come at less than five percent of the cost of a U.S. Landsat satellite, but they can address a large proportion of the applications targeted by Landsat. When these small satellites are then put into constellations, the benefits multiply. We are already seeing this concept commercialised through systems such as RapidEye. It is likely that other constellations will follow. ■

SAR-Lupe, TerraSAR-X and TanDEM-X

Radar observation satellites

Through a set of national military and civil radar satellites, Germany has achieved independent global reconnaissance capabilities for security and safety.

On the civilian side, TerraSAR-X is embedded in GMES and was realised by an innovative public-private partnership.

National space programmes are responding to national needs and requirements while also aiming at contributing to the wider objectives pursued within the European space policy, including through bi- and multilateral activities. Germany has proven to be a responsible international partner. It has contributed significantly to many ESA programmes such as Galileo, Global Monitoring for Environment and Security (GMES), meteorology, science, communications and launchers.

Through its recently introduced national systems for Earth observation with space-based radar, Germany has achieved independence in reconnaissance, with a reliable capability to collect timely data under all weather conditions, at night and through cloud cover. The resulting space application is unique in its technical capability, offering both very high resolution and wide-area coverage. It serves the needs of society with regard to security and safety, including emergency management, land and sea monitoring, discovering and avoiding environmental pollution, spatial planning, water-quality monitoring etc. The government can use the gathered data for reconnaissance and thus do its best to provide for the safety of soldiers and civilian aid workers who serve abroad.

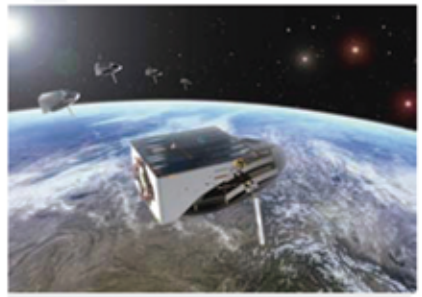
Source: Infoterra

Map of the Kashmir region using TerraSAR-X after the 2005 earthquake.

The Federal Ministry of Defence, the German Aerospace Centre DLR and Infoterra, a subsidiary of Astrium, operate the individual components with funding from the three Federal Ministries of Defence, Economy, and Technology & Research, and from industry. Development and exploitation also involve ESA and EU FP7, the French government and non-European governments, partners in other industries and in universities, as well as commercial users. The systems are successfully used by the government, parliament, armed forces, emergency services and surveying and mapping institutions.

SAR-Lupe is entirely funded and controlled by the Ministry of Defence. It is Germany's first satellite-based reconnaissance system. The federal government needs to be able to identify and monitor regions of latent crisis at an early stage, and to do so with independent means of reconnaissance. SAR-Lupe, in service until 2017, consists of five identical satellites equipped with highest-resolution radar instruments that provide worldwide information in all weather conditions 24 hours a day. The ground segments of SAR-Lupe and the French optical reconnaissance system Helios-2 are to be used jointly as the core element of European cooperation in strategic reconnaissance operations.

The German radar satellite TerraSAR-X was implemented in public-private partnership (PPP) and successfully launched in 2007. With its active antenna, the spacecraft acquires high-quality X-band radar images of the entire planet from a polar orbit at 514 km altitude, independent of weather conditions and illumination. TerraSAR-X, designed for a lifetime of five years, is an outstanding, reliable new source of radar images of wide areas with high resolution. The data delivered by TerraSAR-X is crucial for GMES.



SAR-Lupe.

From December 2009, TanDEM-X, a twin satellite to TerraSAR-X, is expected to enhance the mission. The resulting new dual-satellite constellation, in service until 2012/14, is designed to produce high-precision digital elevation models (DEM) of exceptional long-term value on a global scale by 2012.

The development of the underlying technology, which took over 30 years, was well worth the effort. Germany has established itself as the leading nation in radar technology. The agreement between France and Germany concerning the exchange of optical and radar reconnaissance data reflects today's best practice. The requirement is now to develop follow-on systems with ultra-high resolution. ■

COSMO-SkyMed

Radar images for civil and military users

COSMO-SkyMed is an operational constellation of high-resolution radar observation satellites, to be completed next year.

It was specifically conceived as a dual-use programme that meets both civil and defence requirements for precise, timely worldwide radar coverage. It is run jointly by the Italian Space Agency and the Ministry of Defence as a synergetic tool for the management of the full range of security risks, both nationally and in ESDP.

The Italian COSMO-SkyMed radar imaging satellite constellation was developed in 2000-07 for launch and exploitation in the period 2007–14.

It is a dual-use Earth observation system for disaster prevention and safety. It was developed jointly by the Italian Space Agency (ASI) and the Italian Defence Ministry and is jointly owned.

The system benefits from an innovative mix of institutional funding. It involves the Ministry for Education, Universities and Scientific Research, the Italian Space Agency and the Ministry of Defence.

COSMO-SkyMed provides monitoring and surveillance capabilities for the management of a wide range of exogenous, endogenous and anthropogenic risks. Its missions encompass safety and security, the prevention of environmental disasters and the study of the Earth's surface.

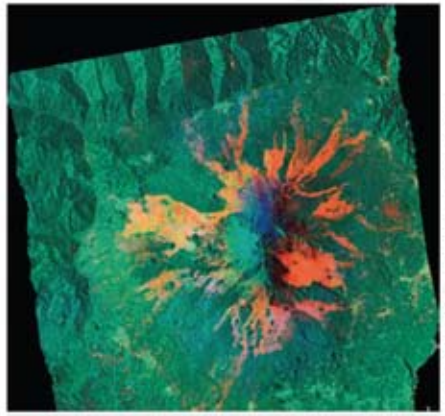
The application services that can be derived from COSMO-SkyMed contribute significantly to homeland security in areas such as fire, landslides, droughts, floods, pollution, earthquakes and subsidence. They also aid the management of natural resources in agriculture and forestry as well as monitoring of urban sprawl.

The system supports both public and commercial products and services. It is the first Earth observation satellite system in the world that has been explicitly conceived and realized from the beginning entirely for dual purposes, both civilian and military, in an integrated approach. In other systems, dual use is only an afterthought and a precarious secondary aspect.

Under the COSMO-SkyMed data policy, civilian (scientific, institutional and commercial) and military users share system resources under appropriate regulations.

On the civilian side, ASI supports scientific and institutional users, while commercial exploitation is handled by a separate public-private partnership company, e-Geos. Italy derives best value for money from the described national synergy in a niche of technological, industrial and operational excellence.

The space segment consists of four medium-sized satellites in a sun-synchronous orbit about 620 km above the Earth's surface. Each satellite is equipped with a high-resolution X-band microwave synthetic aperture radar (SAR) and the capability to change attitude to acquire images at both sides of the ground track.



Source: ASI, Italian Ministry of Defence

Interferometric Cosmo-SkyMed image of Mount Etna.

Source: ASI

Cosmo-SkyMed.

The system was designed for flexible image acquisition modes, short revisit time and a very quick system response time between tasking orders and product release.

COSMO-SkyMed is interoperable with other Earth observation missions. The ability to observe the entire Earth, metre by metre, during day and night in all weather conditions using radar technology responds to Europe's Global Monitoring for Environment and Security (GMES) objectives.

In the context of the European Security and Defence Policy (ESDP), COSMO-SkyMed has created new opportunities for Italy to develop its international and bilateral relations in the field of security and defence. ■

Farmstar

Guidance from space for environmentally friendly precision farming

Farmstar is a French crop management support service that permits precision farming with high-resolution maps generated from satellite imagery and collateral information in near-real time. Its commercial use by farmers is spreading fast and is rendering improved performance at reduced environmental impact.

Farmstar is an operational commercial service that has been offered to a growing number of French farmers for wheat since 2002, rapeseed since 2003, barley since 2005 and maize since 2006. It is a national project based on SPOT satellite imagery. It is now operated by EADS Astrium through Infoterra France in partnership with the Regional Council Midi Pyrénnées in the South West of France and the farmer-owned applied agricultural research institute ARVALIS.

Farmstar provides timely, rich mapping information at the scale of individual fields to help with the conduct of optimised crop farming. It offers a comprehensive, practical solution for managing inputs, monitoring the crops and identifying crop stress. Where applied, Farmstar has helped farmers to achieve up to 30 percent reduction in the use of fertilisers and 20 percent less pesticides and herbicides. In 2006, 100,000 square kilometres of farmland were serviced by Farmstar in France, involving 8,000 subscribed farmers and nearly 25,000 plots.

Through cooperatives, farmers take out a subscription for the plots they are cultivating. They provide the necessary base information such as crop variety, date of sowing, depth of soil and irrigation. Infoterra translates this into a plot database. Before the crop period begins, farmers receive a start-up kit with a detailed plan for each plot (surface area, type of soil) and annual crop information (a farming summary).

The plot database enables Spot Image to optimise image acquisition and processing. The number of images to be acquired to ensure total coverage of each site varies according to cloud conditions. For the 2004 campaign, an average of 1.4 images had to be acquired for each site to cover 99 percent of the target plots. With these images, Infoterra draws up the crop-status and recommendation maps and related advice.

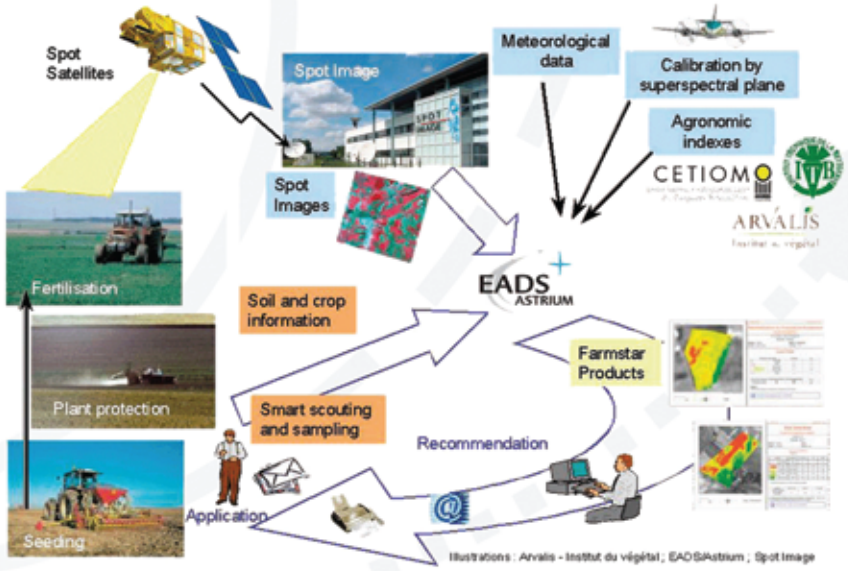
The resulting maps are archived and sent by post, fax or e-mail to the farmers, at the earliest five days after the image was acquired. Depending on the type of crop monitored, farmers will receive 3–6 advice maps per campaign.

With Farmstar, farmers are able to take informed management decisions during the entire growing season. In addition, regional actors, distributors and collectors benefit by being better able to oversee and forecast production and quality, scout fields and deliver advanced services to farmers.

Targeted information is provided at all key stages of the cultivation cycle. All parts of each field can be viewed at a glance. This allows subscribers to determine irrigation requirements, apply fertiliser, weed and pest control only if and where needed, prepare for harvest and optimise seeding varieties and density according to the heterogeneity of soil types and growth conditions within individual fields. The ability to understand in-field variation is a significant added value offered by Farmstar.

Rapid uptake proves that French farmers are eager to exploit technological innovation where it makes economic sense. The average annual cost of a Farmstar subscription is 10 euros per hectare. The achievable productivity gain is much higher, above all due to reduced fertiliser expenses.

Farmstar is an operational program that is undergoing further development. Infoterra and ARVALIS are in the process of extending their Farmstar activities to other countries in Europe and worldwide. This requires in-depth understanding of agricultural practices of these countries. The services offered need to be adapted to each case. ■



Respond

Instant maps for rapid humanitarian aid and disaster response

With strong participation of one GIS provider and two aid agencies from the Czech Republic, the international geo-information service Respond, a part of GMES, provides valuable instant mapping products based on satellite imagery in support of aid and assistance in disaster situations.

Respond is part of the European Global Monitoring for Environment and Security (GMES) programme as one of the GMES service elements (GSE). This five-year, two-stage project was initiated in 2004. It is operated by Infoterra UK together with an international consortium that includes the Czech company Gisat along with the EU's Joint Research Centre, Reuters AlertNet, UNOSAT, DLR and many others.

Respond works with the humanitarian aid community to improve access to maps, satellite imagery and geographic information and increase the efficiency and effectiveness of international humanitarian relief efforts. By offering improved and timely access to precise, current maps and reliable geo-information, the project helps to improve decision making, logistics, coordination and the supply of direct help in the field.

Respond has been providing a broad spectrum of value-added mapping products based on state-of-the-art Earth observation data and related processing and dissemination techniques.

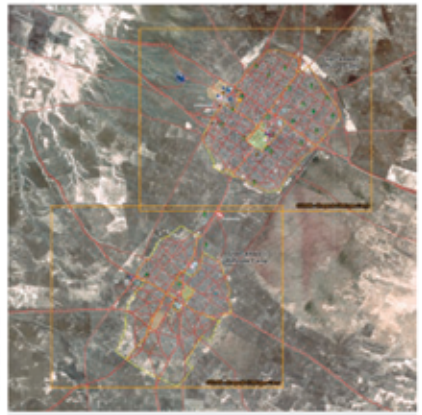
Among the users of Respond services are numerous United Nations institutions such as the Office for the Coordination of Humanitarian Affairs (OCHA), Office for Project Services (UNOPS), Disaster Assessment and Coordination Team (UNDAC), Development Programme (UNDP), Department for Safety and Security (UNDSS), High Commissioner for Refugees (UNHCR) and the World Food Programme (WFP). In addition, Respond products have been prepared for European development agencies such as AECI (Spain), DfID (Britain) and SDC (Switzerland), the International Strategy for Disaster Reduction (ISDR), German disaster response agency Technisches Hilfswerk (THW), the humanitarian aid organisations Caritas International and InterSOS, Medical Emergency Relief International (Merlin) and several international and national Red Cross/ Red Crescent organisations.

RESPOND GMES Services Supporting Humanitarian Relief, Disaster Reduction & Reconstruction

In the Czech Republic, two non-governmental humanitarian user organisations are involved in Respond: the Adventist Development and Relief Agency (ADRA) and the relief and development organisation People in Need (PIN). These two Czech agencies together were the lead users for one sixth of the total of map sheets produced by the entire Respond network in 2007–08, plus user support information and training sessions.

The validation and assessment of the mapping outputs are an inseparable and ongoing part of the production cycle. Through contact with users during each mapping activity, producers receive immediate feedback. At the end of each production stage, the users are prompted to provide feedback and specify benefits, highlight strong or weak points, provide comments and make proposals. This cooperation is crucial for delivering reliable, helpful services for coping with the real-world challenges faced by users.

The Czech producer involved, Gisat, has gained good knowledge of target user requirements in the area of humanitarian and development aid through this process. This helps it to tune the services provided for increased effectiveness and usability. Work under the project has led to better operational mapping methodologies and approaches.



Source: DLR

Respond map of two camps in Eastern Sudan for refugees from Eritrea and Somalia.

For the Czech users involved, participation in Respond has served as an introduction to the area of satellite mapping and GIS applications.

For providers and users, Respond has contributed to better access to Earth observation data in the case of emergencies. Unrestricted, swift access to satellite imagery and other ancillary data is important, especially in cases that require rapid activation of the mapping process.

In summary, Respond has been a success story. It has strengthened the preparedness of the European and international disaster relief community to provide emergency response. It has given a boost to the cooperation between the humanitarian aid community and geographical information service providers. The main beneficiaries of such cooperation are people affected by crises and catastrophic events. ■

SIGUR

Capacity building for flood disaster response

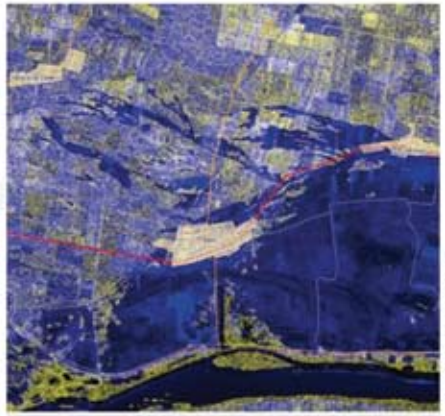
In the major recent floods in Romania, satellite imagery from the SIGUR service demonstrated its large practical value for emergency management. SIGUR will enable Romania to cooperate effectively with the operational disaster response mechanisms developed in GMES and the EU.

Since 2005, major floods have occurred in Romania at least once a year, each causing significant damage. The International Charter "Space and Major Disasters" was invoked at four occasions in this context. Space imaging technology is an important enabler for the rapid management of floods and other possible disasters. In particular, the ability to quickly evaluate the location and extent of damage supports the authorities in their decision-making on provision of immediate and equitable assistance to affected regions.

In the interest of capacity building and technology development in this field in Romania, SIGUR has been implemented as a national four-year project, until 2010, by the Romanian Space Agency (ROSA) with funding from the Ministry of Education and Research in cooperation with the national meteorological administration Meteo Romania, the Advanced Studies and Research Center in Bucharest, the Romanian Centre for the Utilisation of Remote Sensing in Agriculture (CRUTA) and the Bucharest Polytechnic University.

The strategic objective of the project consists of the conception and implementation of a base service that will use the most recent remote-sensing data in order to offer a quick response to emergency situations. The main users of SIGUR are the General Inspectorate for Emergency Situations in the Ministry of Interior and Public Administration and local or regional administrations. SIGUR also serves the Prime Minister, the Ministry of the Environment and other ministries and agencies in Romania.

Routinely, the service delivers basic products to the end users, such as land cover, infrastructure and administrative maps. In emergency situations, these are complemented by instant targeted products such as maps of the affected areas, the spatial and temporal dynamics of the phenomena that cause the event and geo-information about the damage incurred.



Source: ESA, ROSA

ERS image of the 2006 Danube flood.

SIGUR is built on existing local technical standards for interoperability with the National Management System for Emergency Situations, but it also interfaces with European standards to achieve good compatibility with the future GMES Emergency Response Core Service. The project as a whole is designed to be compatible and in support to the ESA/EU Global Monitoring for Environment and Security (GMES) programme. Achieving better compliance with the relevant EU policies in the field of emergency response is one of the major benefits of the project.

During 2006–08, the SIGUR service was activated for the three flood crisis situations in those years. It was considered effective by the national authorities and international partners. Utilisation of the SIGUR system in the crisis committees in charge is expected to augment their intervention efficiency because it allows decision-makers to base their actions on realistic knowledge of the given phenomenon's dimensions and range. This should help to limit and reduce material damage and casualties.

The service is designed and implemented in accordance with end user needs. It is being integrated more closely with the National System for Emergency Situations Management. SIGUR ensures that the service will be ready for its expected operational use. The services are to be standardised and finalised by spring 2010 and kept in tune with the progress of the EU GMES SAFER core services.

In the experience that has been gained from applying SIGUR services during the recent flood emergencies in Romania, space technology has indeed clearly demonstrated that it offers valuable contributions that respond to immediate societal needs. The availability of SIGUR imagery led to an increase in confidence and feeling of security in Romanian society. ■

Source: CNES, ROSA

Map of areas flooded in 2005.

Vega

European launcher for smaller satellites

The Italian-led new small ESA launcher Vega, scheduled to enter service within two years, is designed to make access to space easier, quicker and cheaper. It drives innovation in launcher technology and expands Europe's autonomous access to space to the important field of small payloads serving institutional as well as commercial users.

The Vega small launcher, developed in ESA since 2001, is due to become operational in 2010/11. It can launch satellites of up to 1500 kg into polar orbits and other low Earth orbits (LEO). This class represents a large amount of payloads, including many space-science and Earth-observation satellites.

Vega will offer a cheaper way to launch such satellites than available in Europe now. Launches will cost an estimated 15–20 percent less than with a U.S. launcher. This gives easier access to space to small and medium enterprises, universities and research centres. Vega can also place multiple payloads in orbit.

The new launcher fills a gap in European capabilities and expands the range of European independent and affordable access to space. It complements Ariane-5 which is optimised for large satellites on missions to geostationary transfer orbit (GTO) and for very heavy payloads to LEO. Vega also complements Soyuz, which is tailored for carrying medium-weight payloads to LEO and smaller spacecraft to GTO.

Italy has a leading role in the Vega development programme in ESA as the main "shareholder" with a contribution of 65 percent of overall cost. Other participants are France, Spain, Belgium, the Netherlands, Switzerland and Sweden.

The launcher consists of three stages with solid-propellant motors developed by Avio with innovative technologies – including carbon-composite casing and nozzle and a re-startable liquid-propellant upper stage, the Attitude Vernier Upper Module (AVUM).

Development and qualification of Vega are near completion. Only the third-stage engine Zefiro 9A needs a last test in Sardinia in early 2010. The ground-segment infrastructure is finalised at the European launch base in Kourou.

Vega is expected to serve the needs of both commercial and institutional users, including the launch of Earth monitoring satellites for safety and security. The recent evolution in Earth-observation technologies permits a reduction in satellite mass. Optical and infrared detectors have become much smaller. Even in radar observation, all-weather surveillance can now be performed with satellites of about one ton mass.

ESA's future Earth-observation programmes are based on multiple small missions instead of another single large satellite like Envisat. Assessments of the potential market for a European small launcher estimate that the number of governmental missions using a small launcher will initially be of the order of two per year, and may grow to four per year after 2015.

In communications, two types of missions have been identified for small launchers such as Vega: "Little LEO" constellations for data transmission, messaging and store-and-forward services, and "Big LEO" network constellations.

For the latter, spares management is a real challenge. The ability to replace a failed spacecraft within less than two months would allow major savings. With constellations relying on a very large number of satellites, the market potential for small launchers is linked to the need for such replacements.

Vega follows an approach that makes optimal use of existing expertise. This includes the technical expertise of the French space agency CNES, the commercial know-how and infrastructure of Arianespace, the launch-technology base of Avio's ELV SpA team and the management of ESA.

For Italy, Vega is a source of increased industrial and scientific capability in launcher technology. For ESA as a whole, Vega helps to maintain the competitiveness and affordability of European launchers in response to market demands and drives innovation in launcher technology. It also supports European industry, technology and research capabilities and fosters the creation of a European institutional market for launchers. ■

Robotics and research in space

Good investments for valuable benefits at home

Germany is determined to fully exploit the unique research opportunities offered by the ISS and extend them into the future. Human and robotic space activities complement each other. The fascination of reaching out to the Moon and beyond is key for attracting new scientists and engineers. Spin-offs from space robotics benefit our society.

Robotics in space and research on the International Space Station (ISS) are both pursued in support of finding new solutions for practical problems on Earth, with robotics and manned spaceflight complementing each other. Space robotics cannot fully replace human activity in space, but it can help to avoid unnecessary risks. Robots can be used on preparatory missions at reasonable cost.

Investment in robotics technology offers excellent added value with regard to terrestrial applications. The main benefit of robotics in this sense lies in spin-offs to terrestrial applications such as logistics, manufacturing and medical technologies for the benefit of all citizens. Robotic technologies also help us to cope with the problem of space debris and in-orbit servicing of satellites.

Research onboard the ISS is the greatest science project and technological achievement in the history of mankind. It stands as a bright symbol for high-value research in worldwide peaceful cooperation between nations. It has already delivered numerous new discoveries in medicine and basic research although it has only just started to be fully operational after the launch of Europe's orbital module Columbus. New developments in biological and materials sciences that are expected from research work in the orbital laboratory in microgravity conditions will be crucial for life on Earth.

The Columbus orbital laboratory.

The benefits extend not just to scientists, industry and space agencies but to society as a whole.

Science is a cultural task. It reaches beyond mere utilitarian aspects. Exploration and science in space, both manned and robotic, make essential contributions to our understanding of the origins of the universe and life as such. Robotics and astronautics are fascinating endeavours. They encourage young people to pursue careers in science and engineering, preserving and refreshing a vital resource that is necessary for securing the successful economic performance of our countries in the future.

Germany has embraced a large range of robotic missions for the years to come. This includes robotic missions to extend the lifetime of satellites in orbit (mainly communications satellites) and to de-orbit satellites. Above all, Germany is committed to a mission to the Moon by 2014, preferably with a lander plus rover or crawler, if possible in cooperation with international partners. While the Moon is the first goal, Germany also wants to enable further research excellence with orbiting and landing probes to the solar system.

With regard to the ISS, finally the time has come for full-scale exploitation under ESA's European programme in life and physical sciences (ELIPS) to derive the best possible use of the large European investment in orbital laboratories for life and material sciences. For the future, this includes the perspective of replacing current research facilities with new ones. The excellent research on ISS justifies our past investment. It must be extended to include private companies as scientific users of the ISS. The ISS also serves as a test bed for further exploration missions to the Moon or Mars.

Source: DLR

Lightweight Robot Hand.

The option of extending the use of the ISS seems likely to be taken. There are studies about the technical status of ISS modules with regard to their utilisation beyond 2020. For the time after the phase-out of the U.S. Shuttle, all partners must find a new agreement that secures continued full operation of the ISS and provides the necessary logistics support for accessing the optimum capacity of the ISS with six astronauts.

Public interest in space has always been high in Germany. Facing the worldwide economic crisis, space can be presented as an enormous asset of technological progress in industrial countries. Justifying huge investments in robotics is going to be easy if the effort is focused on spinoffs to terrestrial applications for the benefit of society. This has particular relevance in view of demographic change and the need for new, better medical and rehabilitation treatment for an ageing population. ■

GTSP and PTF

Ultra-precise Galileo time service

With active Polish participation, the EU's time metrology community is building the basis for a rapidly expanding Galileo-related downstream industry that promises long-term growth, jobs and wealth creation in Europe.

The two projects presented here help to create the cutting-edge ground-based time service infrastructure for the Galileo system.

Today's and tomorrow's global and regional satellite navigation systems rely on the powerful, new precise timing technology that has developed rapidly in all major countries in recent years, including the United States, the Russian Federation, China, Japan and India. In order for the European Union (EU) to ensure its independence and to benefit politically, technologically and commercially from this new technology, the decision to develop Galileo as Europe's own satellite navigation system has been essential.

This European Galileo satellite navigation system gives rise to a wide range of downstream technologies, including attractive mass applications such as hand-held navigation and time receivers integrated into everybody's mobile phone. It is not a far-fetched vision to predict that billions of small receivers will synchronise all kinds of human activities on Earth. This includes, for example, the control and automation of traffic and transportation.

The extremely high timing accuracy of Galileo enables improved satellite navigation and worldwide time synchronisation. Such technology depends on well-coordinated atomic clocks and accurate time transfer. Poland is involved in two key European projects that underpin Europe's ability to build the necessary autonomous time infrastructure to enable the growth of a rapidly expanding Galileo industry.

The first is the Fidelity Galileo Time Service Provider (GTSP), a consortium of five time laboratories and a number of private companies that was formed in 2005 under an EU FP6 grant to create a European time reference for the Galileo system and develop the operational prototype facility for time-service provision to Galileo's first in-orbit validation satellites (IOV). The Space Research Centre (SRC) of the Polish Academy of Sciences is a member of this consortium.

The second project is the Galileo Precise Timing Facility (PTF). It is such an essential part of the on-ground Galileo infrastructure that redundancy is necessary to ensure a back-up. Therefore two separate Precise Timing Facilities are under development: one in Germany and one in Italy.

The group that develops the PTF located in Italy is led by the Turin Time Consortium (CTT) and includes the Italian Institute for Metrological Research (INRIM), ESA and a few private companies. A Polish team from the Astrogeodynamical Observatory (AOS) of SRC is involved in this consortium, providing time transfer modelling, coding and implementation. This ESA/EU project started in 2007, with co-funding from SRC.

The work on these projects is controlled by the European Commission and the European GNSS Supervisory Authority (GSA).

Source: ESA

Galileo time services: improving the quality of life.

The European Commission is satisfied with progress and is allocating further funds for continued progress of the Galileo-related industry to make the EU a major world player in satellite navigation and time synchronisation.

The two projects generate advanced knowledge and operational skills for creating the time infrastructure needed for Galileo. They support the further development of Europe's time metrology community, including the autonomous capacity to build atomic clocks and develop miniature time receivers.

The two projects provide a solid basis for the Galileo-related industry and contribute significantly to the perspective of steady long-term growth and wealth creation in this sector that offers many innovative and attractive downstream technologies, applications and services. During the coming decade it is expected to reach a turnover of 200 billion euros and create 200,000 high-quality jobs in the EU. ■

Broadband Reach

Internet access for rural and remote areas in Scotland

On behalf of the Scottish government, Avanti has been realising a variety of satellite-based broadband access solutions for rural and remote areas.

The success of the Reach project demonstrates that broadband delivery through communications satellites provides a viable solution for overcoming the digital divide across the European Union.

Under the Scottish government's strategy for extending broadband Internet access to all the people of Scotland, the Broadband Reach project delivers affordable and sustainable connectivity to the "not-spots" that lack coverage by existing networks. These areas affected by the digital divide are not only located in the Highlands and Islands of Scotland. They include communities across the whole of Scotland.

Earlier, the further expansion of Scotland's fixed-line broadband infrastructure (ADSL) had been encouraged. BT, the largest UK telecom provider, was commissioned to upgrade 378 Scottish telephone exchanges that were not commercially viable for broadband. Still, a substantial number of homes and businesses across Scotland remained beyond the reach of this

extended broadband network. Fixed-line technology simply could not deliver service to them.

The Scottish government then made a capital budget of £3.3m available to support the current project. Following an international tender, Avanti was chosen as the primary satellite broadband supplier. Avanti completed over 2,100 installations, placing satellite terminals at individual homes and businesses, creating WiFi communities linked to the Internet through a shared high-bandwidth satellite connection and deploying wireless last-mile access on the Black Isle. There is no solution that fits everywhere. With ADSL or cable, the maximum bandwidth is determined by locality. It is very low for rural populations. Small wireless clusters with satellite backhaul can be very cost-effective where fixed-line broadband is non-existent or of poor quality. Standalone satellite terminals are necessary in remote and rural locations.

After Avanti's roll-out of satellite broadband solutions was a success, the Scottish Executive awarded Avanti a follow-on contract for a regional extension programme to connect additional customers. With service take-up by half of those who had registered their demand, the project brought the rural areas on a par with the Scotland-wide broadband adoption rate of 53 percent (2009). This demonstrates that satellite broadband is the Internet solution for rural populations.

The Scottish government tender was technology-neutral. It made sure that all potential technologies could be considered. This gave value for money to the people of Scotland. The Scottish government enabled success through effective marketing, creating a sufficient platform of customers to attract industry interest. Central procurement offered better scale than community grants.

Other national and regional governments throughout the EU should consider the Scottish experience and recognise that similar satellite-enabled broadband solutions for rural and remote regions are viable and credible. They are invited to define their own technology-neutral procurement programs for addressing the digital divide in their countries.

When Avanti's HYLAS satellite is launched in mid-2010, it will cover large areas of Europe including Italy, Southeast Europe, Poland and Spain. Many countries face similar challenges as Scotland: a lack of infrastructure and funds prevents people and businesses from getting ADSL/cable broadband. Scotland's Broadband Reach project has shown how to bring fast Internet access to communities in such areas. ■

Source: Avanti Communications

HYLAS coverage map.

Medicin@Païs

Telemedicine services for remote areas

Using broadband satellite links, the healthcare infrastructure of rural, mountainous areas is lifted to a higher level through remote consultation and training. Doctors and nurses can access the expertise of university hospitals to offer better treatment and care to their patients and the elderly.

Medicin@Païs is a 3-year regional programme in 2009-12. It is led by the General Council of Alpes Maritimes (the regional government in Nice) and realised in cooperation with Thales Alenia Space and the Medical School of the University of Nice. The goal is to maintain and improve the quality of healthcare provision in mountainous and rural areas by offering remote training and advice to healthcare professionals and medical staff in these areas.

In the region concerned, rural hospitals are at a far distance from the centres of medical expertise on the Mediterranean coast. In particular, they do not possess sufficient expertise for addressing all the specific requirements of the ageing population. Psychiatric conditions, Alzheimer and cardiovascular incidents are on the rise. Local health staff are insufficiently prepared. A satellite-based telemedicine network has therefore been set-up to link rural hospitals with remote expert centres for diagnosis, treatment and care. Satellite technology provides guaranteed quality of service for applications such as videoconferencing, interactive training and video teleconsultation. The use of broadband satellite links for the communications channel between the urban consulting site and the rural users provides superior service compared to terrestrial networks, especially for reaching very isolated locations that would otherwise never have access to expert medical centres.

Medicin@Païs connects four hospitals at the coast in Nice with fifteen rural hospitals in the remote, mountainous hinterland through satellite communications. The users of the service include rural hospitals, convalescence clinics, care centres and nursing homes. The service supports general practitioners and nurses as well as experts in psychiatry, cardiology, dermatology and other fields. It is also used by the Alzheimer training association.

Remote consultation permits local, high-quality treatment and avoids expensive, risky transfers. Remote interactive training about Alzheimer, respiratory diseases, pain and bedsore treatment and other geriatric conditions empowers local staff to better help and manage elderly people. Feedback has highlighted the confidence-building effect of being able to connect with an expert for a second opinion or to confirm a diagnosis. One is not left to one's own devices for taking decisions. For medical staff, remote interactive training reduces travel time and risks. There is no need to leave work for more than the duration of the training. Interactivity permits question-and-answer sessions for improved understanding.

With a higher number of doctors and healthcare workers trained in up-to-date medical knowledge and skills by remote interactive instruction, the quality of patient care is improved. As a consequence, patients are likely to return home earlier after hospitalisation, leading to reduced costs while at the same time supporting the survival of the rural hospitals. The chance for continuing professional development of medical practitioners in isolated areas also helps to attract new doctors.

The leading role adopted by the government of Alpes Maritimes in promoting telemedicine has been crucial for the development and success of this project. The political impetus derives from the realisation that regional and social development depends on the provision of the same level of medical service to the whole population in all parts of the region. The rural population appreciates this improvement in healthcare infrastructure. People from the littoral centres are more likely to consider moving to rural areas again. Encouraging such moves is an element of urban and regional development planning.

Telemedicine is an activity that involves many actors. Its development cannot be supported by each rural hospital on its own. There is a need for a lead institution with sufficient decision-making power, funding and policy support to gather and manage all the actors under a unifying set of objectives and processes. In addition, the integration of communications, hardware and software requires a single systems integrator for the network as a whole and strong, continuous technical support to the lead institution and end users. ■

Proba-V

Continuity for vegetation monitoring

Proba-V (V stands for "vegetation") is a Belgian-led small satellite under development at ESA for launch in 2012. It is designed to extend the valuable long-term data set of the multispectral VEGETATION sensors for land-cover observation and provides superior technical capabilities.

Data from such multispectral vegetation sensors has been available since 1998. This data series needs to be kept running for operational services. Proba-V data will provide a key contribution to global environmental science and climate monitoring.

Since 1998, the low-resolution multispectral imaging instruments called VEGETATION onboard the French SPOT-4 and SPOT-5 satellites have monitored and mapped worldwide vegetation every ten days. This body of data provides essential information to an ever-expanding user community on issues such as crop yields, droughts, desertification, changes in land use and vegetation, deforestation etc.

These current instruments are expected to stay in operation until around 2012. To help ensure that these vital data sets are continued, ESA is currently building the Sentinel-3 satellites under the European GMES programme. However, users remain concerned over a likely gap in VEGETATION data between SPOT and the Sentinel-3 satellites.

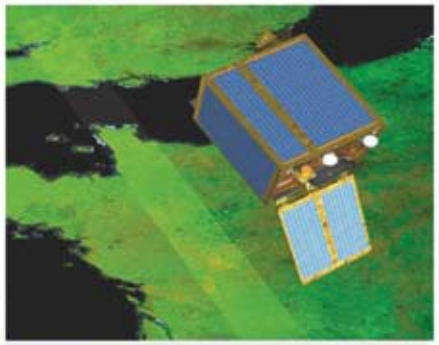


Image courtesy of Verhaert Space

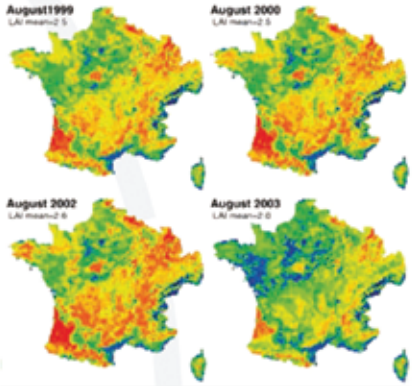
Proba-V.

Proba-V will fill this data gap, sustaining VEGETATION data time series and safeguarding their scientific value for future generations. The Belgian Science Policy Office (BELSPO) initiated the development of this small satellite mission in 2008, based on its own Proba experience. The mission, called Proba-V, complements the Sentinel-3 satellites and is an important Belgian contribution to GMES and the Global Climate Change Initiative.

VEGETATION data is required by 6,800 users worldwide. The number of users grows by 500 each year. With the impact of GMES, it is likely to expand dramatically. The UN Framework Convention on Climate Change is in desperate need of essential climate variables linked to vegetation. Proba-V, together with the VEGETATION archive, will be an indispensable tool for drawing valid conclusions on changes in land cover.

The Flemish Institute for Technological Research (VITO) has been in charge of data archiving, processing, product generation and distribution of the existing SPOT/VEGETATION instruments. VITO is ideally placed to play the same role for Proba-V.

The main challenge for the Proba-V project is to reproduce the specifications of the previous VEGETATION instrument using state-of-the-art advanced technology. The old VEGETATION instruments weigh about 200 kg and are extremely complex. The entire Proba-V satellite, including the instrument, will only weigh about 100 kg.



Source: Météo-France

Multi-annual comparison of the Leaf Area Index, a measure of green plant density, over France from SPOT/VEGETATION data.

The power consumption of the satellite as a whole, using the proven Proba-1/2 platform, will be considerably lower than the power consumption of the old VEGETATION instrument. The instrument will consist of three 3-mirror astigmatic (TMA) telescopes, each covering a part of the field of view. The pixel size will be 300 metres by 300 metres – ten times better than at current.

In the context of GMES and GEO, Proba-V will provide essential information on the worldwide evolution of vegetation and the causes of climate change. In view of the likely gap in VEGETATION data between the SPOT satellites and the Sentinel-3 satellites, the decision to start Proba-V in 2008 has proven to be just in time. Given the growing demand for data, the success of Proba-V seems guaranteed. ■

SEOSAT/SEOSAR

Spanish Earth observation satellites

Spain is building a national Earth observation satellite system consisting of an optical and a radar platform, the latter being defence-oriented.

The new system will help to better satisfy the data requirements of various user communities in science and government. Internationally, it enables Spain to share imagery with others and support GMES/GEOSS.

The Spanish Earth Observation Satellite System is a 6-year national programme funded by the Ministry of Industry, Tourism and Trade and the Ministry of Defence. It is based, in the first instance, on two satellites: a high-resolution optical satellite called SEOSAT/Ingenio and a radar satellite, with SAR technology, called SEOSAR/Paz. Both have entered the final stages of development (phases C/D).

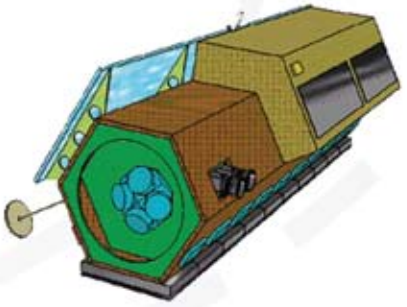
The two complementary satellites will provide both high-resolution optical and radar images within a short revisit period. They can obtain an image of any place in the world every 24 hours. The Ministry of Industry has entrusted the Spanish Centre for the Development of Industrial Technology (CDTI) with carrying out the technical and contractual management of SEOSAT/Ingenio. To this aim, CDTI has signed an assistance agreement with ESA. The radar satellite is managed by the Ministry of Defence. The Spanish National Institute for Aerospace Technology (INTA) and Hisdesat are the operators of the whole system. The overall number of different companies and bodies involved makes for a complex programme. From the beginning, this required strong communication between the industrial actors in charge of the development of the satellites and the end users.

By developing this national Earth observation system for the systematic acquisition of land imagery, Spain will be able to cover a range of user needs. Earth observation has long been a field of major institutional investment worldwide due to its utility for environmental and natural risk management, security and defence.

Nevertheless, there is a lack of data to cover user needs. The Spanish Earth Observation Satellite System will improve this situation by increasing the available Earth observation data.

At the national level, the system will cover most of the user needs of Spanish civil, institutional, government and defence users. It serves institutes and research centres as well as various ministries and regional governments in application areas such as environment, agriculture, fisheries, science and innovation, industry, tourism and defence.

At the international level, it may benefit other European users in the framework of GMES and GEOSS. It will enable Spain to exchange data with other countries and contribute to European and international initiatives. In addition, the system is a major impulse for the development of Spain's national space industry, including satellite and equipment manufacturers as well as software and applications providers. ■



SEOSAR/Paz.

SEOSAT/Ingenio.

Technical description of the two satellites:

SEOSAT/Ingenio

Orbit	Sun-synchronous orbit
Altitude	690 km
High resolution imaging:	
– panchromatic	2.5 m
– multispectral (RGB, near IR)	10 m
Daily coverage	over 2.5 million km²
Swath	up to 60 km
Lateral access	± 35°
Local time of descending node	10:30 hrs
Repeat cycle	49 days
Minimal revisit time	3 days (35° angle view)
Lifetime	7 years

SEOSAR/Paz

Orbit	Sun-synchronous orbit	
Altitude	514 km	
High resolution imaging:		Swath:
– spotlight	less than 1 m	5 km
– strip mode	3 m	30 km
– scansar	under 15 m	100 km
Daily capacity	at least 200 images	
Lateral access	± 35°	
Local time of descending node	06:00 hrs	
Lateral access	15° – 60°	
Minimal revisit time	5 days	
Mass	1350 kg	
Lifetime	5 years	

FORESAT

Sustainable forest monitoring with satellite and ground images

This proposed project combines geo-referenced woodland photographs taken on the ground and related satellite images of forest areas in a national database.

It permits the government and citizens to monitor the state of forests and detect significant changes. This interactive, participatory application of space technology supports law enforcement and environmental protection and involves the public actively.

FORESAT is a highly innovative project idea for developing a forest viewing system and making data on the state of forest regions available to government authorities and citizens by means of a public, interactive geospatial portal. The selected approach involves building an operational database and developing data-fusion technologies that combine random, amateur geo-coded ground pictures with Earth observation satellite data.

The main policy problem addressed by FORESAT is the need to monitor and control natural and artificial deforestation including illegal logging and clearance in Central and Eastern Europe. FORESAT can demonstrate the effectiveness of geospatially enabled instruments and Earth observation satellites in supporting sustainable forest management.

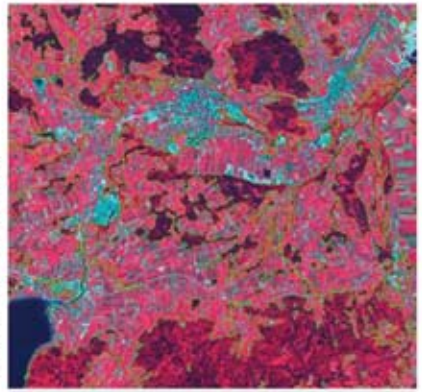
It can also help to increase the awareness of possible effects of climate change due to inefficient forest management.

The Romanian Space Agency (ROSA) intends to propose FORESAT as a 4–6 year national project with international cooperation and possible funding from the Romanian government, ESA and the European Commission (DG ENV, DG RES, DG ENTR, EU Structural Funds). FORESAT aims to support the implementation of the Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).

The FORESAT system will draw on digital landscape pictures of local woodland acquired by individual citizens, tourists and community organisations on a voluntary, random basis. This involves portable cameras that are equipped with satellite navigation or positioning capability and can transfer images either via mobile wireless phone networks or via communications satellites. The acquired images are transmitted in real time to an operational monitoring centre. By means of semi-automated data-fusion and change-detection algorithms, the resulting data will be:

- processed, stored and fused with periodic Earth observation satellite data in order to improve the resolution of local information, detect sudden changes and reduce the specific update time of the database through information gathered from satellites;
- disseminated to the appropriate local and central authorities in charge of forest monitoring for long-term environmental and short term law-enforcement purposes;
- published on a high-resolution geospatial portal (similar to Google Earth) to be widely accessed by the public and the media.

The main users targeted by the proposed system are the Romanian government, public administration and law enforcement agencies, as well as all interested European organisations. In addition, it would serve community activists, environmental protection groups and the general public. The system could also be of value to universities and high schools with courses in space applications, environmental management, geographic information systems and so on.



Source: Joanneum Research

Example of a forest area classification map generated in the GMES Service Element Forest Monitoring.

Romania is currently developing image-processing software (Project LEOWORKS) for ESA to be freely distributed in high schools and universities. ESA has developed a wide network of users across Europe in this context. This community might be the first to experiment with FORESAT.

One of the major attractions of FORESAT is its hands-on approach to the utilisation of satellite data. The project does not only give the public direct access but actually builds on active contributions by citizens to a decision-support tool that is driven by space technology. FORESAT's strength is further underpinned by its low development and implementation costs. ■

The European Interparliamentary Space Conference (EISC)

The European Interparliamentary Space Conference (EISC) was established ten years ago as a permanent forum of co-operation between European national parliaments on space-policy issues. It facilitates information exchange and co-operation on current and prospective space programmes between European national parliaments.

The EISC framework improves mutual understanding of national space policies and provides a forum for analysing and discussing the major issues at stake in the European space sector.

Permanent Membership is open to national parliaments of the Member States of the European Union or of the European Space Agency that have created a parliamentary body dealing with space affairs.

There are at present nine permanent members: Belgium, Czech Republic, France, Germany, Italy, Poland, Romania, Spain and the United Kingdom.

National parliaments that have created a parliamentary body dealing with space affairs outside Europe can acquire the status of a Member. The Russian State Duma has joined EISC as a member. National parliaments of the European Union or European Space Agency Member States and/or international organisations that have not created a parliamentary body dealing with space affairs can become associate members.

Conclusions of the annual conference are agreed unanimously by the Permanent Members present. Each calendar year, the Presidency and Secretariat of the EISC are held by one of the Permanent Members. The European Space Policy Institute (ESPI) in Vienna provided organisational support for the Xth and XIth EISC conferences in Prague and London.

More information can be found on the website at www.eisc-europa.eu.

XIth European Interparliamentary Space Conference (EISC)
United Kingdom
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Galileo image source: ESA


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