

Telehealth

Space technology for health



C N E S activities in the area of telehealth

Space for Earth

Space techn

Developing Telehealth solutions are based, among other things, on space technology with a view to improving our capacity of reacting to emergency health situations in distant or remote places. Telehealth enables healthcare personnel (doctors, nurses, firefighters, institutions and scientists, etc.) to effectively communicate over distance with each other and with patients.

How does telehealth work?

- Healthcare professionals and local administrative staff work together to define healthcare and logistics needs, as well as the clinical and scientific protocols specific to their activities.
- Industrial players then set up the technical system architecture required for telehealth operations, combining terrestrial resources and space technology (remote sensing, radiocommunications, data gathering and global positioning). They implement the defined protocols.
- A pilot phase allows end users to gradually become more familiar with the system and is followed by an operational phase.

Observing the Earth from space plays a key role in estimating risks to human, animal and plant life.

It opens up access to better quality medical care for everyone, improving our knowledge of the factors involved in the ●●●

- 1 Improving access to healthcare
- 2 Environment/climate/health
- 3 Crisis management
- 4 Education and Training

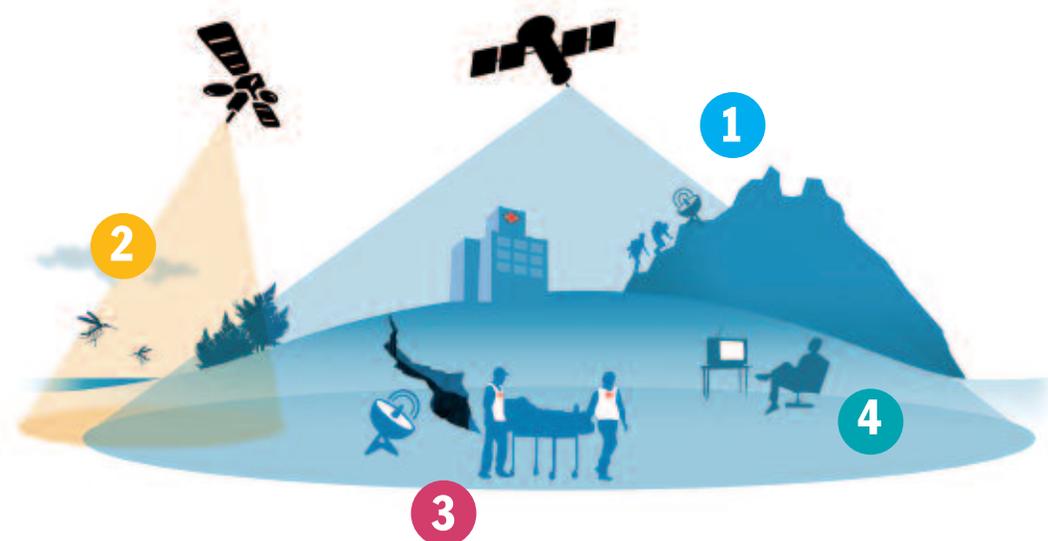


Diagram showing how a Telehealth system works

ology for Health

●●● emergence and spread of epidemics. Humanitarian aid operations following major disasters (natural or industrial disasters, wars, terrorism, etc.) are areas in which space technology provides a contribution now seen as crucial for the health sector.



An electrocardiogram sent between two distant sites



Treating disaster victims on-site

© EC/ECHO/Anne-Françoise Moffroid, 2007

Space technology improves our ability to observe, measure, compare and understand phenomena linked to health. It is used to ensure a continuous flow of quality information. The services available are thus unique, allowing greater access to communication resources for as many people as possible, anywhere and in any circumstances, at a minimal cost and covering the planet to provide positioning and Earth observation services.

Since 1998, CNES, the French National Space Agency, in conjunction with its partners, has been involved in the development of telehealth applications focused on four key areas: improving access to healthcare, environment/climate/health, crisis management and education and training.

This rich, varied offer includes telemedical kits used for teleconsultation at remote or mobile sites, humanitarian containers deployed in the event of natural disasters or conflict situations to improve emergency aid to victims and space instruments used to monitor epidemics, etc.

This brochure explains more about all these tools and services.



Ultrasound performed remotely thanks to a telemedical kit

The right term

Telehealth is a general term that encompasses:

- telemedicine, providing care from a distance (teleconsulting, teleassessment, remote monitoring, robotic teleoperation and teleultrasound),
- teleepidemiology (study of the interaction between the environment, climate and health),
- teletraining or distance learning (classes online),
- teleeducation and teleprevention (educating patients at home).

Who benefits from telehealth?

Using telehealth tools depends on cooperation between the professionals that need practical and reliable solutions, including:

- healthcare professionals
- patients
- civil protection personnel
- NGOs
- international organizations (UN, WHO and WMO, etc.)
- government institutions (e.g. the Ministry of Health)
- professional staff at mobile sites, such as oil rigs and aircraft, etc.
- insurance firms

What can Space do for Health?

Satellite communications, Earth observation and global positioning are just some of the space-based technologies that can help:

- provide fair and equal access to healthcare for everyone,
- speed up development in under-developed countries,
- improve our understanding of the factors involved in the emergence and spread of epidemics,
- improve forecasting of natural disasters.

Telehealth: des offres à votre service

1

dedicated services

Improving access to healthcare

Teleconsultation satisfies a need to open up access to healthcare. It can be performed at remote or mobile sites (on a plane or boat) and makes it possible to provide access to healthcare in remote regions that are difficult to get to or where there are no healthcare services. Teleconsultation also plays a crucial role in the medical response following natural or industrial disasters or armed conflict, or when large crowds of people gather together (demonstrations, etc.). Satellite links can be used to consult a specialist (cardiologist, pediatrician, gynecologist, dermatologist, parasitologist, etc.) at sites where there are no permanent or temporary terrestrial communications links.

PERSONAL ACCOUNT

Prof. Philippe Arbeille
CHU Trousseau/Tours

“Ultrasound is the primary examination imaging technique used in emergency situations. Satellite technology can be used to remotely perform an ultrasound in real time from a specialist university hospital on a patient located in a remote or hostile place (desert, tropical rain forest, contaminated area, etc.). A robotic arm reproduces the movements of the specialist’s hand thanks to an ultrasound probe placed on the patient. Hundreds of such examinations (abdominal and fetal) have been performed successfully thanks to the use of space technology.”

Remote ultrasound performed in a remote or hostile environment



Thanks to the different solutions developed and monitored by CNES and its partners, teleconsultation promises to become a way of improving existing healthcare networks: more efficient and faster treatment of patients, an end to the isolation of practitioners, access to and equality of healthcare for all... It is also the subject of special cooperation projects designed to improve the telemedicine system on aircraft.

Other information and positioning systems are currently being examined (interactive nursing terminals, monitoring dependent patients, etc.) with a view to simplifying the work of different healthcare professionals in caring for patients in the home (biomedical data acquisition, records of diagnosis and treatment, etc.).

Portable telemedicine workstation developed by CNES and MEDES.
Aim: to gather information and transmit it to a medical dispatch center.

© CNES/Anne Laure Huet



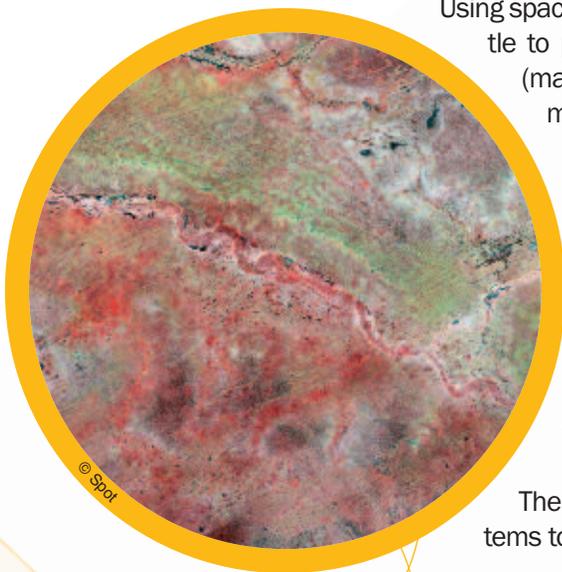
Monitor, predict and prevent epidemics

As regards monitoring epidemics, merging health data with environmental and climatic data gathered on the ground or by observation satellites (data on water, air, vegetation and soil) can be used to identify the conditions likely to cause diseases to develop and to gain a deeper understanding of the mechanisms involved in the spread of disease.

Using space-based techniques in this field is a major step forward in the battle to prevent diseases transmitted through water, the air or carriers (malaria, Rift Valley fever, yellow fever and dengue, etc.), which cause millions of deaths each year across the world.

Within the framework of cooperation projects developed on the basis of the working groups and consortiums in which it is involved, CNES is active in Africa (Senegal, Niger and Burkina-Faso), South America (Argentina, Paraguay and Bolivia), Asia (China and India), in the Maghreb (Algeria, Tunisia and Morocco, as well as in the French Overseas Departments and Territories, such as Guyana and Réunion Island, setting up epidemic monitoring networks.

The ultimate aim of these projects is to set up early-warning systems to predict epidemics



Above: High spatial resolution satellite image (SPOT 5), detecting pools of water (up to 100 square meters), related plant cover and turbidity. Aim: to assess the potential areas inhabited by mosquitoes in high-risk zones

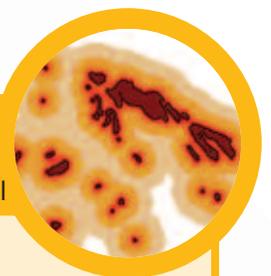
Below: Barkedji pool (Senegal)



PERSONAL ACCOUNT

Dr Jacques-André Ndione,
Climatologist at the CSE in Senegal

“The CSE (Ecological Monitoring Center) in Senegal uses satellite data and products to improve the quality of monitoring farmland (characterization of the period of crop installation, analyzing vegetation growth conditions and tracking grazing patterns). In addition, since 2003, the CSE has forged a sound and productive partnership with MEDIASFrance to develop research in the field of Environment/Climate/Health and design new satellite-based decision-aid tools. The resulting early-warning system is highly appreciated by the Senegalese authorities.”



Zone potentially inhabited by mosquitoes (ZPOM)

3 Crisis management

Better management of major humanitarian crises

Every year, all over the world, humanitarian crises occur due to industrial or natural disasters (tsunamis, hurricanes and earthquakes, etc.) or terrorist attacks. Conventional communications are often out of service. A period of improvising resources begins and it becomes difficult to coordinate emergency response operations in the area struck by the disaster. Telecommunications, Earth observation and GPS satellites can be mobilized at any time and from anywhere in the world to help deal with humanitarian aid operations. They ensure secure communications and data interchange with remote centers (hospitals, ambulance services and civil security forces, etc.).



Humanitarian containers are used to provide remote medical aid to the victims and local populations. Another tool developed by CNES and the European Space Agency is the International Charter on Space and Major Disasters. The aim of this Charter is to achieve a unified satellite data acquisition and delivery system for use in the

event of a major disaster, regardless of whether the cause is natural or technological. Its use may be requested by the civil protection, defense or security organizations of one of the authorized members.

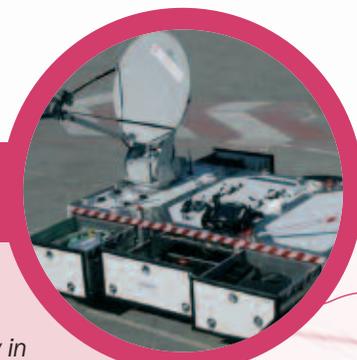


International Charter on Space and Major Disasters. An initiative that aims to strengthen international cooperation in providing humanitarian aid, by making emergency services and the organizations responsible for aiding disaster victims more efficient.

PERSONAL ACCOUNT

Dr Gérald Egmann, Head of Ambulance Services in Guyana

“Guyana’s ambulance service, in partnership with CNES, is developing a state-of-the-art communications and control tool that is autonomous, adapted for use in tropical areas and easy to deploy in remote or disaster-struck areas. This is known as the PSMA, or Poste de Secours Médical Avancé (advanced medical response unit) and can be used to establish a tactical communications network and collect a very broad range of information (medical, epidemiological and environmental, for instance) that can be transmitted by satellite to the emergency response coordination center to plan, support and coordinate emergency operations. It will be possible to deploy this health crisis management tool in the Amazonian rainforest and any other kind of “hostile” environment.”



Humanitarian container, equipped with space-based communication equipment

4 Education and Training

Improving healthcare and learning thanks to Space



Home-learning system

PERSONAL ACCOUNT

Dr Line Kleinebreil

Hôpital Européen
Georges Pompidou, Paris

“Living till a ripe old age with diabetes or a heart condition is now a reality, but those extra years imply educating the patient. In France, between the ages of 70 and 80 years old, 11% of women and 18% of men are diabetic. We need a way to teach these patients to change their lifestyle, without having to hospitalize them. Thanks to EDUCAD, I have the magical ability to teach at the hospital and in my patients’ homes at the same time.”

Television is still the best means of spreading information. With a view to providing new interactive TV services via satellite, CNES has developed a complete system that includes a services portal, a satellite telecommunications module and a terminal designed to provide users - people with chronic illnesses, such as diabetes - with information aimed specifically at teaching them how to deal with their conditions more appropriately.

Content developed and adapted by specialist doctors is made available to users in the form of interactive games, question-and-answer sessions or conferences on different themes.

Space-based applications can also be used to develop remote training programs in the field of medicine by setting up communication and application platforms as well as teletraining networks.

Within the framework of the French Virtual Medical University (the UMVF), which now includes all the university medical schools in France, 31 university hospitals and several universities in Africa, CNES thus plays an active role in testing out new uses (interactive training via satellite, broadcasting teaching material, etc.) thereby enabling everyone involved to break down the barriers created by distance or the lack of terrestrial Internet access.

PERSONAL ACCOUNT Prof. Jean-Didier Vincent,

President of the UNFM, Member of the Institut de France
(University Institute of France)



“Since 2005, the World French-speaking e-University, the UNFM, has been developing teaching modules through partnerships between distant countries and countries in southern Africa (Mali, Burkina Faso, the Democratic Republic of the Congo, etc.). It uses cutting-edge communication techniques thanks to CNES, which has always been strongly committed to supporting the development of this enterprise. The technology chosen, based on space technology, will also enable us to experiment with broadcasting classes from the southern African states for rebroadcast in certain areas via the Net.”

Distance-learning classes given by the UNFM thanks to satellite communications

CNES

CNES, the French National Space Agency is responsible for shaping, proposing and implementing France's space policy. Its goal is to develop space programs and technology to meet the needs of public authorities and the scientific community in both civilian and military sectors and to promote the emergence of and access to new applications.

CNES develops applications for human health, in conjunction with the public authorities, healthcare professionals and users, together with industry and the scientific community.

Do not hesitate to contact CNES to find out what it can do to meet your needs.

Contact us at

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