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**EDUCATION AND TRAINING IN REMOTE SENSING : GDTA'S EXPERIENCE**

**FORMATION EN TELEDETECTION : EXPERIENCE, METHODE, PROGRAMME DU GDTA**

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**ABSTRACT**

*The diversification of Earth observation satellites and the recent availability of high resolution imagery, notably the one produced by SPOT, have helped widen the field of operational remote sensing applications.*

*Users have to be trained to master and operate this high technology tool. In order to meet their requirements in the most suitable and flexible way the Aerospace Remote Sensing Development Group (GDTA) offers different types of regular courses and customized training services.*

*GDTA's training programs and methods are based on two major orientations :*

*- To adapt training users specific needs with reference to their professional environment and concrete objectives.*

*- To ease the acquisition of practical know-how as real technological transfer between professional.*

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## RESUME

La diversification des satellites d'observation de la terre et la récente acquisition d'images haute résolution, notamment celles provenant de SPOT, ont aidé à élargir le domaine des applications de la télédétection.

Les utilisateurs ont été formés pour maîtriser et utiliser cet outil de haute technologie.

De façon à satisfaire leurs demandes de la manière la plus adéquate et la plus souple, le Groupement pour le Développement de la Télédétection Aérospatiale (GDTA) offre plusieurs types de cours réguliers et des formations personnalisées.

Les programmes de formation du GDTA sont basés sur deux orientations majeures :

- Adapter la formation aux besoins spécifiques des utilisateurs en accord avec leur environnement professionnel et leurs objectifs concrets.

- Faciliter l'acquisition d'un savoir-faire pratique en tant que réel transfert technologique entre professionnels.

## INTRODUCTION

The Aerospace Remote Sensing Development Group (GDTA) is an Economic Consortium (G.I.E.) founded in 1973.

GDTA includes at the present time six organisations :

<b>CNES</b>	: Centre National d'Etudes Spatiales
<b>IGN</b>	: Institut Géographique National
<b>BRGM</b>	: Bureau de recherches Géologiques et Minières
<b>IFP</b>	: Institut Français du Pétrole
<b>BDPA/SCET AGRI</b>	: Bureau pour le Développement de la Production Agricole
<b>IFREMER</b>	: Institut Français de Recherche pour l'Exploitation de la Mer

Its activities cover the following sectors :

- Professional training in Remote Sensing, as presented in this paper.
- The distribution of space imagery.
- Airborne data acquisition (visible, thermal, micro-wave).

## TRAINING ACTIVITIES

### Background and Experience

Remote Sensing is a proven source of useful information for creating and updating resource inventories, topographical and thematic mapping, developing geographic information systems and improving monitoring and alarm devices.

The diversification of Earth observation satellites and the recent availability of high resolution imagery, notably the one produced by SPOT, have helped widen the field of operational Remote Sensing applications.

Users have to be trained to master and operate this high technology roll. This is one of GDTA's main activities, and in 1980 a permanent infrastructure for training in Remote Sensing was created, building upon the experience of its members.

The National School of Geographical Sciences (ENSG) has played a central role in this activity, right from the start. The other members of the group have also contributed, their specific skills thus giving a multidisciplinary dimension to GDTA training.

The trainees' professions and fields of speciality vary greatly :

- Decision-makers, department or project directors wishing to familiarize themselves quickly with particular Remote Sensing applications.
- Engineers and technicians who are required to implement Remote Sensing themselves in a production center or for a specific project.
- Researchers involved in the design and development of new applications.
- Professors and instructors wishing to broaden or to increase their knowledge within education and training projects.

GDTA's training programs are based on two major requirements :

- To adapt training to users' specific needs with reference to their professional environment and concrete objectives.
- To ease the acquisition of practical know-how as a real transfer of technological knowledge between professionals.

## TRAINING FACILITIES AND METHODS

The increasing importance of Toulouse as one of the major world poles of development in Space and Remote Sensing has resulted into an exceptionally favorable scientific and technological environment for training at GDTA.

The GDTA training center is based on the aerospace complex in the modern premises of FIAS (International Aeronautics and Space Training) right next to CNES, SPOT IMAGE and the laboratories of the University of Sciences.

Through agreements between GDTA and FIAS, trainees have access to accomodation and restaurant facilities.

They also can attend preliminary language training in French which includes an introduction to technical Remote Sensing vocabulary and familiarizes the trainees with the scientific and technical environment in France.

At GDTA, professionals are trained by other professionals, which creates a particularly lively and fruitful type of technological transfer.

Lecturers and instructors are top level experts from GDTA member organisations and a national network of specialized partners. GDTA is thus able to muster nearly 200 specialists covering all Remote Sensing disciplines and topics :

- Specialists in Remote Sensing satellites space instrumentation.
- Digital and analog processing experts.
- Remote Sensing applications specialists, in all fields (geology and oil exploitation, cartography, agriculture, forestry, urban and rural planning, environment oceanography, etc...).

GDTA has developed cooperative links with several education and training establishments. The main ones are :

- The French National School of Geographic Sciences (ENSG)
- The French National School of Rural Engineering and Forestry (ENGREF).
- The Universities Paris VI and Toulouse III, who, along with ENSG and GDTA, have created the High Certificate of Specialized Studies (DESS) in "Remote Sensing, Methods and Applications", which recognize the CETEL course.
- The International Institute for Aerospace Survey and Earth Sciences (ITC) in the Netherlands.

GDTA training emphasizes on practical exercises in the processing of space images in digital and analog form (hands-on learning in small groups).

The digital image processing equipment actually includes :

- An interactive PERICOLOR 1 500 images processing system by SEPIMAGE
- Three interactive PERICOLOR 1 000 images processing system by SEPIMAGE.
- Five PC/AT
  - . 3 Compaq 386/20.
  - . 1 Compaq 386/33.
  - . 1 Toshiba 386/20.

equipped with MULTISCOPE software by CAP SOGETI and DIDACTIM by AES IMAGE.

- A dozen microcomputers equipped for image processing with the TITUS software developed by the National Institute for Education Research.
- Geographic Information Systems : ARC/INFO and SYNERGIS
  - . Digitalizing table.
  - . Plotter.

All those equipments are connected on a SUN 4/SPARCSTATION. GDTA also relies on its member's facilities, as each member has a large image processing center.

GDTA's specialized Remote Sensing documentation center is open to trainees. A terminal can be used for remote interrogation of a large number of databases all over the world.

## TRAINING PROGRAMS

In order to meet users' requirements in the most suitable and flexible way, GDTA offers different types of regular courses and customized training services.

### Regular courses

Every year GDTA sets out a training program at its training center in Toulouse.

This program includes short-term courses and a comprehensive course.

### **Short-term Courses**

#### *a. RSC - Interdisciplinary Remote Sensing Course*

In three weeks, the RSC offers an introduction to Remote Sensing and its thematic applications ;

The RSC is taught in English and enables trainees to :

- Review the basic concepts needed to understand the technology.

- Comprehend the tools and methods used for acquiring processing and interpreting Remote Sensing imagery.
- Get to grips first hand with practical Remote Sensing applications using examples and case studies from fields of interest to trainees : agriculture, urban planning, cartography, geology, country planning, environment, coastal studies etc...

The RSC program alternates lectures and practical exercises in analog and digital image processing (use of interactive mini and micro-systems) and thematic applications.

The last two weeks concentrate mainly on the applications of high resolution SPOT data.

#### *b. The SITEL Course*

This course is similar to the RSC. The SITEL is given in French.

#### *c. The SPOT Course, the SPOT system and its applications*

This one-week course is designed for trainees who, while familiar with Remote Sensing, wish to be thoroughly informed about the specifics of the SPOT system and data, and about demonstrated applications of its data in different thematic fields.

Many professionals and specialists directly involved in the system and the SPOT program take part, thus enabling trainees to :

- Comprehend the technical and operational specifics of the system.
- Gain practical knowledge about SPOT data in analog and digital form.
- Update their expertise on current practical applications using concrete examples presented by professionals working in fields of interest to trainees : geology, agronomy, cartography, country planning, urban planning, oceanography ; etc.

The SPOT course is given alternatively in English and in French.

#### *d. Thematic Application Courses*

These short intensive courses (usually one to two weeks) are designed for specialized audiences interested in a specific application of Remote Sensing.

The program of these courses usually includes the following parts :

- Problems linked to the application theme to be looked at in the light of user requirements.

- Specific tools and methods for the acquisition and processing of space data and additional data.
- Concrete case studies including formal exercise sessions on image processing systems.

Every year, GDTA organizes one or several such courses. For example, application courses are scheduled in 1991-1992.

- A single-week course on Remote Sensing applied to Urban planning (in French).
- A two-weeks course on Remote Sensing and G.I.S. (in French).
- A two-weeks course : SRVT on Remote Sensing applied to Vegetation with high and low resolution data (in French).

#### **A comprehensive course : CETEL - Course in remote Sensing**

This ten months course (September to June) is designed primarily for engineers and specialists whose profession is the inventorying and management of natural resources, topographical and thematic mapping, urban and rural planning or environmental monitoring. The aim is to enable them to master the theory and practice of Remote Sensing tools and methods used in their field.

The course is taught in French. An intensive course in French is organized for prospective trainees to take prior to attendance.

The content of this training program is placed under the higher authority of the National School of Geographical Sciences. The course program includes three complementary parts :

First part : Basic training (14 weeks) which includes fundamental and applied basics and methods of Remote Sensing.

Second part : thematic applications (10 weeks).

Trainees are offered a choice of thematic options. Some of the main options are :

- Geological applications.
- Cartographic applications.
- Rural planning and forestry.

Other options are offered as a function of trainees' requirements : oceanography, environment, urban planning, regional planning, etc.

Third part : Practical training course within a company (15 weeks)....

Each individual trains in a company of specialized laboratory and does practical work on his chosen subject.

The CETEL course can, under certain conditions, lead to the granting of higher education certificates by French Universities of National Schools.

### **Spacemaps training course : production and utilization of Spacemaps**

The Spacemap course which lasts 6 weeks is dedicated in English and French and is designed to develop understanding of cartographic applications of Remote Sensing imagery from space.

The prime objective of the course is to document the main map production steps and the resulting capabilities and interpretation aspect at the user level.

### Customized training services

Customized training courses are organized for individuals and groups. The type of training, its content, organization and budget are defined jointly with the organizations concerned.

### **Customized training courses**

These are organized on application to meet the specific requirements of a group with roughly the same type of profiles and objectives.

The training procedure, program, length, and the choice of instructors are determined by GDTA together with the applicant organization.

These courses can be organized at the GDTA training center in Toulouse or at the organization abroad.

We include in this category customized courses and seminars on the application of high resolution data from the SPOT satellite :

- Seminars of three to five days introducing the specifics of the SPOT systems and an overview of prime thematic applications.
- Courses of one to two weeks for specialists wishing to keep up with SPOT applications in a specific field.

### **On-site training**

Extensive training :

GDTA can provide training personnel and experts on request for foreign organizations. The missions are adapted to requirements :

- organization of training programs.
- Participation in courses, etc.



- Assistance on learning how to use an image processing system.
- Project training including work in the field.

GDTA training personnel and experts regularly work with several Regional Remote Sensing Centers throughout the world :

- A.I.T., in Bangkok (Thailand).
- R.C.S.S.M.R.S. in Nairobi (Kenya).
- I.G.A.C. in Bogota (Colombia).
- R.E.C.T.A.S. in Ile-Ife (Nigeria).

Short time courses and workshops :

On request, with the support of the French Ministry of Cooperation and the Ministry of Foreign Affairs, CNES, ESA, etc... GDTA is able to organize short courses abroad with foreign partners : National Remote Sensing Centers, Universities, Public or private organisms.

As an example :

- One week course on Urbanism in Argentina.
- Three weeks course on Agriculture purpose in Mexico.
- One week course with ESA on Radar applications and integration SPOT-RADAR data.
- Several image processing workshop in Roumania, New-Caledonia, French Polynesia, Thailand, Perou, etc...

### **Individual and on-project training sessions**

On-project training session is a very personnalized training course designed for engineers or technicians wishing to acquire know-how in Remote Sensing via a case study on the application theme and region in which their organization is interested.

The duration and organization of these courses are treated on a case by case basis. The training program usually comprises two parts :

- Basic or reinforcement training in Remote Sensing at GDTA (attendance to a regular short course as RSC, SPOT).
- Practical training at GDTA or at one of the members' location including a case study to be carried out with personal guidance.

At the end of the course, which varies from 2 to 6 months according to the individual, the trainee draws up a study document that constitutes a demonstrative example for his organization.

## CONCLUSION

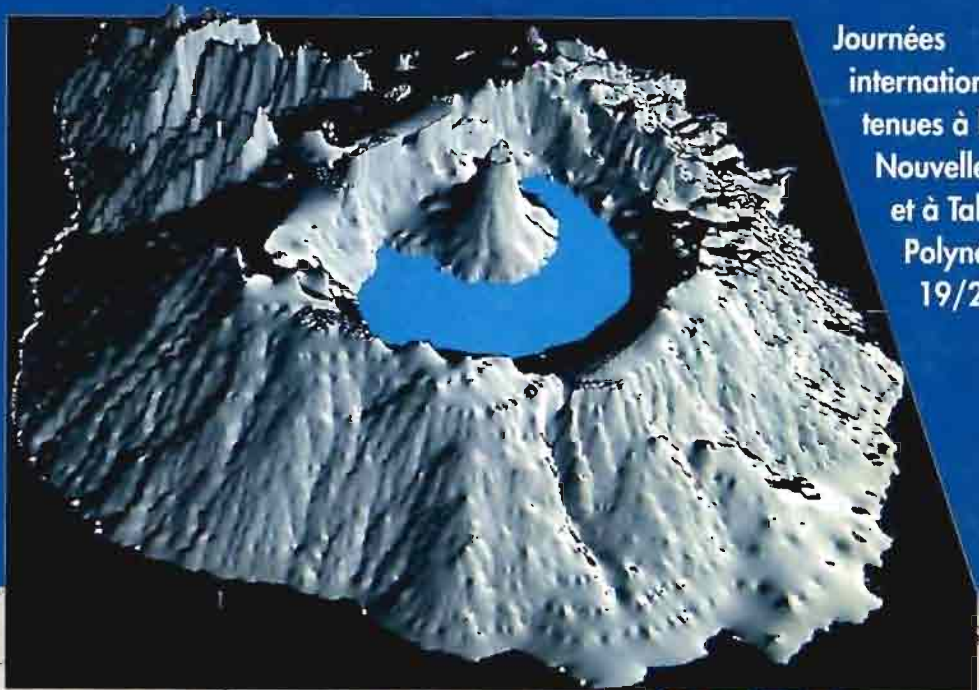
The increasing importance of Toulouse as one of the major aerospace and Remote Sensing world pole is an highly favourable environment for GDTA training activities. More than thousand trainees from 79 different countries have been trained only during the regular courses given in the GDTA training center in Toulouse during the 1989-1990 period.

# "PIX'ILES 90"

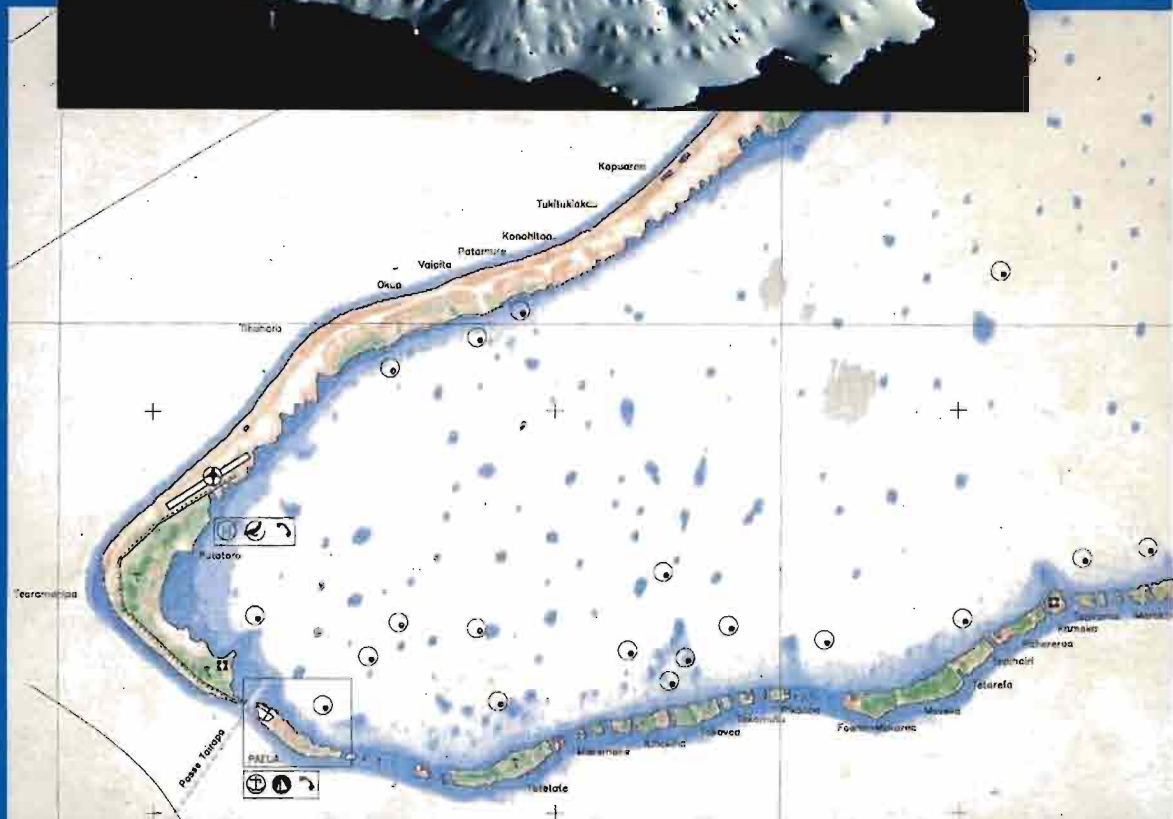
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