Introduction

Programme OCR Interreg III C Beachmed-e is a research schedule centred on new technologies purpose to realize a precise and regular monitoring of the shoreline. So, the LiDAR which is a monitoring tool is tested.
"Conseil général de l'Hérault" and the "Direction Régionale de l'équipement Languedoc Roussillon" are the financial partner of this ambitious project.
This report is at the semi-course of the program, which in terms of administrative times coincides with the phase B. You will find in this report, a part on the analysis of the results of the flight pre-test (presented in the report of the phase A) carried out in Mars 2006, on a zone of 12km of length and 500m broad on the Gulf of "Baie d'Aigues Mortes" . Then, a description of the preliminary phase of the flight test of April 2007 is presented. And finally, the technical schedule of conditions of this mission of flight test on "Baie d'Aigues Mortes" is described.

I. Analysis data of pre-test flying

a. Pre-test flying campaign

In the purpose of testing technical and economical relevance of LiDAR acquisition, an evaluation test was made on "Baie d'Aigues Mortes" in spring 2006. First results were produced in report of phase A (Première approche sur l'utilisation de la technologie LiDAR topographique et bathymétrique, Septembre 2006).

Pre-test flying was realized by Admiralty Coastal Surveys AB with Hawk Eye II system to obtain topographic and bathymetric data. In bathymetric mode, LiDAR emits a green laser at 532 nm with a frequency to 4 kHz. It is projected by rotary mirror which sweeps water surface with swath width of 120 m and flight altitude of 300 m. Associated with the LiDAR system, navigation and position are provided by an integrated GPS and inertial reference system which delivers accurate co-ordinates in all three dimensions.

Detection system gives point density of 0.45 pts/m^2 (1 point every 1.5 m) in bathymetric mode, and a value superior to 6 pts/m^2 (1 point every 0.4 m) in topographic mode.

Survey's results were: 1) Raw data on disc ASCII format with x, y and z coordinates; 2) Interpolated grids with the step of 8 m. Final positions and heights / depths were referenced on WGS 84 UTM projection system and local French Lambert South III system.

b. Generation method of numeric models

The first stage is to reduce dataset allow for needed accuracy and means of put calculations has provision.

In this study, grid size 2 m, 5 m and 10 m were produced. Interpolation method choosed is Kriging which uses in the same time a weighting by the distance and the variogramme [Swales, 2002]. Kriging is an exact interpolator due to estimated value of a point of measurement is equal to the value of it. More, kriging is an optimal interpolator since it minimizes the variance on the error estimation. Main constraint is computing time. Three software were used to product numeric models: Golden Software® Surfer 8, MapInfo® Vertical MapperTM, and ESRI ® ArcGis.

c. Results

Digital surface models (DSM) were built from data provided. These digital models allowed detection of tiny morphology and exact shape of underwater bars (considered rectilinear hitherto). On figure 1, DSM provided by survey LiDAR present of pluri-metric morphologies which could never have been observed by the methods of surveys known as traditional.

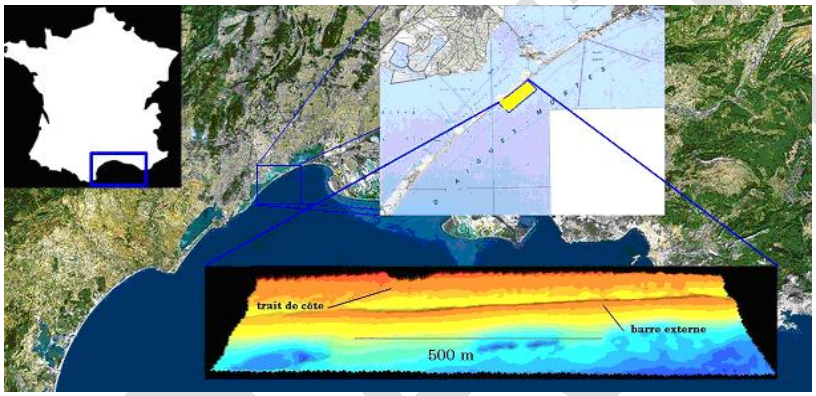


Figure 1: Localization of pre-test flying place and Digital Surface Model provided by LiDAR

Figure 2 (page 4) shows a comparison of Digital Surface Model, one in the Gulf of Aigues Mortes realised from LiDAR data in March 2006 (grid size 5 m), and another provided by echo sounder data in June 2006 (grid size 10 m).

"New" morphologies are put on evidence despite problems of representation related to an interpolation more important on data provided by traditional methods. The infracoast beachrock known as sandstone of Carnon are quite visible on the LiDAR survey: they are presented in the form of chaotic reliefs levelling in the seafloor from 8 to 10 m. However, on external bar, harmony is acceptable between the surveys methods: if external bar seems festooned on March 2006 (survey LiDAR) and linear on June 2006 (survey echo sounder) then that results from a morphological evolution due to marine forcings. In this instance, it is necessary have a field wake approach not to confuse normal evolution and data error.

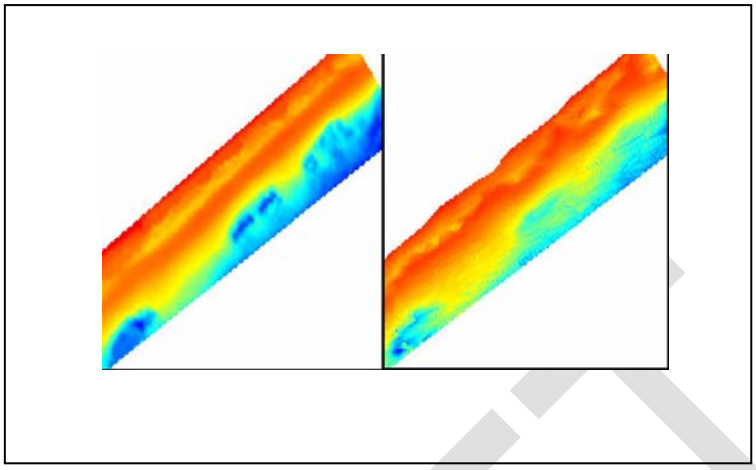


Figure 2: Comparison of digital model provided by "traditional" survey (data EID, June 2006, on the left) and provided by LiDAR survey (data Admiralty Coastal Surveys AB, March 2006, on the right)

The high density of data also makes it possible to identify accuratly morphologies of small sizes (sand dunes, mega ridges) created by hydrodynamics of swell and currents. In the close coastal zone, these morphology (figure 3) are usually mapping by traditional technical. Indeed, it is quasi-impossible to obtain sufficient form density point with echo sounder mono beam, and the water in bars area is shallow to make surveys with multibeams sounder.

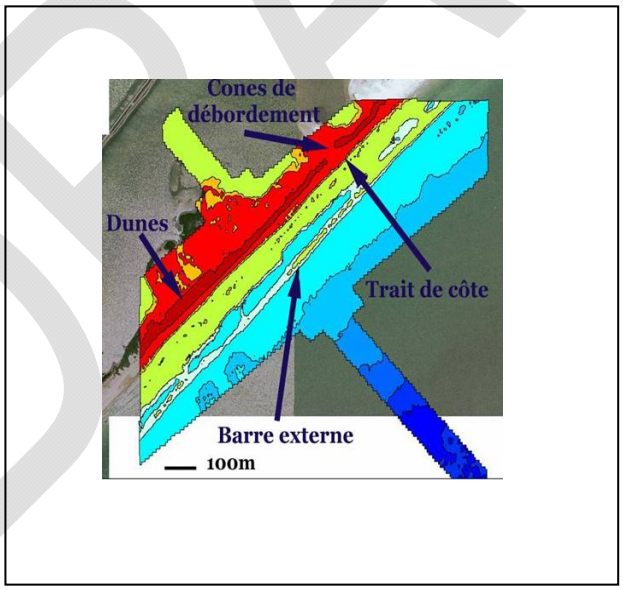


Figure 3: Morphologies highlighted on DSM LiDAR: sand dunes, nebkas bush, contours of the cones of overflows (overwash) in contact with the pond.

d. Survey evaluation: density

Random samplings were carried out in four sectors of 100 m^2 on the study zone to check real density acquired at the moment of survey. The mean density is about 0.6 pts/m^2 but this one is not regular.

We obtain a density of 0.4 pts/m^2 in the not covered sectors, and 0.8 pts/m^2 in the coverage of two flight lines sectors. So, it is necessary to execute coverage of at least 40% between two successive lines to get significant and homogeneous density.

e. Limits on shallow water and/or with turbidity

It's impossible to characterize bottom in the small water depth with bathymetric LiDAR return owing to superposition of the signals corresponding to the water surface and bottom. The "white" in the data is variable and can depend on agitation on the water surface, turbidity, etc.

For example, in the areas of mouths which presented more important turbidity, the results aren't satisfying. On the other hand, on the Lido of Maguelone, the great diversity of the funds (beach-rock, pebbles, sand) doesn't seem to have incidence on the data of altitude.

f. Vegetation and framework fitting-out impacts

For example, a survey was also made by the BRGM with Admiralty Coastal Surveys on the Corsica coastal zone. The study of detail of these results obtained made it possible to highlight some artefacts, resulting from broken reliefs (structures of littoral installation), or from the presence of sea grass (Posidonia Oceanica).

Herbarium localisation is relatively easy owing to a very chaotic signature on the digital model (figure 4). On the other hand, like that was already studied by many authors, the identification of the bottom and height of the herbarium is much more complex. Indeed, the return can correspond to the top of the herbarium, the bottom, or an intermediate position function of the penetration of the laser in the sheets.

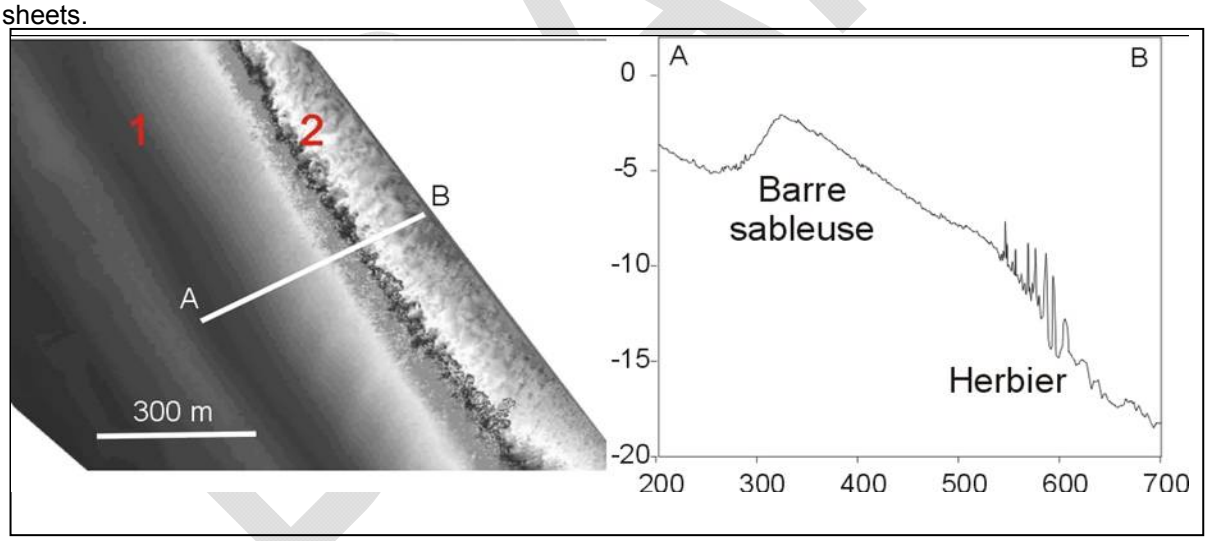


Figure 4: Characterization of an herbarium of "posidonies" on the LiDAR data. Morphologies observed on the digital model (on the left): 1) features smoothes on the sandy bars and 2) chaotic features on the herbarium. Profile (on the right) showing the strong variation of amplitude on the herbarium.

g. Conclusion on analysis data of pre-test flying

The results of the campaign executed on the Lido of Villeneuve-les-Maguelone, highlighted a precision of altimetry of LiDAR data in coastal zone which comes comparable with that from the technological known as traditional (bathymetry mono, multiple beam). However, dataset density is more significant

and homogeneous. LiDAR technological makes it possible to build digital terrain model (DTM) much more realistic and to observe low-size morphologies.

In addition, the technical makes it possible to obtain a simultaneous survey of topography and bathymetry, with a gap of data close to the shoreline (in shallow water) which remains very limited if the conditions of agitation are weak.

Fastness operation of LiDAR (about 25 km^2/h) is also a strong asset on the others technological in these environments where morphology can evolve very quickly.

Although sensitive to the weather conditions (cloudy cover in particular), it makes it possible to carry out a survey post-storm as soon as a window of good weather is presented, whereas a ship cannot have such a reactivity, and remain completely depend on the conditions of marine weather, residual swells,…

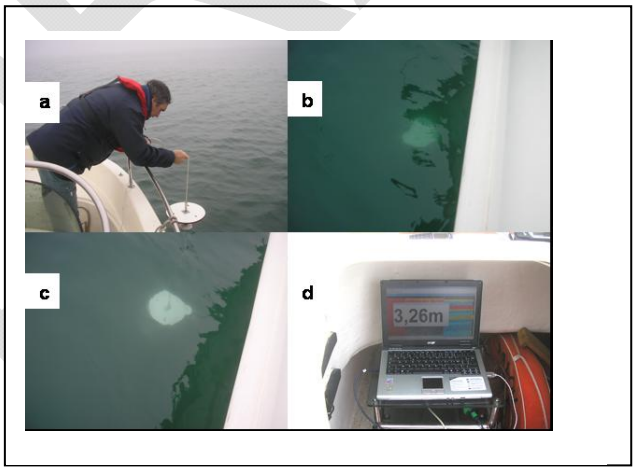
However, if this system can be make use of quickly, to ensure a survey post-storm, the quality of the results obtained is degraded very quickly if the conditions of sea are bad (agitation, broad zone of surfing at the coast...) or in the zones of mouth in which turbidity increases following a strong gale.

II. Provision of LiDAR mission

a. Secchi measures

Measurements of turbidities carried out with Secchi disc (demonstration below with: a) wager on the sea of the disc b) visibility at -1 m c) visibility at -3 m and d) retrieval data) on three coastal areas of "Baie d'Aigues Mortes" : Frontignan, Palavas-les-Flots and la Grande Motte (figure 5,6 et 7; pages 7-8).

On the whole of these three zones, the measured maximum value of the index of turbidity (ratio depth on the limit of visibility of the disc of Secchi) amounts to 2,2. Thus, knowing that the depth of acquisition which LiDAR can reach is estimated in the literature between 2,5 and 3 times the depth of Secchi, we can establish that for the zones where the index is equal or lower than value 2, turbidity will not have influences to the LiDAR measure.



The climatic conditions at the time of these measurements of turbidities were as follows according to the heavegraph coming from the buoy of Sète:

Date	Significant height of the waves in m	Temperature of the sea in °C	Mean velocity of the wind in knots	Wind direction

15/03/07	0.2	13.5	8	South East

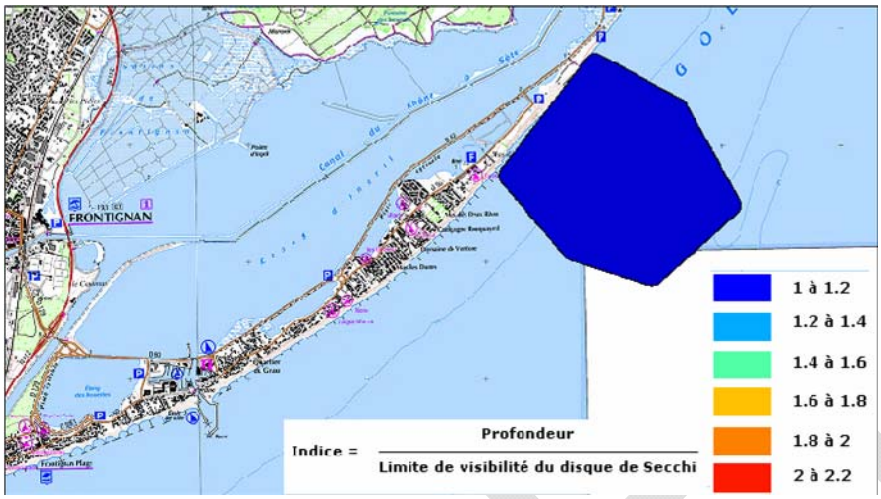


Figure 5: Representation of the interpolation of measurements of the index of Secchi on the zone of Frontignan in March 2007 (index is the ratio of depth on the visibility limit of Secchi disc)

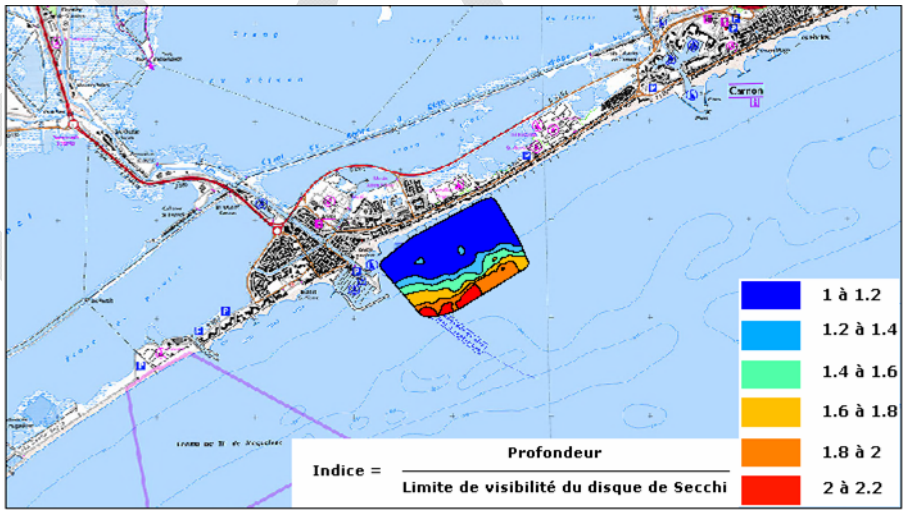


Figure 6: Representation of the interpolation of measurements of the index of Secchi on the zone of Palavas-les-Flots in March 2007 (index is the ratio of depth on the visibility limit of Secchi disc)

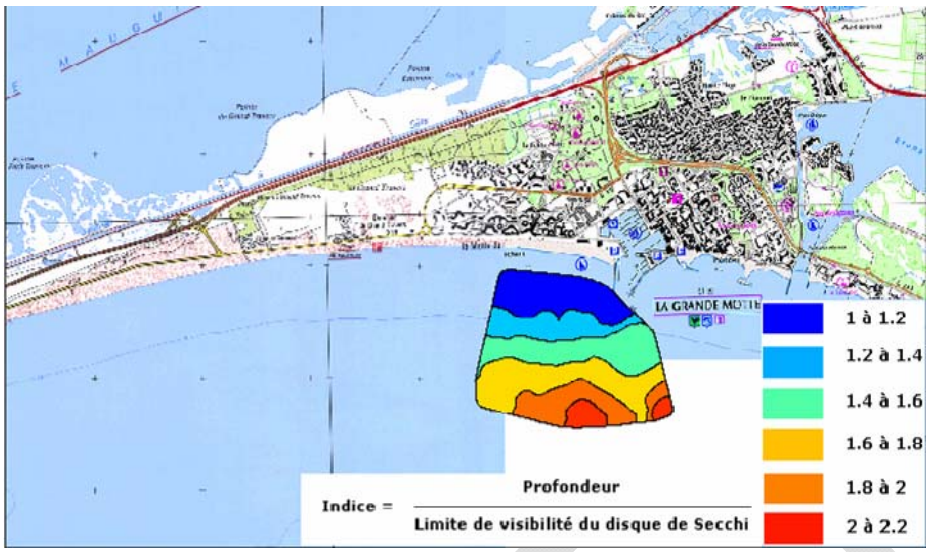


Figure 7: Representation of the interpolation of measurements of the index of Secchi on the zone of the Grande-Motte in March 2007 (index is the ratio of depth on the visibility limit of Secchi disc)

b. Bathymetric LiDAR systems

Currently, there are three great systems of Bathymetric LiDAR, where the principal specifications are gathered in the following table:

	SHOALS 1000T	EAARL	HAWK EYE II
Constructor	Optech	NASA	Saab Dynamics
Flight altitude	200-400 m	300 m	400 m
Swath width		240 m	140 m
Beam off-nadir angle	0-40°	0-40°	0-40°
Diameter size of laser spot on surface	240 cm	15 cm	40 cm
Vertical accuracy	15 cm	15 cm	25 cm
Horizontal accuracy	-	1 m	5 m
Measurable minimum water depth	20 cm	30 cm	30 cm
Measurable maximum water depth	60 m	25 m	40-70 m
Type of Laser	Classe IV Nd :Yag	Classe IV Nd :Yag	Classe IV Nd :Yag
Energy green laser	5mJ	70 microJ	5mJ

In every instance, the general principle of bathymetric LiDAR operation (figure 8; page 9) is the same one: send-receive of intense laser impulses (several megawatts), at regular frequency, of which the duration of advance is transformed into distance (laser Telemetry). Its characteristic is the use of impulses in two wavelengths: an impulse in infra-red (1064 Nm) reflected by the surface of water, and an impulse in the green (532 Nm) which penetrates the surface of water then is reflected by the bottom of water.

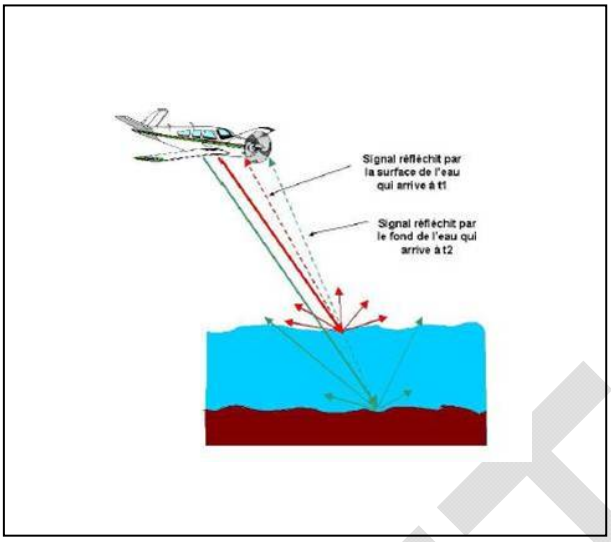


Figure 8: Principle of operation of bathymetric LiDAR, origin [Lesaignoux, 2006]

III. Technical schedule of conditions

a. General context

The OPTIMAL project envisages the topographic and bathymetric data acquisition of the emerged and immersed beaches littoral of "Baie d'Aigues Mortes" using airborne bathymetric LiDAR sensor.

The test area to be explored by the technique of LiDAR covers a total surface of a little less than 50 km^2, it's a succession of urban beaches (city of Palavas-les-Flots) and much more natural sectors, virgins of all anthropisation (Lido of Villeneuve-les-Maguelone). These beaches being largely attended the summer, the period of acquisition of the data proceeded at the end of April 2007.

b. Campaign objectives

The objective of this campaign is to collect by the intermediary of an airborne laser some altimetric information on the coastal zone, this information having for vocation to constitute a demonstrator which can allow us to generalize thereafter this type of statement on the whole of Golfe du Lion.

The density of points, which will determine the smoothness of the survey, will be compatible with the applications and the surroundings met and will have to allow:

- To study the morphology of field dunes
- To identify foredunes
- To study possible zones of immersion to the backshore
- To study morphology of inner and outer bars (seafloor forms)

All in all, this type of LiDAR measurements will have to make it possible to mitigate the lack of data on:

- The feature of coast
- The space influence of the tricks (ears, mole) and their effects on the surroundings
- The space influence of the dwellings known as of sea front when they exist
- Micro topography necessary to the hydrodynamic models with fine meshs applied to local problems (sedimentary transport...)

This topographic and bathymetric survey will make it possible to evaluate the width of phenomena such as erosion and sedimentation on the scale of the beach ensemble. During the course of the mission, the EID Mediterranée executed in parallel of the surveys of control on ground and at sea.

c. Surveys area description

The map (figure 9) delimits accurately the areas raised by the bathymetric LiDAR: each green rectangle was digitalized under the software MapInfo®.

As this figure shows it rather schematically, the LiDAR area raised is marked by three zones which correspond in indicative tracks of the aircraft way.

The reference marks (yellow stars) for the depth were extracted from the base of data of the bathymetric profiles acquired annually by the EID service of littoral monitoring within the framework of the departmental observatory of the littoral.

Surface presented covers a totality of 47 km2.

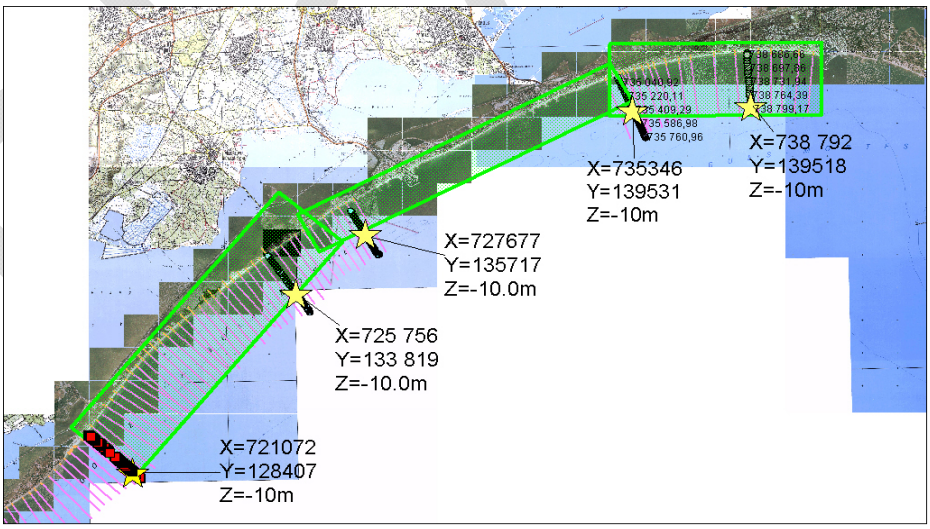


Figure 9: Area raised by bathymetric LiDAR in the Gulf of "Baie d'Aigues Mortes". Co-ordinates given in Lambert III South.

Co-ordinates X and Y of the tops of the zones 1 and 3 (in the direction of the needles of a watch), given in Lambert III South, as well as the co-ordinates of the tops of the rectangle of zone 2, to cover by the flight LiDAR are in the following table:

Zone 1 : Frontignan – Villeneuve les Maguelone		**Zone 2 : Villeneuve les Maguelone – Petit travers**		**Zone 3 : Petit travers – La grande Motte**	
Surface : 22 km²		**Surface : 13 km²**		**Surface : 12 km²**	
X	Y	X	Y	X	Y
720500	127700	726400	135200	734700	139300
718800	129300	725800	136200	734700	140900
722500	133700	734800	140800	735600	140900
722800	133500	735400	139700	735600	141100
723300	134100			737000	141100
723400	134000			737000	141300
724000	134700			748000	141300
724100	134600			748000	139300
725500	136700				
727100	135400				

The provider has an obligation of results, however an absence of data corresponding to a maximum of 5% (that is to say approximately 2,5 km2) of total surface required above will be tolerated.

d. The LiDAR provider: Admiralty Coastal Surveys AB

The provider who answered our request (see Appendix B, Analyse Offers) is the Sweden Company Admiralty Coastal Surveys AB, which had also accomplished the pre-test flight. They use the system LiDAR Hawk Eye II whose principle of operation is illustrated on figure 10.

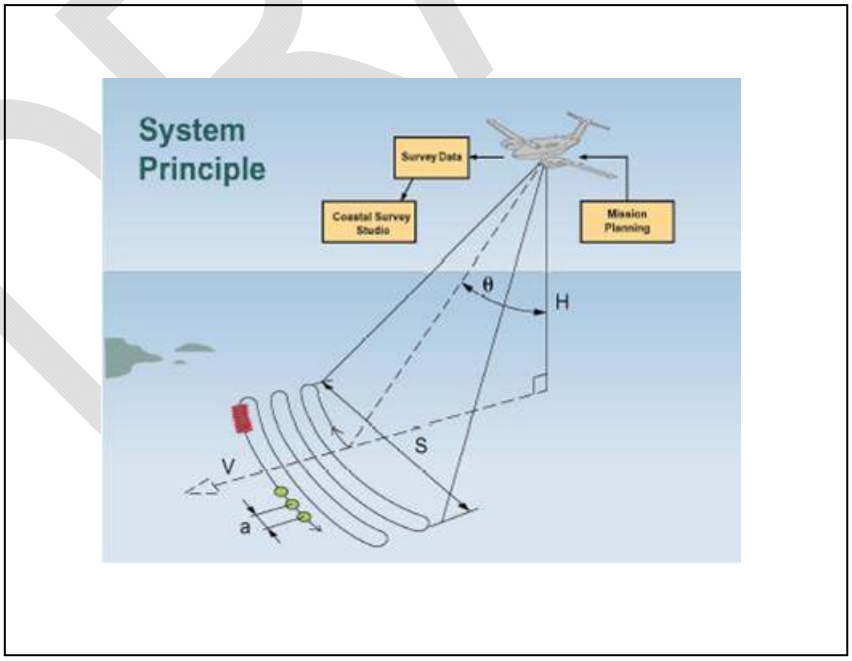


Figure 10: Principle of acquisition of LiDAR Hawk Eye II

The technical specifications of this system are in the table below.

PARAMETERS	VALUES
Flight altitude in m	300
Swath width in m	120
Bathymetry sounding density	1 point every 2 m
Topography sounding density	1 point every 1 m
Overlap in m	40
Sounding rate in kHz	3.6
Speed in miles/h (1 miles = 1.852 km/h)	150
Energy of green laser in mJ	3
Beam off-nadir angle in degrés	20
Full Width at Half Maximum in s	7.10^{-9}
Field of view in milliradian	10-50
Diameter size of laser spot on water surface in m	3.3
Diameter size of laser spot on ground surface in m x m	0.33 x 0.66

e. Data acquisition

Taking into account that data acquisition is altimetry data by LiDAR and vertical airborne pictures.

Data acquisition performed with a twin engine turbo-prop aircraft, a Twin Commander 690 B, of the "Wermlandsflyg" society Swedish. The duration of the data acquisition and preliminary processing assuming the foregoing has been of 3 days.

Bathymetric LiDAR accuracy:

- Vertical accuracy : ± 25 cm (1σ)
- Horizontal accuracy : ± 3 m (2 σ)
- Topographic height : 25 cm (2 σ)

LiDAR data acquisition was successive flight lines and collateral to the shore line, with an overlap of 40% to cover fully area.

Aircraft positioning was GPS during data collection. 2x geodetic GPS (dual frequency) base stations with logging was established at precisely surveyed marks (centimetric accuracy) and referenced to WGS84 and transformed to Lambert III South using the process provided by IGN.

Data obtained from these geodetic stations was used in carrier phase post-processing. Final positions and heights/depths were referenced:

- X – Y : WGS 84 :(UTM 31 projection system) **AND** Z : ellipsoid height
- X – Y : Lambert III South **AND** Z : N.G.F. - IGN 69

The distance to the fixed GPS stations used on land wasn't exceed 15km. The two stations used are Villeneuve-les-Maguelone and Montpellier (RGP), see the Appendix A (page 15) for the coordinates.

Furthermore, during the survey, minimum 5 visible GPS satellites having elevations > 10° was be available and the PDOP was <3.5.

During the survey, an image every second was stored. The overlap between the images on the water surface is approximate 50%. The images are of the size 1600x1200 pixels. The pixel size on the water surface corresponds to approximately 15x15 cm.

f. Deliverables

Raw data has been provided to the EID after the survey in X, Y, Z ASCII (PC, ANSI formats).
Final processing will be performed by ACSAB personal at the ACSAB offices in Sweden and UK, to 2 behaviours:

- Data cleaning will be to coastal zone monitoring standard
- The data filtered according to the following rule: in a radius of 5 meters around each measured point, elimination of all the points of which the difference in altitude is lower than 30 cm.

In two cases, data will be restored in the form of files X, Y, Z ASCII.

For each flight line, an un-interpolated cleaned ASCII XYZ file will be delivered. This file will contain: Surface elevation, bottom elevation, seabed depth and flag for bathymetry and topography.

More, data interpolation will be used geostatistic method to obtain gridded digital elevation model (DEM), digital slope model (DSM), digital terrain model (DTM) with grid size 2 m, 5 m and 10 m, ASCII format. These digital models will be also returned in the form of GeoTIFF image with a colouring representing the variation of altitude.

Please take note that technical swap with the provider will admit a better comprehension of data cleaned.

The products and the whole documentation will be provided on DVD-ROM. But, a preliminary report has been provided at the end of the mission holding confirmation of survey completion and diary of events.

A final report (pdf format and hard copy) will be provided with the cleaned data set and associated products:

- Description of the operations
- Description of the processing of LiDAR data including editing and quality controls
- Quality Control values
- Description of the sensor calibration procedures
- Positionning project report
- Flight lines map and project coverage area
- Discussion on data quality including quality assurance (QA) and quality control (QC) procedures
- Ground control reports
- Aircraft navigation

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APPENDIX A

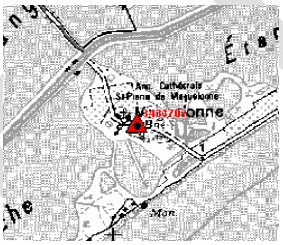
Réseau **G**éodésique **F**rançais

Service Géodésie Nivellement
Site géodésique

VILLENEUVE-LES-MAGUELONE VII

Département :	**HERAULT (34)**	*N° Site:* **3433707**
Commune :	**VILLENEUVE-LES-MAGUELONE**	
Lieu-dit :		**site NTF d'ordre 4**

Azimut de la prise de vue : 320 gr



Extrait de la carte n° 2744
SETE

Points du site :	*(Cliquez sur la désignation des points ci-dessous pour obtenir les coordonnées)*
(1)	**Grande croix : Centre**
(A)	**Borne en granit gravee IGN**
(B)	**Cathedrale : Toiture : Repere en bronze G.M. scelle**
(C)	**Grande croix : Axe et sommet**

Avertissement

Compte-tenu des risques de destruction ou de déplacement des bornes ou repères, il est indispensable de procéder avant usage à un contrôle de stabilité avec les repères voisins. La responsabilité de l'IGN ne saurait être engagée en l'absence d'un tel contrôle.
Toute remarque concernant la disparition ou le mauvais état des repères doit être signalée au Service de la géodésie : sgn@ign.fr

Réseau **G**éodésique **F**rançais

Service Géodésie Nivellement
Point géodésique

01

Site	*Point*	*Désignation*
3433707	**A**	**Borne en granit gravee IGN**

Remarque(s) : **- Point vu en place en 2001**

Système RGF93 - Ellipsoïde : IAG GRS80 - Méridien origine : Greenwich				
T	*Longitude*	*Latitude*	*Hauteur sur l'ellipsoïde (m)*	
	3° 53' 05,2838" E	**43° 30' 43,3850" N**	**58,96**	
Système RGF93 - Projection LAMBERT - 93			**NGF - IGN1969 Altitude normale (m)**	
T	*E (m)*	*N(m)*		
	771 572,64	**6 268 508,88**	**9,5**	**D**
Système NTF - Projection LAMBERT 3				
	E(m)	***N(m)***		
	725 174,73	**135 857,95**		

Azimut de la prise de vue : 20 gr

T: Coordonnées obtenues par transformation / **M** : Précision métrique / **D** : Précision décimétrique / **C** : Précision centimétrique

Avertissement

Compte-tenu des risques de destruction ou de déplacement des bornes ou repères, il est indispensable de procéder avant usage à un contrôle de stabilité avec les repères voisins. La responsabilité de l'IGN ne saurait être engagée en l'absence d'un tel contrôle.
Toute remarque concernant la disparition ou le mauvais état des repères doit être signalée au Service de la géodésie : sgn@ign.fr

La borne en granit est légèrement inclinée, suite selon toutes vraisemblances à un choc avec un véhicule. Un post-traitement avec le réseau RGF de la station de Montpellier a été réalisé ; par conséquent, pour la mise en place d'une station post-traitement sur ce point, il faut utiliser les résultats ci-dessous :

Projection Lambert 3

E(m)	**N(m)**	**Altitude (m) NGF-IGN 1969**
725 174.846	**135 857.838**	**9.525**

Système RGF93 - Ellipsoïde : IAG GRS80 - Méridien origine : Greenwich
Longitude 3° 53‘ 5.28890’’ Est
Latitude 43° 30’ 43.38125’’ Nord
Hauteur Ellipsoïdale (m) 58.990

Système WGS84
Longitude 3° 53‘ 5.26127’’ Est
Latitude 43° 30’ 43.40183’’ Nord
Hauteur Ellipsoïdale (m) 59.778

MTPL Montpellier

Propriétaire : CNRS - Université Montpellier II - Laboratoire Dynamique de la Lithosphère
Usufruitier : CNRS - Université Montpellier II - Laboratoire Dynamique de la Lithosphère
Mise en service : 20/04/1999
Classe **:** TP
Numéro Domes : 10097M001

Fiche signalétique au standard international (logsheet)

Coordonnées : RGF93 - Lambert-93

X	Y	Z	Hauteur d'antenne
4612940.762 m	311634.702 m	4379108.308 m	0.0 m
Latitude	**Longitude**	**Hauteur**	
43° 38' 14,76555" N	3° 51' 53,41308" E	120.313 m	
E	**N**	**Altitude**	
769805.16 m	6282425.551 m	70.6 m	

Type de données disponibles :

Session/Echantillonage	1h/1s	1h/30s	24h/30s
Temps Différé	☑	☑	☑
Temps Réel	DGPS		RTK
	☐		☐

Station GPS permanente de Montpellier, pilier géodésique et antenne au sommet (sous radôme conique blanc)

APPENDIX B

Mesure 2.1
Optimal

Analyse des offres en vue du choix du prestataire LIDAR

Lettres envoyées à tous les prestataires :

Suite à l'étude de marché réalisée par l'EID Méditerranée, trois prestataires ont été identifiés comme capable de répondre à notre demande.Il s'agit de :

- Admiralty Coastal Surveys AB

Klubbhusgatan 15
SE-553 03 Jönköping
Sweden

- FUGRO GEOID SAS

3 rue Jean Monnet
34830 CLAPIERS
France

- SAS ActiMar

24 Quai de la Douane
F - 29200 BREST

Deux envois de nature différente ont été réalisés vers les prestataires énumérés ci dessus :

- L'un par courrier électronique le vendredi 12 janvier 2007
- L'autre par Chronopost le lundi 15 janvier 2007.

Chacun des courriers été accompagnés d'un document identique qui reprenait nos demandes techniques et administratives.

Courriers électroniques envoyés aux prestataires français

Messieurs,

Nous sommes maintenant prêt à vous envoyer nos demandes de survol (utilisant la technologie LIDAR) : le dossier en attachement traite de nos besoins. Concernant ce fichier joint, le texte est en français mais nous pouvons vous donner plus tard plus de précisions en anglais ou traduire rapidement quelques parties pour les partenaires étrangers.

Comme vous pouvez voir la date limite est le 24 janvier, ce qui est bientôt, ceci à cause de processus administratifs.

Le montant global de ce travail est fixé à 120 000 €, TVA incluse.

Dans un premier temps, nous acceptons les réponses électroniques avec :

- Votre proposition technique
- Vos références, CV
- Le reçu de votre proposition financière

Lundi 15 janvier au matin, je vous envoie le dossier par courrier papier. Nous avons besoin que vous le signiez et que vous nous le retourniez par courrier papier.

Dans une seconde étape (à la fin du mois de janvier), quand le choix final du partenaire sera fait : il recevra ce texte en attachement et une convention administrative (je pourrai envoyé a modèle de cette convention bientôt, lundi prochain) qui complète et explique plus en détails, alors il sera nécessaire de signer ce contrat et de nous le retourner par courrier.
Respectueusement,

. Courrier électronique au prestataire étranger

Gentlemen,

We are now ready to send you our request of the survey (using LIDAR technology): the file in attachment deals with all our requirements. Concerning this enclosed file, the text is in French but we could give later all the precision in English or translate quickly some parts for the foreigner partner.

As you can see the deadline (January 24th) is very close because of administrative processes.

The global amount for this work is fixed to 120 000 € included V.A.T.

In a first time we accept electronic answer with:

- Your technical proposition
- Your references, C.V.
- Recipient of your financial proposition

Next Monday morning on 15th January I send u the file by paper mail. We need you sign it and you give us by mail in return.

In a second step (at the end of January) , when the final choice of the partner is done : he will receive this text in attachment AND an administrative convention (I could send a model of this convention soon, on next Monday) which complete and explain with more details, then it will be necessary to sign this contract and to send it by mail.

Best regards,

Courrier chronopost envoyé aux prestataires français

Objet: Suivi dans le Golfe d'Aigues Mortes (France)

Cher Monsieur,

Vous avez certainement reçu un courrier électronique concernant notre projet de suivi des plages et des petits fonds dans la "Baie d'Aigues Mortes" (France).
Cette lettre confirme nos besoins. Comme vous pouvez le voir date limite (24 janvier) est très proche à cause de processus administratifs.
Le montant global pour de travail est fixé à 120 000 € incluant la T.V.A.
Si vous acceptez ce contrat, le représentant légal de votre compagnie doit le dater et le signer, page 8 du document joint. De plus vous avez à parapher chaque page et à nous retourner le document par courrier.
Je me tiens à votre disposition pour tout supplément d'information.
Dans l'attente de vous lire, bien respectueusement.

Courrier chronopost envoyé au prestataire étranger

Objet : Survey in Golfe d'Aigues Mortes (France)

Dear Mr,

You have certainly received an electronic mail concerning our project of beach and seabed monitoring in Golfe D'Aigues Mortes (France)
This letter confirms our requirements. As you can see the deadline (January 24th) is very close because of administrative processes.
The global amount for this work is fixed to 120 000 € included V.A.T.
If you accept this contract the legal person of your company have to sign and date it, page 8 of the document enclosed. Moreover you have to write your initial of each page and to send it by mail in return.
I would be delighted to supply any further information you may require.
I look forward to hearing for you, best regards.

. Réponses reçus

Les 3 prestataires ont répondu mais deux d'entre eux (FUGRO GEOID SAS et SAS ActiMar) ont décliné l'offre.
Seul Admiralty Coastal Surveys AB est intéressé par notre offre.

. Réponse de SAS ActiMar

Bonjour,

Merci de votre proposition. Nous ne pouvons malheureusement pas répondre à vos attentes pour les raisons suivantes :

- Le délai d'exécution ne correspond pas à la disponibilité des capteurs de notre côté.
- Le montant indiqué ne permet pas de répondre au cahier des charges.
- La surface à acquérir est trop faible pour rentabiliser ce type de mission.
- La société ActiMar a eu la charge du premier démonstrateur Litto3D, et privilégiera les AO à venir dans le cadre de ce projet. Nous regrettons que ce levé n'en fasse pas partie.

Cordialement,
Marc Lennon.

Les arguments énoncés par ce prestataire parlent d'eux même, les principaux soucis c'est qu'ils ne possèdent pas le capteur en fond propre et qu'ils ne peuvent pas en disposer facilement.

. Réponse de FUGRO Géoïd SAS

Monsieur,

Après examen de votre dossier de consultation, nous avons le regret de vous informer que le Groupe FUGRO n'est pas en mesure de répondre à votre demande. En effet notre système SHOALS ne sera pas disponible en Europe à la période indiquée pour les opérations (le système sera en opération en Floride pour une durée de 4 mois). D'autre part nous pensons qu'il nous est impossible de réaliser cette opération dans le cadre budgétaire défini dans votre document de consultation. Il serait effectivement souhaitable de grouper plusieurs opérations du même type (dans le cadre du projet Litto3D par exemple) pour réduire les coûts – en particulier les coûts de mobilisation/démobilisation.
Nous restons cependant à votre disposition pour tout renseignement ou toute autre demande que vous pourriez formuler.

Meilleures Salutations

Laurent VIGIER
Business Development Manager

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Fax +33 1 69 19 15 59
FUGRO TOPNAV
129 rue de PARIS
91349 MASSY Cedex - France

Cette réponse fait suite à une série de questions (échanges par mail) et d'entretiens téléphoniques que nous avons avec le groupe FUGRO, après nous avoir dit qu'ils répondraient, ils se sont rétractés. Là encore le budget qui leur est proposé leur semble trop peu important : c'est essentiellement dû au fait qu'ils ne disposent pas de la technologie LIDAR en propre et que le coût de la mobilisation/démobilisation (supérieur à 100 000 €) vient grever le budget.

Réponse de Admiralty Coastal Surveys AB

C'est avec ce prestataire que nous avons eu le plus d'échanges mails et téléphonique.
Ils sont intéressés par notre projet, ils ont signé le cahier des charges, et nous ont envoyé une proposition technique et financière dont nous allons faire une synthèse critique.

. Synthèse critique de l'offre unique reçue

Seul Admiralty Coastal Surveys AB nous a fait une offre composée de 19 pages en anglais qui mettent en valeur leur savoir faire.

. Critères de choix:

Les notes attribuées au prestataire en fonction de nos critères de choix sont les suivants

- Adéquation de l'offre aux critères techniques énoncés 25/30
- Propositions supplémentaires (augmentation de la surface du secteur couvert ou meilleurs modes de traitements de la donnés) 25/30
- Les références 18/20
- Les moyens humains, matériels et organisation de l'équipe affectée à la mission 19/20

Pourquoi ces notes ? A la lecture de leur offre, il nous semble que les points à retenir sont les suivants.

- Concernant l'adéquation de l'offre aux critères techniques énoncés
  - La zone de recouvrement (entre chaque ligne de vol) proposé est de 30% pour 40% demandée. Cela reste néanmoins correcte par rapport à ce que l'on trouve dans la littérature scientifique.
  - Les coordonnées des stations DGPS utilisées nous seront bien fourni.

- Concernant les propositions supplémentaires (augmentation de la surface du secteur couvert ou meilleurs modes de traitements de la donnés) :
  - Une ortho-photo mosaïque nous est proposée
  - Une surface supplémentaire de 10 km2 en plus de celle demandée et adjacente à notre zone nous est aussi proposé
  - Le coût de 112 965 € Hors Taxe pose problème, à finaliser dans nos futures discussions avec le prestataire.

- Concernant les références, ils ont déjà travaillé avec plus de 15 clients différents dont IFREMER et EDF. Par contre la compagnie n'existe que depuis mars 2004.

- Concernant les moyens humains, matériels et organisation de l'équipe affectée à la mission :
  - 4 personnes dont un pilote, un chef de projet et deux hydrographes travailleront sur le terrain.

Sans que cela fasse partie des critères demandés, une des conditions sine qua non est le paiement d'un acompte de 30 % à la signature du contrat. L'explication tient dans le fait que Admiralty Coastal Surveys AB doit louer un avion et qu'ils ne veulent (peuvent) pas faire l'avance.

. Délais :

Compte tenu de la disponibilité de leur matériel, Admiralty Coastal Surveys AB possède en propre un LIDAR bathymétrique, ils n'ont que l'avion à louer ; cette compagnie peut a de la disponibilité et en outre elle m'a affirmé verbalement respecter les délais imparties dans notre cahier des charges.
Cahier des charges qu'ils ont d'ailleurs signé.