

MISSION REPORT

Glider Facility



Code Name *canset11*

Description *This document summarizes the mission definition, preparation, ballasting and deployment of the mission CANALES SEPT 2011*

Deployment Zone *West coast of the island of Ibiza (Balearic Islands, SPAIN)*

Date *September, the 29th of the year 2011*

Parent Project *SOCIB*

Platform(s) *Shallow glider icoast00 (unit ref# 050)*

Summary *Icoast00 has been prepared and configured to sample the Ibiza channel seeking to gather CTD, oxygen concentration and fluorescence level data to investigate the mesoscale, seasonal and inter-annual variability of the water exchanges in the Ibiza Channel*

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Report

Update Record

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29/09/2011	1.0	<i>Initial writing. First draft</i>	<i>Marc Torner / Simó Cusí</i>

Chart A – Update Record

Verification and Distribution List

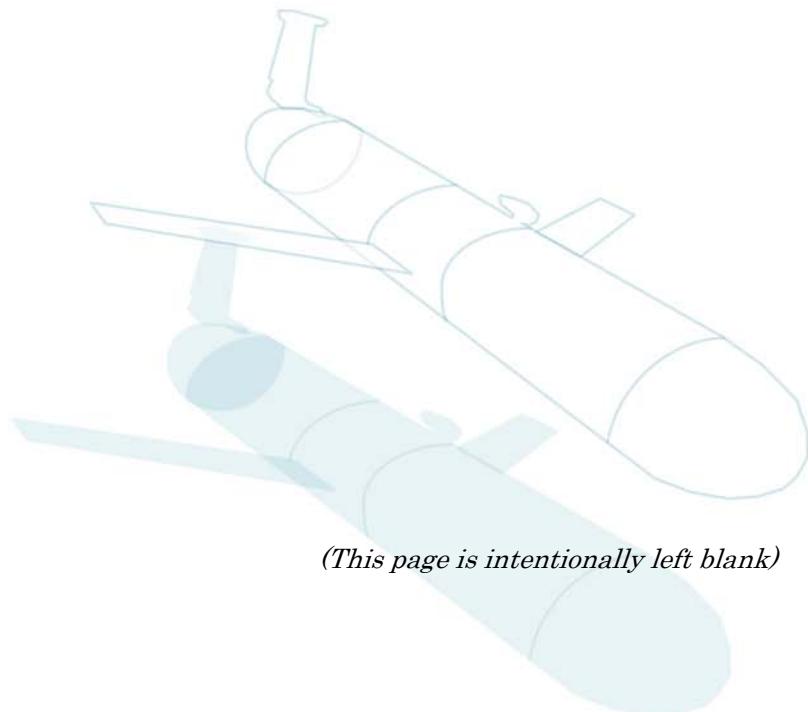
Date	Checked By	Company / Work Package	Signature

Chart B.I – Verification List

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Chart B.II – Distribution List



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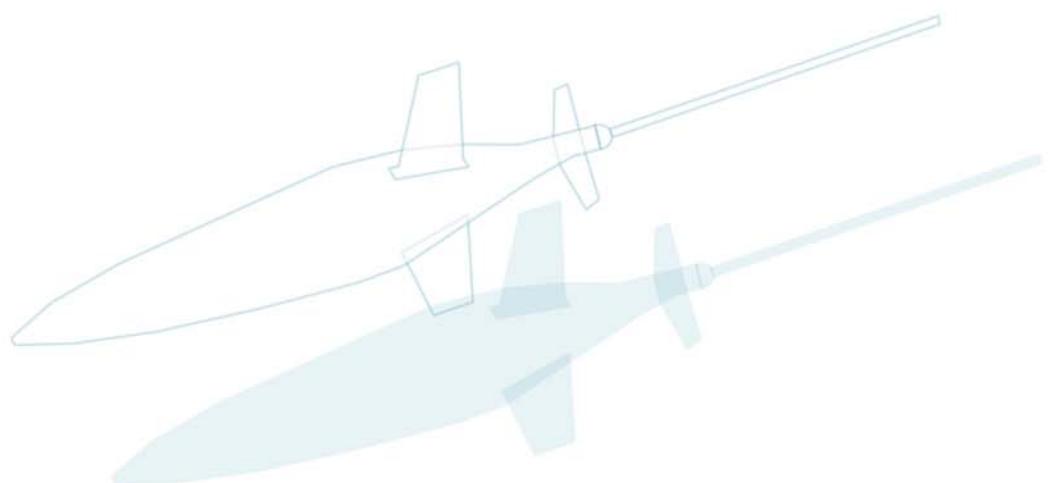


Table of Contents

BLOCK I	9
I.1- SUMMARY	11
I.2- PARENT PROJECT: DESCRIPTION AND OBJECTIVES	11
I.3- MISSION: DESCRIPTION AND OBJECTIVES	11
I.4- BACKGROUND AND OCEANIC CLIMATOLOGY	11
I.5- INVOLVED PLATFORMS.....	12
I.6- RELATED PROJECTS	12
BLOCK II	13
II.1- MISSION PLANNING	15
II.1.1- <i>Mission Meeting Minutes</i>	15
II.1.2- <i>Schedule</i>	15
II.1.3- <i>Route</i>	15
II.1.4- <i>Sampling Strategy</i>	16
II.1.5- <i>In-situ Data Transmission</i>	16
II.1.6- <i>Administrative Notifications</i>	17
II.1.7- <i>Summary Chart</i>	18
II.2- DATA PROCESSING AND RESULTING PRODUCTS.....	19
II.2.1- <i>Applicable Quality Control</i>	19
II.2.2- <i>Scripting</i>	20
II.2.3- <i>Data Pathways</i>	21
II.2.4- <i>Virtual Storage Repository</i>	21
II.3- LOGISTICS AND OPERATIONAL TACTICS	23
II.3.1- <i>Deployment schedule and logistics</i>	23
II.3.2- <i>Communications</i>	23
II.3.3- <i>Operations infrastructure</i>	23
II.3.4- <i>Virtual Resources</i>	24
II.3.5- <i>HHRR</i>	24
II.3.6- <i>Partnership</i>	25
II.3.7- <i>Supporting Platforms & Observatories</i>	25
II.4- FINANCIAL PREVISION.....	26
II.5- TECHNICAL SETUP	27
II.5.1- <i>Platforms to be deployed</i>	27
II.5.1.1- Slocum Electric Shallow Glider	27
a) Hardware Configuration	27
Ballasting.....	27
Checklist	27
Sensors Onboard	27
Energy Plan	27
Incidents	28
b) Software Configuration	28
Significant Files	28
Sampling Strategy	28
Real-time files.....	28
c) Technical Specification Sheet	29
II.5.1.2- Data Center	29
a) GAPP Configuration File	29
b) DockServer Checklist	29
c) Scripting Checklist	29
II.5.1.3- On-field Equipment	29
a) Checklist	29

b)	Garmin MapSource File.....	29
c)	Vehicle Loading	29

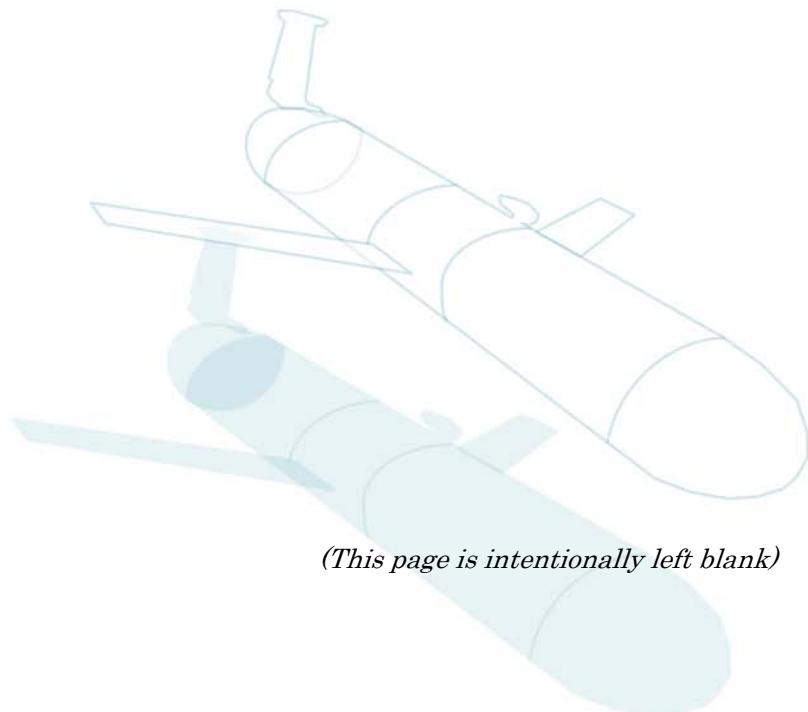
BLOCK III 31

III.1-	MISSION FORMS	33
III.1.1-	<i>Mission Meeting Minutes</i>	34
III.1.2-	<i>Mission Announcement for Competent Authority</i>	36
III.1.3-	<i>Mission Summary Chart</i>	40
III.1.4-	<i>Ballasting and H-moment Adjustments WorkSheet</i>	42
III.1.5-	<i>Pre Mission Checklist</i>	44
III.1.6-	<i>Mission Equipment Checklist</i>	48
III.2-	GLIDER TECHNICAL SPECIFICATIONS.....	50
III.3-	CONFIGURATION MISSION FILES.....	52
III.3.1-	<i>Glider</i>	52
III.3.1.1-	Mission File (canset11.mi)	52
III.3.1.2-	Mafiles	53
a)	surfac10.ma.....	53
b)	surfac11.ma.....	53
c)	surfac12.ma.....	54
d)	surfac13.ma.....	54
e)	yo50.ma	54
f)	goto_110.ma.....	55
g)	prepar10.ma.....	55
h)	sample10.ma.....	55
III.3.1.3-	Data Subsampling (.DAT)	56
a)	sbdlist.dat.....	56
b)	tbdlist.dat.....	56
III.3.2-	<i>GAPP</i>	57

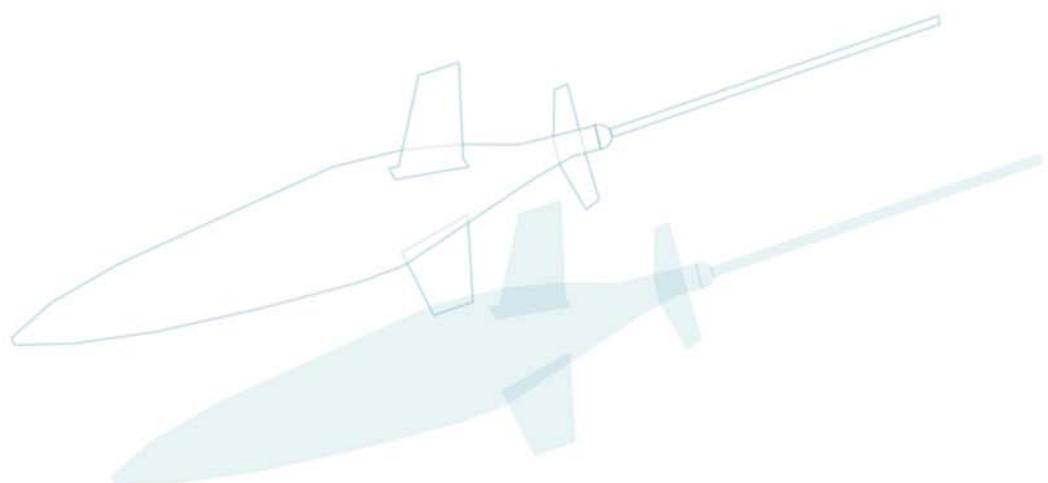
Table of Figures

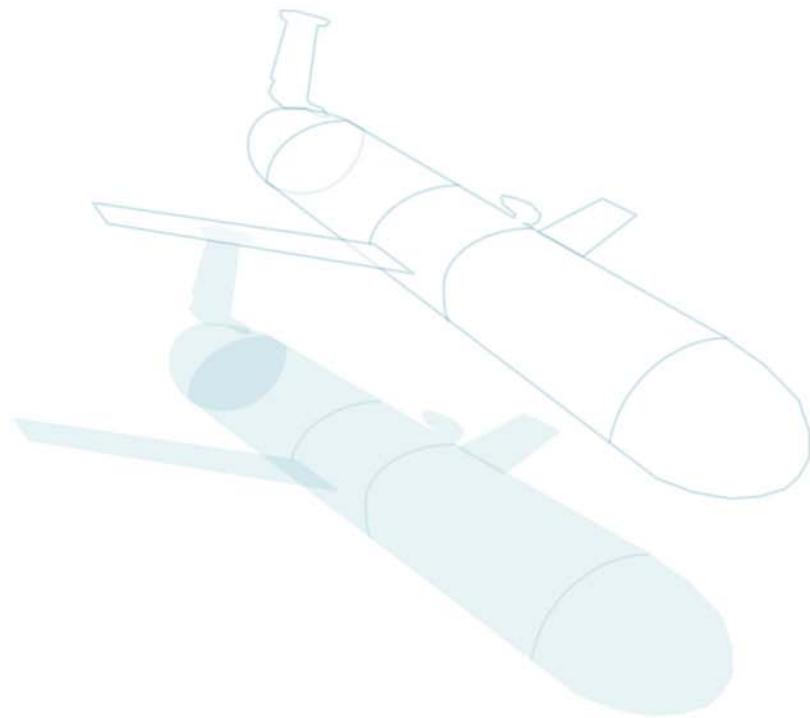
CHART A – UPDATE RECORD.....	3
CHART B.I – VERIFICATION LIST	3
CHART B.II – DISTRIBUTION LIST.....	3
FIGURE I.4.1 – SALINITY CLIMATOLOGY FOR THE NORTHWESTERN MEDITERRANEAN SEA OBTAINED FROM MEDAR DATABASE. THOSE VALUES, TOGETHER WITH IN SITU MEASUREMENTS (SALINITY AND TEMPERATURE) FROM BUOYS ARE USED FOR GLIDER BALLASTING –	11
FIGURE I.5.1 – SLOCUM DEEP ELECTRIC GLIDER. MANUFACTURED BY THE TELEDYNE WEBB RESEARCH COMPANY. DEEP MODELS ARE SUITED FOR A MAXIMUM DEPTH OF 1050 METERS WHILE SHALLOW MODELS ARE LIMITED TO 200 METERS (ALTHOUGH THERE ARE VERSION FOR 30 METERS ONLY)	12
FIGURE II.1.1 – PLANNED ROUTE SHOWING INITIAL SEGMENT IN RED, SCIENTIFIC TRANSECTS IN ORANGE AND NAVIGATION SEGMENTS IN GREEN –.....	16
FIGURE II.1.2 – ALL THREE SCIENTIFIC SENSORS ONBOARD WILL SAMPLE AT THE SAME RATE, OR AS SOON AS POSSIBLE FOR EACH ONE OF THEM, DURING THE DIVING AND CLIMBING MANEUVER –	16
FIGURE II.1.3 – EVERY TIME THE GLIDER SURFACES AND CONNECTS TO THE BASE STATION IT IS INQUIRED TO SEND THE LAST TWO PAIRS SBD-TBD MORE RECENT AND NOT SENT YET –	17
FIGURE II.2.1 – ALTHOUGH QUALITY CONTROL IS STRICTLY APPLIED ALONG WITH THE EXECUTION OF THE POST-PROCESSING SCRIPTS, THERE ARE DIFFERENT STAGES OF THE MISSION IN WHICH	

SPECIFIC ACTIONS ARE FOCUSED IN ASSURING AND CHECKING THE GOOD QUALITY OF THE DATA AS WELL AS THE GOOD HEALTH OF THE SENSORS –	19
FIGURE II.2.2 – THE POST-PROCESSING SCRIPT IS CHAIN PROCESS DESIGN THROUGH WHICH THE ENCODED DATA FROM THE GLIDER IS TRANSFORMED BY DIFFERENT DATA MANAGEMENT AND FILTERING TECHNIQUES INTO SCIENTIFIC FILES WITH METADATA READY TO BE USED BY THE SCIENTIFIC COMMUNITY –	20
FIGURE II.2.3 – SOME STAGES OF THE DATA PATHWAYS HAVE BEEN ELUDED FOR CLARITY. FOR EXAMPLE, THERE IS A BACK-UP MODEM AND DOCKSERVER IN CASE THE PRIMARY ONE FAILS TO HANDLE IRIDIUM CALLS FROM GLIDERS –	21
FIGURE II.4.1 – EVEN THAT THE ESTIMATED COST IS HIGH, IT IS NOTHING COMPARED TO WHAT IT WOULD BE IF TAKING CTD PROFILES FROM A RESEARCH VESSEL –	26
FIGURE IV.5.1 – DISCHARGE CURVES FROM ALL THE MISSIONS ICOAST00 HAS PERFORMED UNTIL TODAY –	28
CHART IV.1 - MISSION FORMS CHRONOLOGICAL ORDERING AND RESPONSIBLE IDENTIFICATION.....	33
NOTE: FOR SLOCUM GLIDERS, UNDER NORMAL CIRCUMSTANCES, CONSIDER 1 DAY FOR BALLASTING AND 1 DAY FOR CHECKLISTING.	34
FIGURE IV.2.1 – IDENTIFICATION OF THE MAIN STRUCTURAL PARTS IN A GLIDER –	50
FIGURE IV.2.2 – THE GLIDER NAVIGATES FOLLOWING A TOOTH-SAW TRAJECTORY. THIS IS THE RESULT OF MODIFYING ITS BUOYANCY, ADJUSTING THE POSITION OF THE PITCH BATTERY AND MOUNTING A PAIR OF WINGS –	51



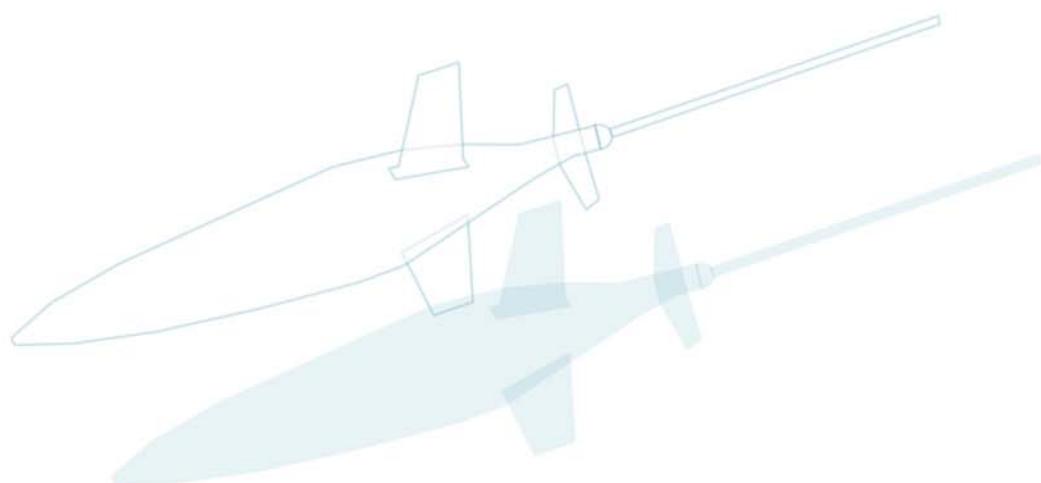
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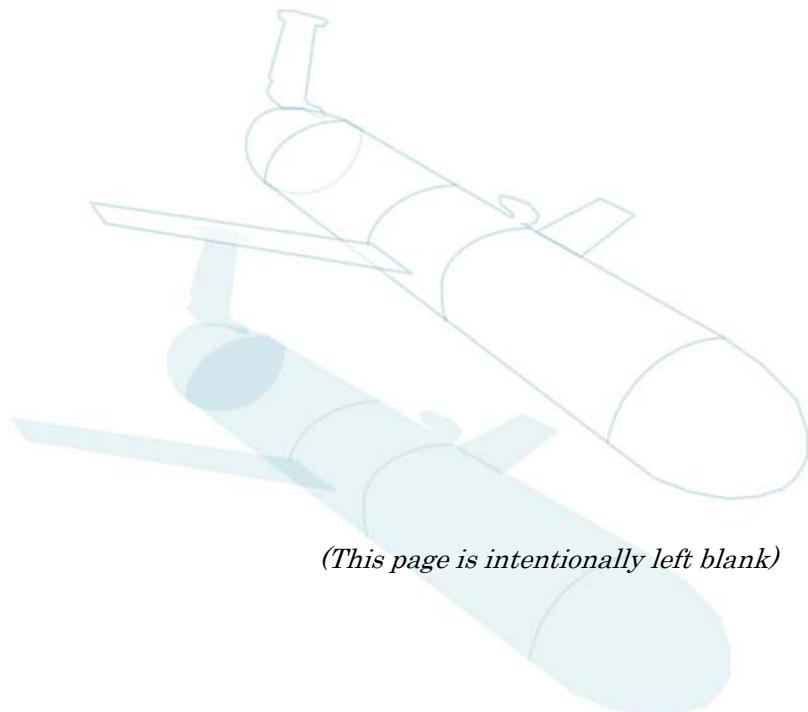




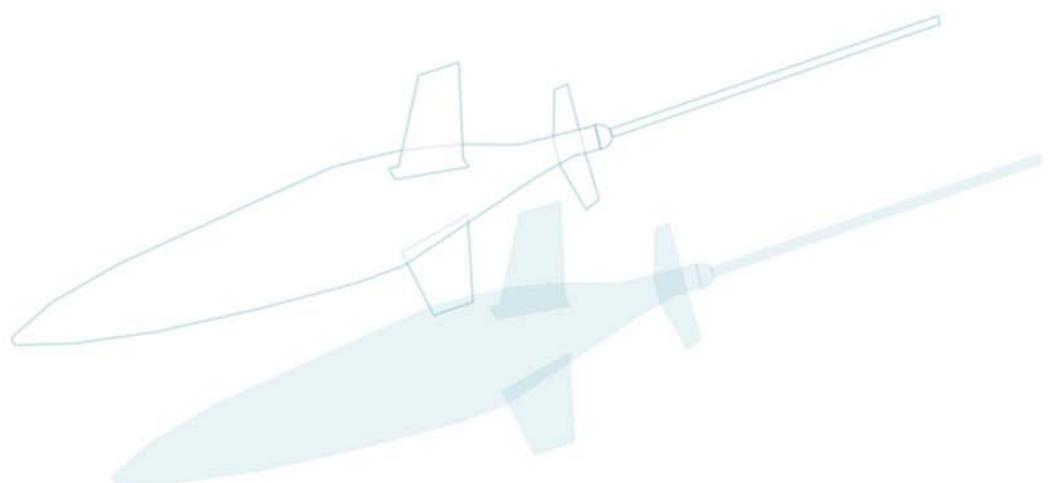
BLOCK I

- CONTEXTUAL SCENARIO -





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I.1- Summary

TBD after mission.

I.2- Parent project: description and objectives

Please refer to the Glider Facility Implementation Plan (http://www.socib.es/?seccion=textes&id_textotextes=planEstrategico).

I.3- Mission: description and objectives

To investigate the mesoscale, seasonal and inter-annual variability of the water exchanges in the Ibiza Channel. The routine gliders monitoring consists of repeated transects between Ibiza and Denia with maximum dives of ~850 meters.

I.4- Background and oceanic climatology

The inflow of Atlantic Water through the Balearic Channels is known to be related to important ecosystem changes such as Bluefin Tuna spawning area located each summer. Having a sustained glider observational program in the Ibiza and Mallorca Channels and considering other data sources (satellites, ships cruises, high frequency radars and buoys) open scientific questions will be addressed such as mesoscale, seasonal and inter-annual variability of the water exchanges in the Ibiza and Mallorca Channel. Apart of the studies carried out by Pinot et al. (2002) using data gathered in the late' 90s, there are not many new contributions and advances on that topic.

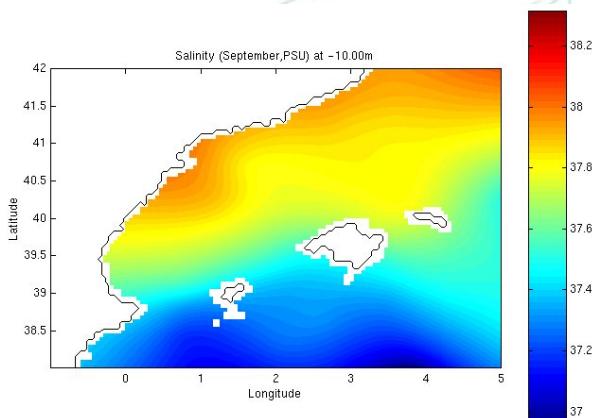


Figure I.4.1 – Salinity climatology for the northwestern Mediterranean Sea obtained from MEDAR database. Those values, together with in situ measurements (salinity and temperature) from buoys are used for glider ballasting –

I.5- Involved platforms

The mission relies, at the moment, with one single Slocum Electric Glider to be in the water sampling the Ibiza channel. Detailed specifications about this vehicle can be found in Annex V.2, at the end of this document.

However, the usage of the same unit depends on the status it exhibits at the moment of the deployment into the Med. Sea. There are numerous factors and situations which can prevent the unit which executed the last mission to be used for the next one. In that case, TMOOS/SOCIB has a fleet of three deep gliders and one shallow Slocums amongst gliders from other manufacturers.

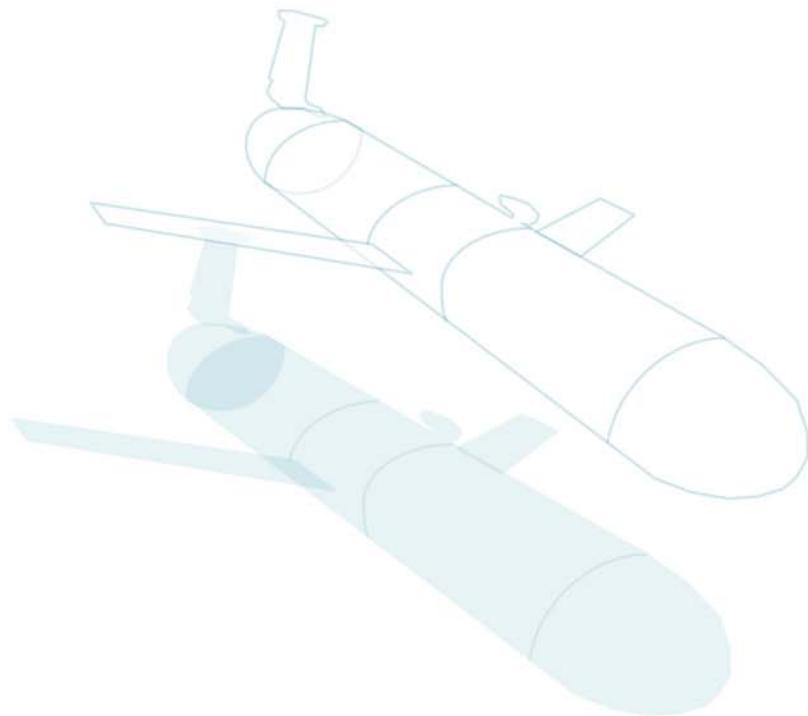


Figure I.5.1 – Slocum Deep Electric Glider. Manufactured by the Teledyne Webb Research company. Deep models are suited for a maximum depth of 1050 meters while shallow models are limited to 200 meters (although there are version for 30 meters only)

I.6- Related projects

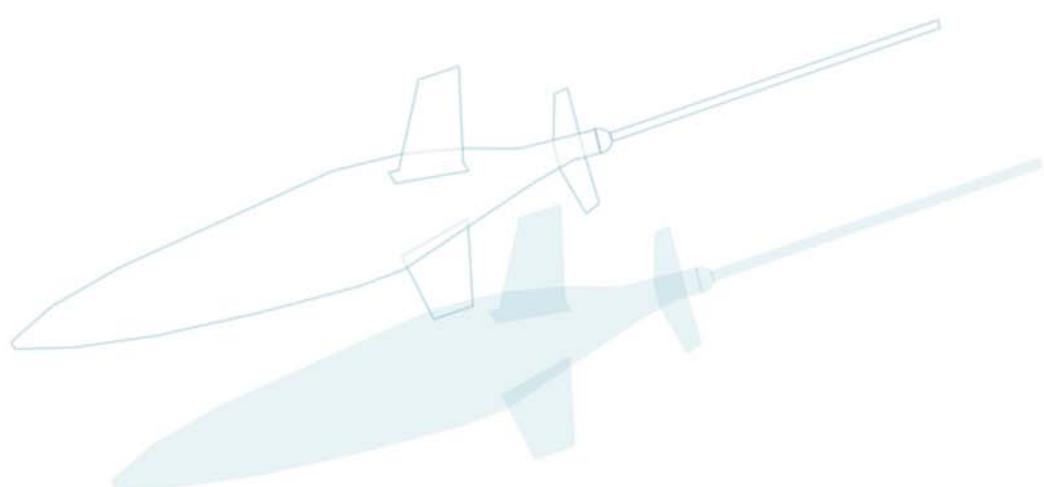
Please refer to the Glider Facility Implementation Plan (http://www.socib.es/?seccion=textes&id_textotextes=planEstrategico).

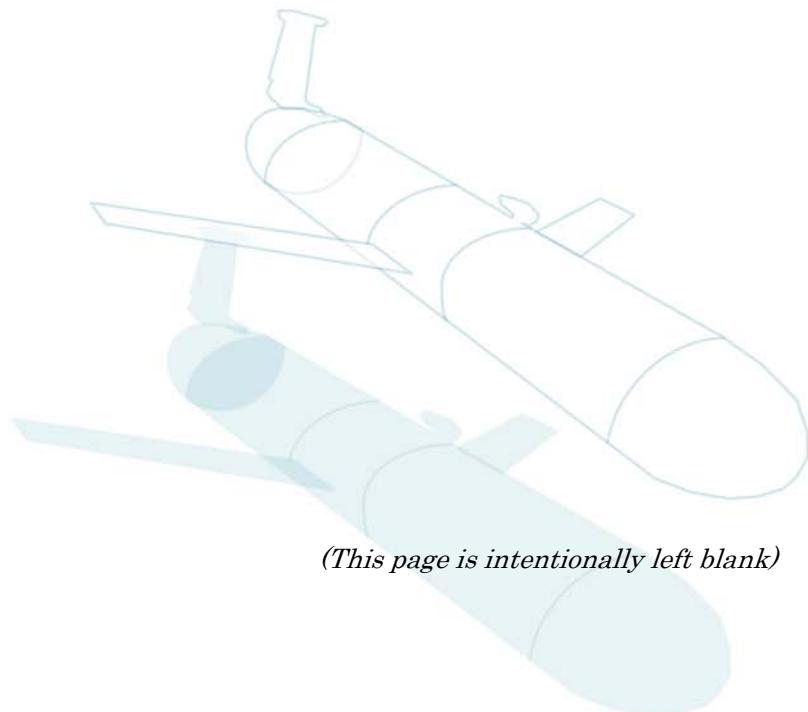
There is no external project associated to this glider mission.



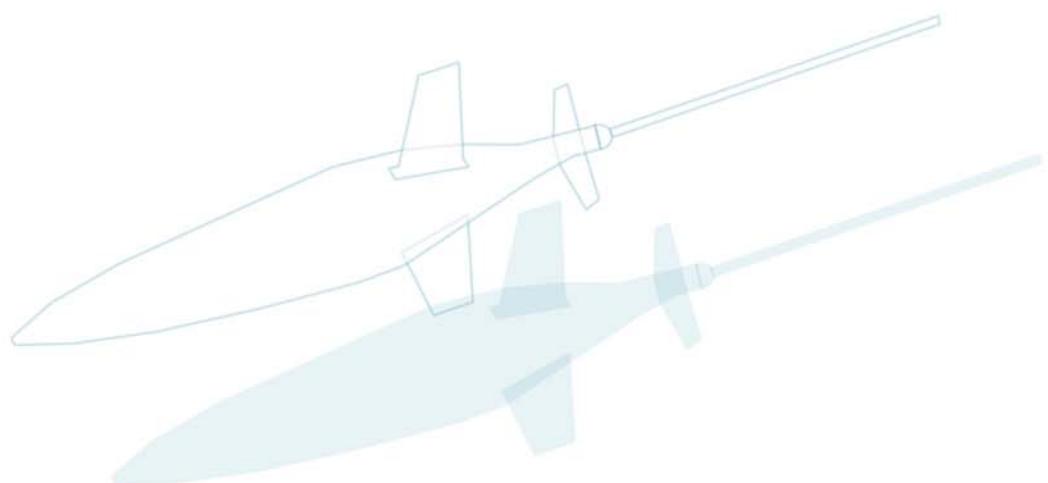
BLOCK II

-PREMISSION-





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II.1- Mission Planning

II.1.1- Mission Meeting Minutes

The fundaments of this mission were discussed and agreed during a meeting which took place at IMEDEA. During the reunion, main issues were considered focusing on the time frame in which the mission will be executed, identification of task responsibles and route planning. Having treated all this topics, modifications of the initial plan would be accepted if forthcoming events force so.

Please refer to Appendix IV.1.1 to consult the minutes of this mission planning meeting.

II.1.2- Schedule

The most significant events to be considered from an organizational point of view are the following:

- Ballasting : 16th Sept 2011
- Checklist : 18th Sept 2011
- Administrative notification : 18th Sept 2011
- Mission definition & simulation : 18th Sept 2011
- Deployment (mission start) : 20th Sept 2011
- Recovery (mission end) : 06th Oct 2011
- Data download (from the glider to the Data Center) : 7th Oct 2011
- Glider in storage mode : 7th Oct 2011

II.1.3- Route

The start of the mission has been defined at 7nm from the West coast of Eivissa island. Following figure shows the programmed route, which can be divided in three main parts applying an objective classification pattern:

- Initial Segment: the glider will be released into the water and, upon completion of pre-launch operations, ordered to advance to the first waypoint of the mission which is 0.33nm away from the point where the glider finishes the pre-launch tests.
- Scientific Segments: the glider is intended to navigate between waypoint WP_SCI1 and WP_SCI2 a minimum of four and a maximum of six times, iteration in which scientific data will be gathered as specified in the following section.
- Navigation Segments: Having the scientific transects been completed, the vehicle will initiate its return to the recovery point near the coast of Mallorca island. The

followed path can be considered as a mere navigation activity during which the scientific sample could be unnecessary depending on the aims and goals of the scientific responsible of the mission.



Figure II.1.1 – Planned route showing Initial Segment in RED, Scientific Transects in ORANGE and Navigation Segments in GREEN –

II.1.4- Sampling Strategy

The sensor set onboard the vehicle deployed in this mission, as well as its configuration and identification figures, is described technically in section II.5 within this pre-mission block. However, a graphical representation of the sampling strategy follows these lines describing the requirements transmitted to the technical staff by the scientific responsible of the glider facility.

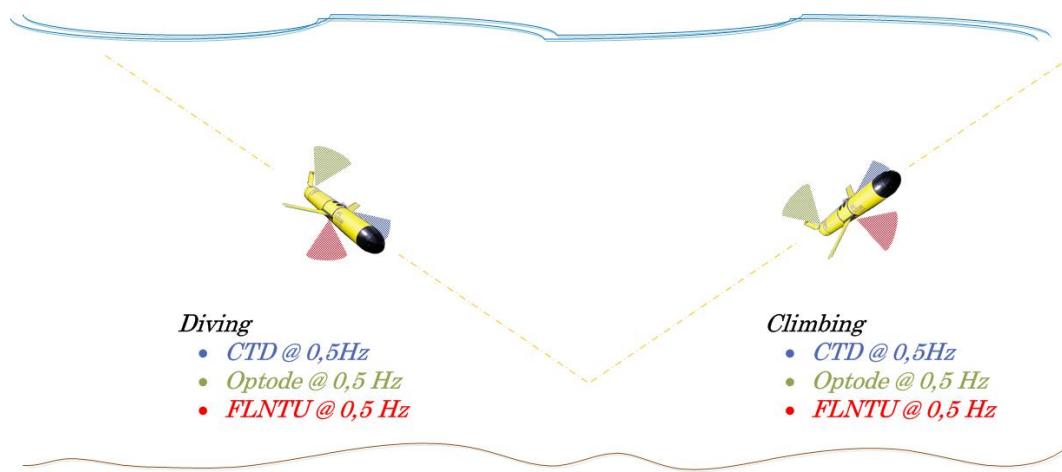


Figure II.1.2 – All three scientific sensors onboard will sample at the same rate, or as soon as possible for each one of them, during the diving and climbing maneuver –

II.1.5- In-situ Data Transmission

A special consideration must be taken into account here since SOCIB is still under a test stage of the implementation of real time scientific data visualization through the Glider Application hosted at www.socib.es. Consequently, even that the transmission of a

reduced set of the gathered data on every surface is planned, it could happen during the execution of the mission that this flow of information, from the field to the Glider Facility at IMEDEA, to be turned off for various reasons. Nevertheless, the initial strategy can be resumed as follows (see Figure II.1.3):

- Periodical surfaces every 6 hours and, eventually, every time a waypoint is hit
- Glider and Base Station (at IMEDEA) establish a satellite/PSTN link between each other
- Base Station automatically requires the glider to send SBD and TBD files generated during the two previous segments
- Base Station tells the vehicle to resume its mission
- Automatic processing is then started by the Data Center; integration of the new two pairs of files to the mission database will result.

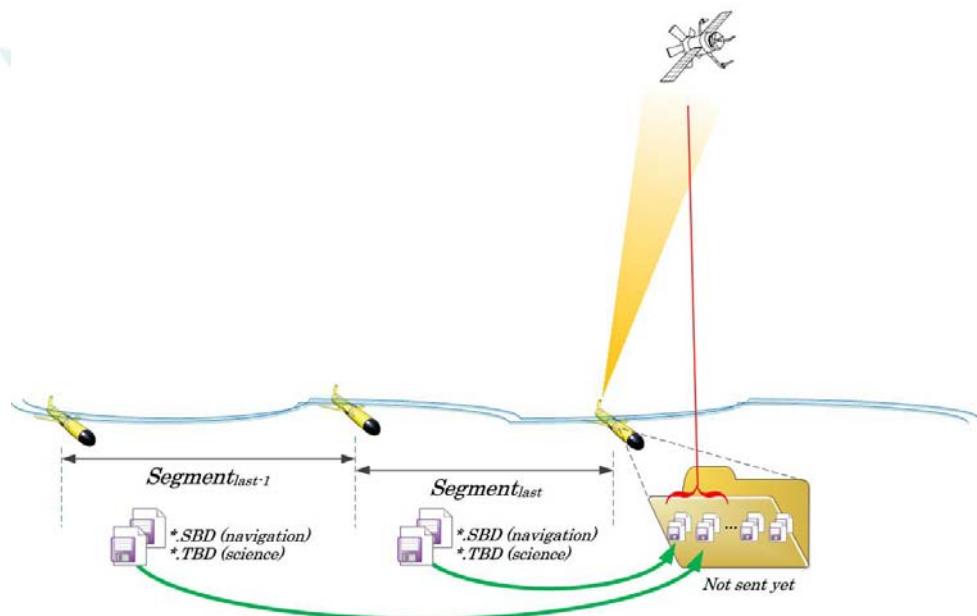


Figure II.1.3 – Every time the glider surfaces and connects to the base station it is inquired to send the last two pairs SBD-TBD more recent and not sent yet –

II.1.6- Administrative Notifications

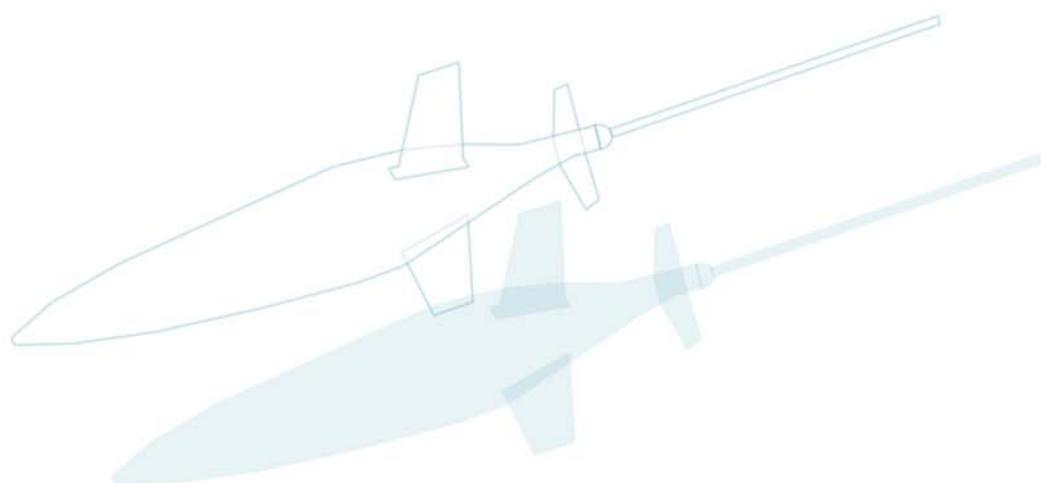
In order to inform the local competent authorities of maritime affairs, customs agency of the Spanish Government and eventual partners; TMOOS/SOCIB executes before every mission deployment a protocol of administrative. As a result of the execution of this protocol various forms are filled out, and sent via fax and/or email, as shown in section IV.1.2 (Mission Announcement for Competent Authority). The protocol can be resumed as follows:

- Customs departure authorization for the gliders involved in the mission.
- Notification via fax to the headquarters of maritime rescue agency (SASEMAR, <http://www.salvamentomaritimo.es>)
- Email to the local office of SASEMAR located in Palma de Mallorca (Balearic Islands)

- Email to the Ministry of Defense of Spain.
- Fax (or email) collaboration solicitudes for partners involved in each particular mission. As an example, a notification of this type is sent to the Conselleria d'Agricultura, Pesca, Ramaderia, Caça i Cooperació Municipal which is dependant of the Consell d'Eivissa, autonomic organism ruling in the island of Eivissa (Balearic Islands).

II.1.7- Summary Chart

A resume of the most significant aspects derived from the mission planning can be found, as one of the mission forms created during the Pre-mission stage, in Annex IV.1.3 (Mission Summary Chart). This documents is intended to serve as a guide to both technical staff within the Glider Facility at TMOOS/SOCIB and anyone seeking to receive main hints about past and/or ongoing missions.



II.2- Data Processing and Resulting Products

The data process system, and hence the resulting products it provides, are under an implementation stage currently. However, a lot of work has been done involving the scripts which are fed with raw data files coming from the gliders. Even a three-level definition of quality control techniques and products is implemented and has been tested already. To summarize, readers must be aware and take into account this section may vary quickly to reflect the progress of this automated processing and publishing system.

II.2.1- Applicable Quality Control

The quality control covers, at the moment, five main control points during the different stages of a mission (see Figure II.2.1); being the post-processing script (applied to control points 3 and 5) the responsible of generating three levels processed results.

Firstly, during the mission planning, a complete simulation is done to assure the correct definition of the behaviors in charge of controlling the sensors onboard and, hence, the data gathering from the field scenario.

Secondly, once the mission has been launched, the glider operator and a scientific member of TMOOS/SOCIB will take a look at the raw data gathered during the very first segments of the mission. This visualization is done using a Java software provided by the manufacturer.

During the course of the mission, reduced data files are sent via satellite link to the base station and processed using the scripts described in the following section. At this point, filtered and rectified data allows the showing of plots on line from SOCIB's webpage.

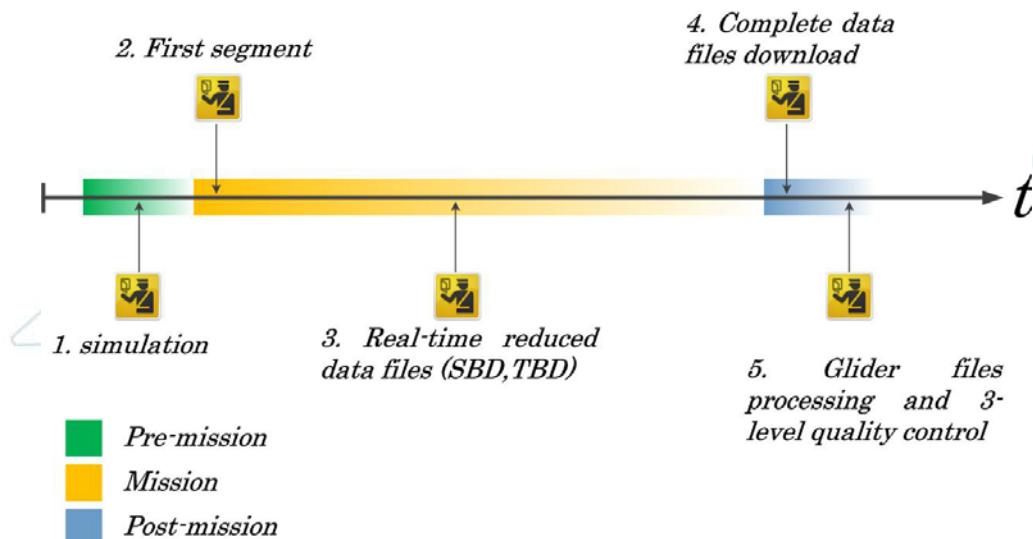


Figure II.2.1 – Although quality control is strictly applied along with the execution of the post-processing scripts, there are different stages of the mission in which specific actions are focused in assuring and checking the good quality of the data as well as the good health of the sensors –

Once the glider arrives to the lab from the field, the complete data set is downloaded to the base station using a radio connection and, once locally backed up, sent to the Data Center at SOCIB. At this point, the whole data set is processed at the Glider Lab and reviewed using the glider software package mentioned earlier in this section.

Finally, at SOCIB's Data Center, the recently uploaded glider files are processed with an automated script (see Section II.2.2) and derived products generated. That is to say: salinity plots, TS diagrams, ncdf files (one for each level of quality control) amongst others.

II.2.2- Scripting

There are two main scripting packages directly associated to the glider activity at the moment. Others could be taken into consideration when referring to other aspects related to gliders but this discussion is out of the scope of the present document. Returning to the groups mentioned in the first place, the following should be noted:

- Dockserver script package: these are XML scripts run by the dockserver and the responsible to define patterns for the automatic interaction between this base station application and the glider while on mission. The most important ones are ResumeMission.xml (tells the glider to continue with the mission as soon as possible with no data transmission) and sbdToDock.xml (in charge of pulling the last two pair of reduced data files).
- MATLAB script package (glider toolbox): it is a group of MATLAB scripts which decode, assimilate, filter, correct and print results to various documents. Further reviews of this section will include a complete description of this package. For now, the most important concept is explained graphically in the following figure.

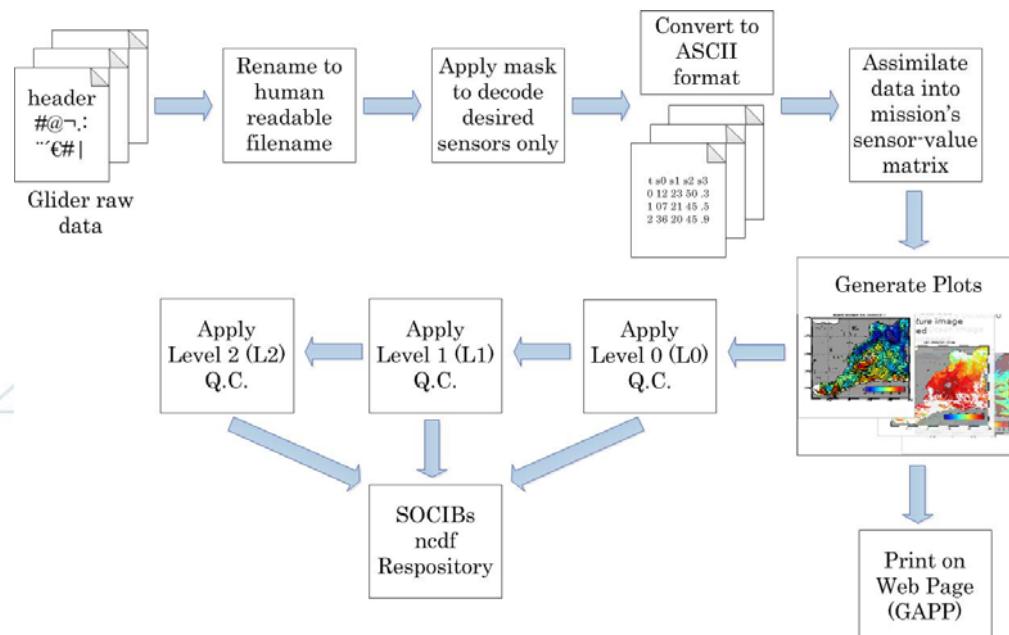


Figure II.2.2 – The post-processing script is chain process design through which the encoded data from the glider is transformed by different data management and filtering techniques into scientific files with Metadata ready to be used by the scientific community –

II.2.3- Data Pathways

Similarly to the other sections in II.2, Data Pathways will be entirely modified once the protocols for data management are written, tested and approved for implementation. Three main aspects stand amongst others when considering different approaches to the challenges involved in handling and transforming the information gathered by the sensors onboard the glider to, then, present it to the scientific community in the most organized, clear and rigorous form possible. These are:

- Keeping an organized back-up of all the files and resulting products, especially during the mid-long term as well as making that information available easily.
- Merging real-time data with post-mission complete data. This process should be performed seamlessly to the final consumers.
- Keeping separated, but not isolated, the data for the technicians and scientist in charge of the operational aspects and that data to be published.

At the moment, only one provisional path for that information has been implemented (see Figure II.2.3).

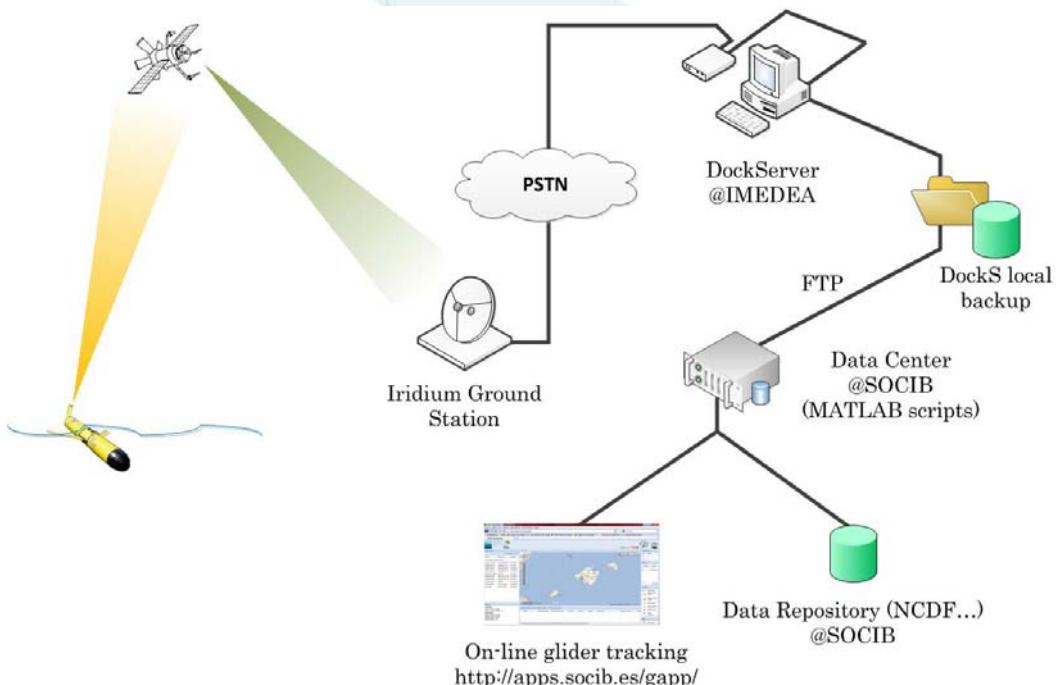


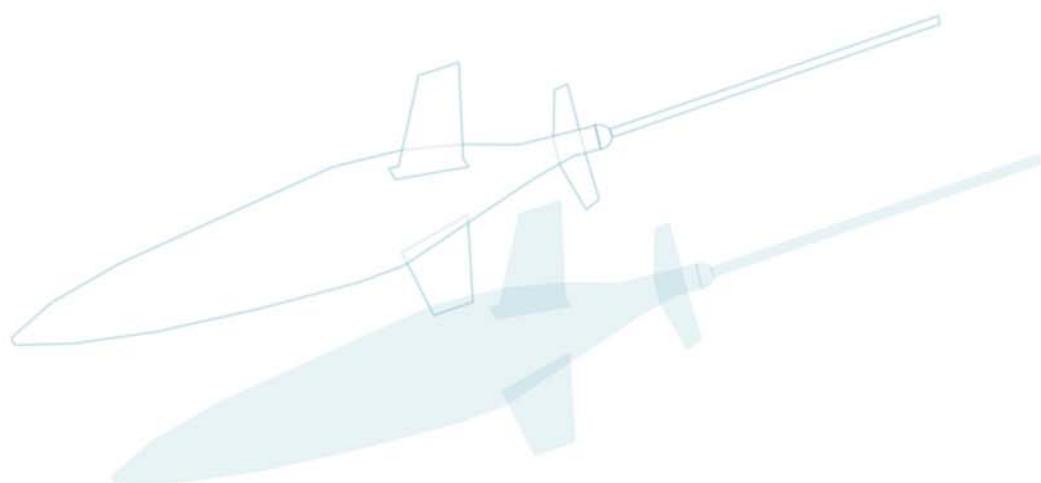
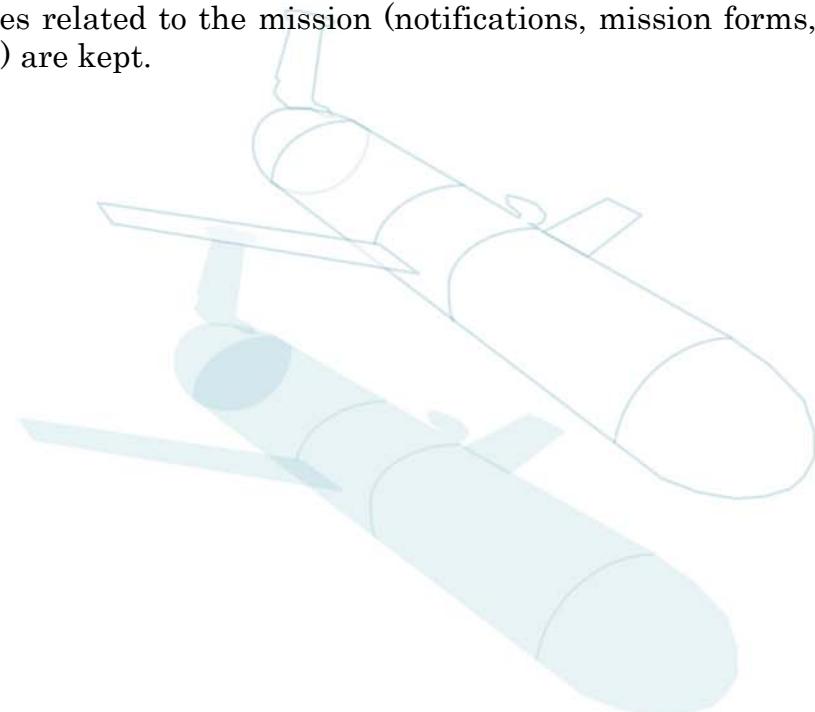
Figure II.2.3 – Some stages of the data pathways have been eluded for clarity. For example, there is a back-up modem and dockserver in case the primary one fails to handle iridium calls from gliders –

II.2.4- Virtual Storage Repository

There are three main repositories of information related to the glider activity at the moment. Internal storage capacity of the glider while being on mission is technically a repository itself but for the moment it will not be listed as such. The ones considered in the scope of this document are:

- Dockserver (Base Station @ IMEDEA): in which the memory card of the glider is backed up in the first place.

- Data Center (@ SOCIB): final storage in which a second back up of the memory card is deposited as well as the resulting products of the real-time and post-mission processing.
- Ramadda (@ SOCIB): internal document repository at SOCIB in which all the files related to the mission (notifications, mission forms, mission definition files, ...) are kept.



II.3- Logistics and Operational Tactics

II.3.1- Deployment schedule and logistics

The glider icoast00 along with the tools (see annex IV.1.8 Mission Equipment Checklist) are transported from IMEDEA to Eivissa harbor with the TMOOS Nissan Pick-Up. The Nissan Pick-Up is loaded to the Balearia ferry that departs from Palma de Mallorca on Tuesday the 20th at 8:00h and arrives in Eivissa the same day at 10:15h.

Once in Eivissa, the trip from the ferry harbor to the harbor where the deployment vessel (a 7 meter Rodman) is waiting takes 15 minutes (10:30h). After loading the glider and tools to the vessel (11:00h), navigating to the launch point takes about 1:30h (12:30h). During navigation the infrastructure for glider operation is set up on the vessel. Once at the deployment point, a 100m CTD profile is taken manually using the YSI CastAway (13:00h). After that, the glider is launched into the water with a buoy attached to it. Overtime and Overdepth missions are performed in order to assure the abort behaviors work properly (13:30h). After these missions, the buoy is detached and a W50 mission is performed to check the glider's correct navigation (14:15h). The glider is ready to start the mission after these tests and the mission is run. The glider calls at the first waypoint, sci1, which is close to the launch point, and calls to the dockserver via iridium (15:15h). Once checked it called successfully and that it is heading to the next programmed waypoint, the vessel heads to port. Once at port and the tools loaded back to the Nissan Pick-Up (17:00), waiting for the Balearia ferry to depart to Palma de Mallorca (Tuesday the 20th at 20:00h) is the only thing left.

II.3.2- Communications

Personal mobile phones carried by glider technicians on the vessel (M. Torner +34678426597 and S. Cusí +34649332317) will be used to talk to ground support personnel in IMEDEA, also using personal mobile phones (S. Ruiz +34629371050 and B. Casas +34629006192). The launch point has GSM coverage but an Iridium phone is carried as a backup. While traveling on the ferry back to Palma de Mallorca, the technicians do not have GSM coverage and therefore no internet and no access to the GliderTerminal to remotely operate the glider. During this time lapse (20:00h to 22:30h), the ground personnel will take the responsibility to check the GliderTerminal if the glider connects to the dockserver.

II.3.3- Operations infrastructure

In IMEDEA, a computer running CentOS with the WebbResearch dockserver application active is connected to two telephone lines through a dial-up modem. When the glider calls to one of these lines through Iridium, the GliderTerminal (a Java application that can run on any computer with internet connection) displays information

of the glider and allows the user to cancel a mission, download files and give other instructions to the glider.

On the vessel, the glider technicians install a similar setup. A portable computer with the dockserver application is connected via Ethernet to the technicians' personal computers. These computers run GliderTerminal so every technician can give orders to the glider. All the logs are stored in the dockserver. The only difference is that instead of an Iridium connection, the dockserver receives and transmits the data from/to the glider via a Freewave modem connected to its serial port.

This way, when the glider is closer than 5 km from the vessel, the freewave connection is used. This makes the Iridium connection to IMEDEA to become just a backup during the launch process.

To get power to run this system on the vessel, the technicians carry a car battery and an inverter.

II.3.4- Virtual Resources

With GSM internet connection on the vessel, the technicians can access the dockserver computer in IMEDEA to check old logs and other information. Also, SOCIB's Ramadda repository is accessible via internet. In Ramadda all documentation concerning the mission and the glider can be found.

II.3.5- HHRR

Ground scientific support and mission manager:

S. Ruiz (Principal investigator)

Ground support:

- B. Casas (Instrumentation responsible)
- C. Castilla (Instrumentation technician)

On field glider technicians:

- M. Torner (Glider operator)
- S. Cusí (Glider operator)

Skipper

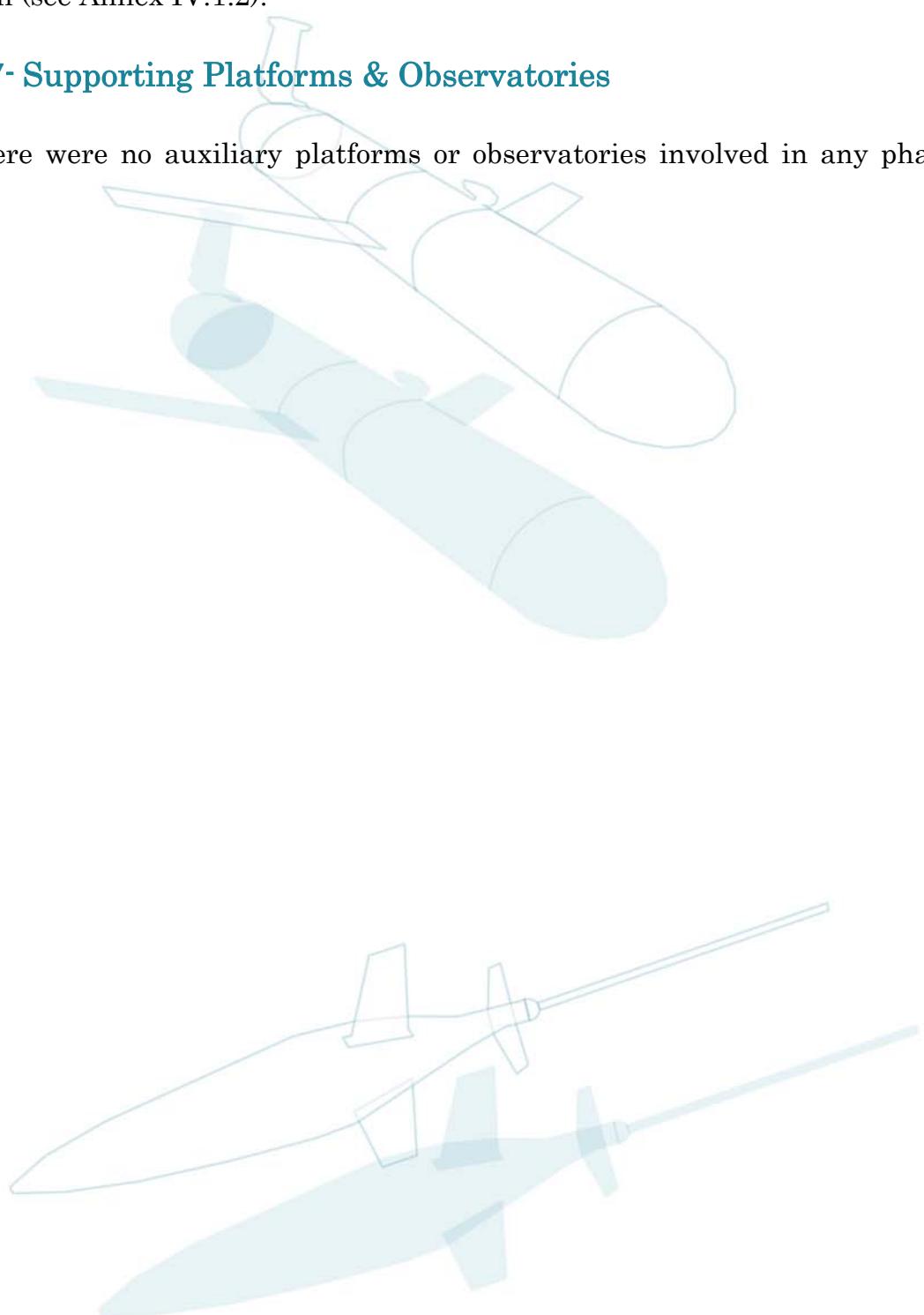
Pointed by Consell d'Eivissa

II.3.6- Partnership

Consell d'Eivissa provides the vessel, the skipper and fuel to carry out the launch operation (see Annex IV.1.2).

II.3.7- Supporting Platforms & Observatories

There were no auxiliary platforms or observatories involved in any phase of this mission.



II.4- Financial Prevision

Mission costs				
		Number	€/unit	Total
<i>Glider setup</i>	Battery set	1	1800	1.800,00 €
	Calibration	0	0	- €
	Shipping*	1	0	- €
	Iridium call	2	3	6,00 €
	Fungible	1	30	30,00 €
<i>TOTAL</i>				1.836,00 €
<i>Deployment</i>				
	Allowance	2	37,4	74,80 €
	Travel	1	250	250,00 €
	Car fuel	1	20	20,00 €
	Boat**	0	0	- €
	Boat Fuel**	0	0	- €
	Iridium call	1	3	3,00 €
	Phone call	5	1	5,00 €
	Other***	1	130	130,00 €
	<i>TOTAL</i>			482,80 €
<i>During Mission</i>				
	Iridium call	84	3	252,00 €
	Phone call	20	1	20,00 €
	3G	1		- €
	Other	0	0	- €
	<i>TOTAL</i>			272,00 €
<i>Recovery</i>				
	Allowance	2	37,4	74,80 €
	Travel	0	0	- €
	Car fuel	1	10	10,00 €
	Boat	1	150	150,00 €
	Boat fuel	1	20	20,00 €
	Iridium call	1	3	3,00 €
	Phone call	5	1	5,00 €
	Other			- €
<i>TOTAL</i>				262,80 €
<i>TOTAL MISSION COST €</i>				2.853,60 €

Figure II.4.1 – Even that the estimated cost is high, it is nothing compared to what it would be if taking CTD profiles from a research vessel –

II.5- Technical SetUp

The information contained in this section summarizes the technical activity of the glider operators. The aim of the team is to accomplish a full documented state in which all the activities, processes and arrangements are written down in a paper; therefore, the Glider Facility will be self-contained and not dependant on any particular person.

II.5.1- Platforms to be deployed

II.5.1.1- Slocum Electric Shallow Glider

The vehicle deployed in this mission will be the only shallow glider (200 m of max. depth) TMOOS/SOCIB can count on. The rest of the fleet is formed by deep gliders. Even that this mission is typically carried out by deep gliders (the Ibiza channel can be up to 950 meters deep) there is any of them available right now.

a) Hardware Configuration

Ballasting

See ballasting sheet form in Annex IV.1.4.

Checklist

See Pre-mission checklist form in Annex IV.1.5

Sensors Onboard

Unit 050 (icoast00) hosts three sensors:

- Seabird CTD, mod. A2637, s/n. 0041
- Wetlabs FLNTU, mod. SLO, s/n. 696
- Aandera OPTODE, mod. 3835, s/n. 429

Energy Plan

Considering the historic discharge curve represented in Figure II.5.1, and considering a minimum battery voltage allowed of 11 Volts, the estimated duration for this mission is 500 hours (20 days, 20 hours). It must be taken into account this is just an approximation since many factors affect the duration of the batteries:

- Overall call time via Iridium
- Volume of cc's pumped back and forth when dynamic piloting to adjust the density of the glider when climbing or diving
- Number of times a diving maneuver is cancelled due to No Comms for a While without hitting the maximum depth
- Particularities of each battery pack

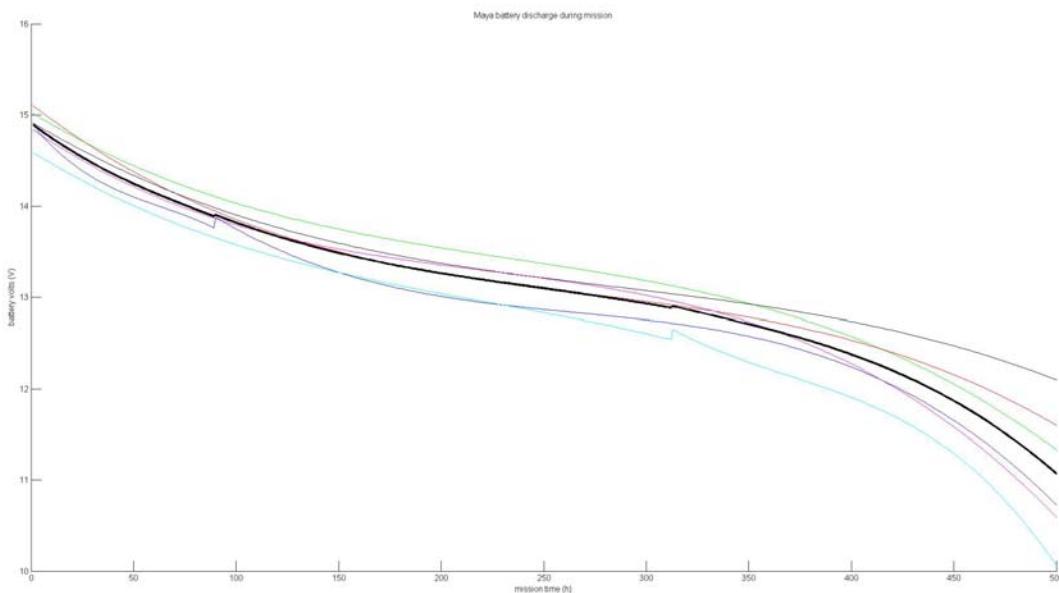


Figure IV.5.1 – Discharge curves from all the missions icoast00 has performed until today –

Incidents

There were no significant incidents observed during the preparation of the glider for this mission. Only the detachment of the backward leak detector's male connector from one of its two cables is worth to be mentioned.

b) Software Configuration

Significant Files

Two important extensions have to be considered, from a Glider point of view, when referring to configuration files. These are: mission files (.MI) and mafiles (.MA). The first, define all the behaviors, its arguments and general values such as the maximum depth at which the glider should dive voluntarily. The second, correspond to external and independent files containing values to complement the definition of some behaviors in .MI.

.MI and .MA files used for this mission can be accessed in Appendix IV.3.1.

Sampling Strategy

The way the glider gathers sampling values from its sensors is defined in the arguments set in the behavior named SAMPLE. See Annex IV.3.1.2.h, an exact copy of the mafile defining the strategy to follow which can be resumed as:

- All the sensors sampling
- At the maximum rate (0.5 Hz)
- Sampling will take place during both climbing and diving maneuver

Real-time files

Sbd and Tbd files will be completed with the variables specified in the files sbdlist.dat and tbdlist.dat respectively. See Annex IV.3.1.3 for further review.

c) Technical Specification Sheet

See Annex IV.2.

II.5.1.2- Data Center

a) GAPP Configuration File

See Annex IV.3.2

b) DockServer Checklist

See Annex IV.1.5, at the end of the list.

c) Scripting Checklist

See Annex IV.1.5, at the end of the list.

II.5.1.3- On-field Equipment

a) Checklist

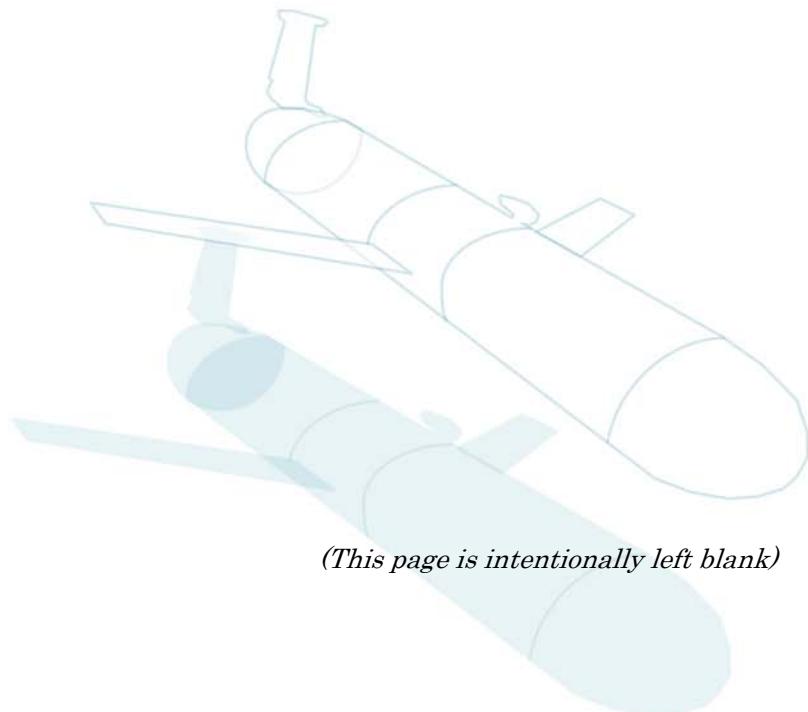
See Annex IV.1.8.

b) Garmin MapSource File

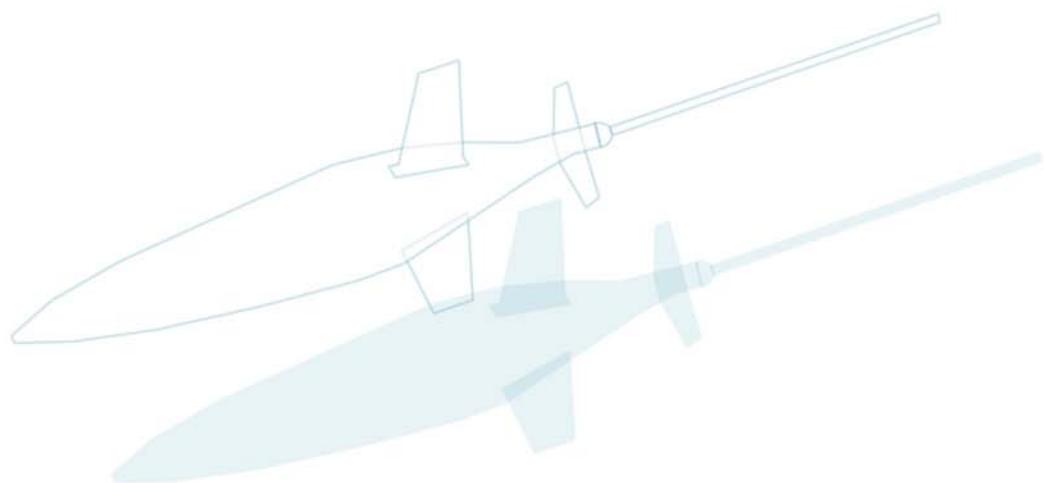
MapSource program is proprietary software licensed by Garmin Corp. It is possible to save the file in XML format and, then, imported using the option available in the most recent versions of the program. This is useful when having the chance to load the map directly to a handheld gps receiver. If the reader desires to have access to this map anytime, please contact the authors of this document. As the mission goes by, significant points will be added to this map.

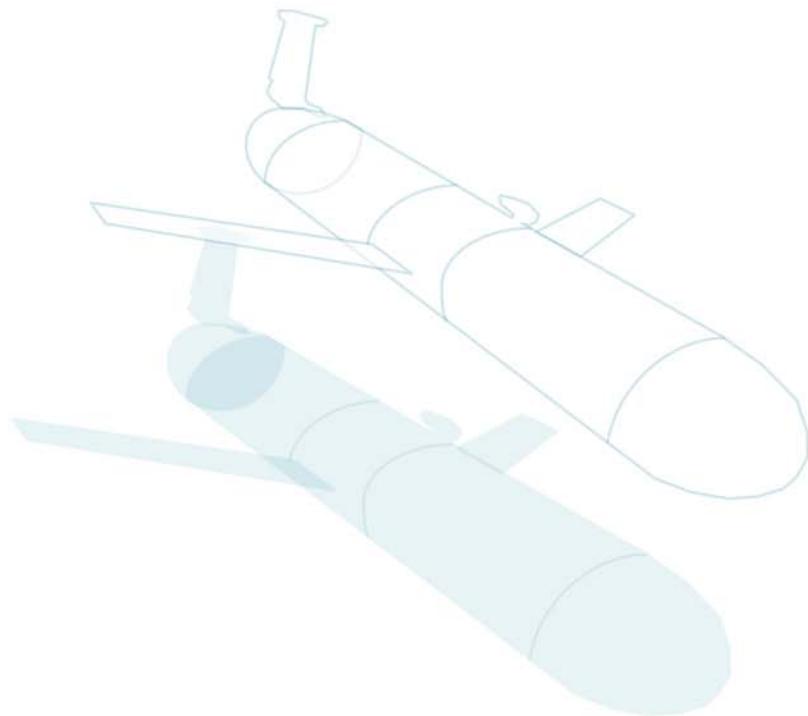
c) Vehicle Loading

See Annex IV.1.8, at the end of the list.



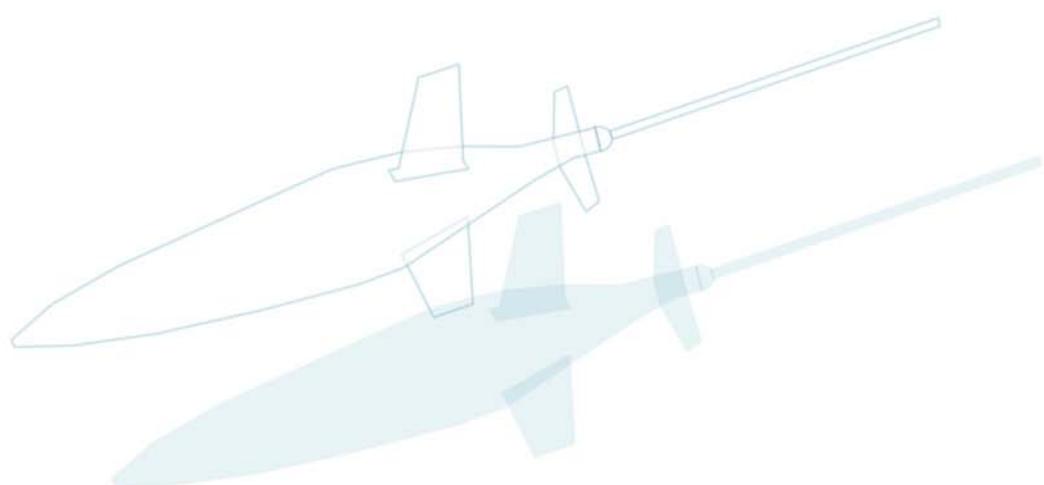
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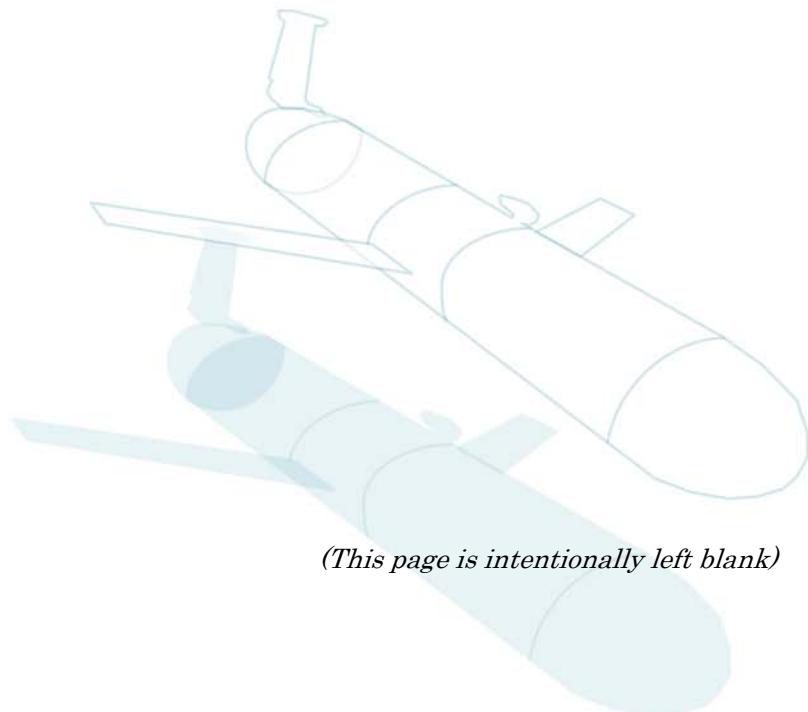




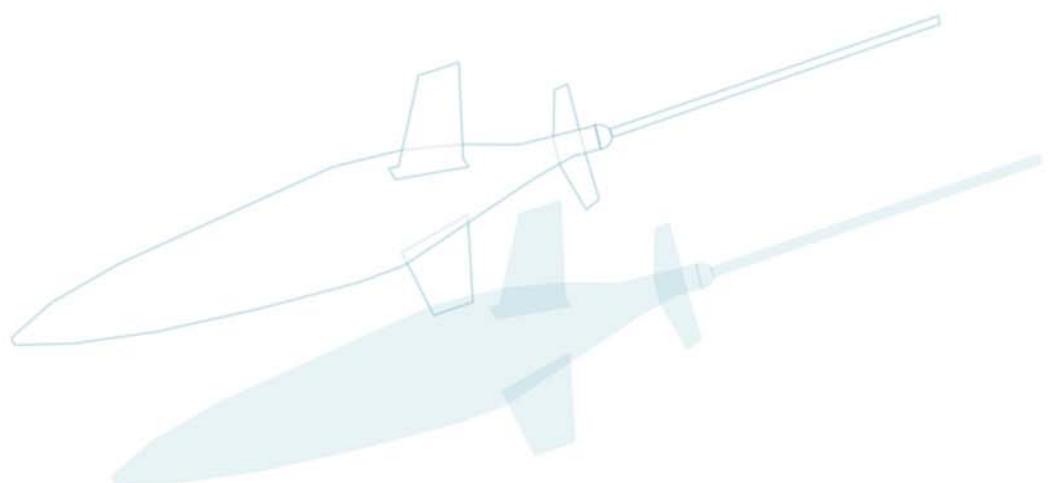
BLOCK III

-Annexes-





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III.1- Mission Forms

This section contains forms completed along the different stages thru which the Glider Team goes until the mission can be considered to be finished. The main goal of such an intense recording is to avoid forgiveness, having processes and actions documented properly and, ultimately, allowing further review and efficiency improvement.

Having these forms separated from the body of the report will also allow individual consultation and/or updating to whom it may interest/correspond. The following chart shows how the documents contained in this section should be filled in and by whom.

Form Document	Responsible
<i>Mission Meeting Minutes</i>	<i>Glider Facility Manager</i>
<i>Administrative Notification of Mission</i>	<i>Glider Operator</i>
<i>Summary Chart</i>	<i>Glider Operator</i>
<i>Ballasting Summary</i>	<i>Glider Operator</i>
<i>Glider Checklist before Mission</i>	<i>Glider Operator</i>
<i>Glider Technical Specification Sheet***</i>	<i>Glider Operator</i>
<i>On-field Equipment Checklist</i>	<i>Instrumentation Technician</i>
<i>Vehicle Loading Checklist</i>	<i>Instrumentation Technician</i>
<i>Deployment Control Sheet</i>	<i>Glider Operator OR Instrum. Technician</i>
<i>Recovery Control Sheet</i>	<i>Glider Operator OR Instrum. Technician</i>
<i>Mission Accomplishment Chart</i>	<i>Glider Operator</i>

Chart IV.1 - Mission forms chronological ordering and responsible identification

*** This document may not change from one mission to another if no major modifications or updates are implemented.

IV.1.1- Mission Meeting Minutes

The present form contains the key conclusions of the meeting celebrated to coordinate the mission. Dates, attendees and topics may vary and, if necessary, this meeting could be avoided and conclusions of the previous mission applied and adapted to the appropriate context.

MISSION PLANNING SUMMARY

Mission Basics

Date	Place

Project	Mission Name	Platform(s)
Deployment Date		Estimated Recovery Date

Task Assignment

NOTE: For Slocum Gliders, under normal circumstances, consider 1 day for ballasting and 1 day for checklist.

Task	Responsible	Date
Administrative Notifications		
Ballasting		
Checklist		
Pre-Mission Report		
Deployment Coordination		
LogBook		
Scientific Follow-Up		
Recovery Coordination		
Data Management		
Post-Mission Report		

Route to follow (Waypoint List)

Notes

Attendance

Name	<i>Position</i>	<i>Email</i>	<i>Signature</i>

De:

IMEDEA-SOCIB

Marc Torner (*mторнер@socib.es*)

Telf: 971611825, Fax: 971611761

Guillermo Vizoso (*g.vizoso@uib.es*)

Telf: 971611825, Fax: 971611761

Para :**FECHA:****ASUNTO:**

Estimado/a Sr./Sra.,

Informamos, a cualquier efecto que se considere conveniente, de la próxima misión de uno de nuestros submarinos robot (conocido como) en

, comenzando

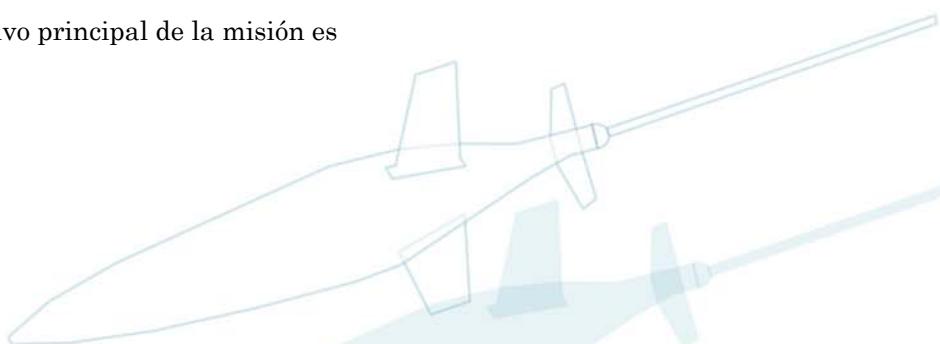
el día

y terminando

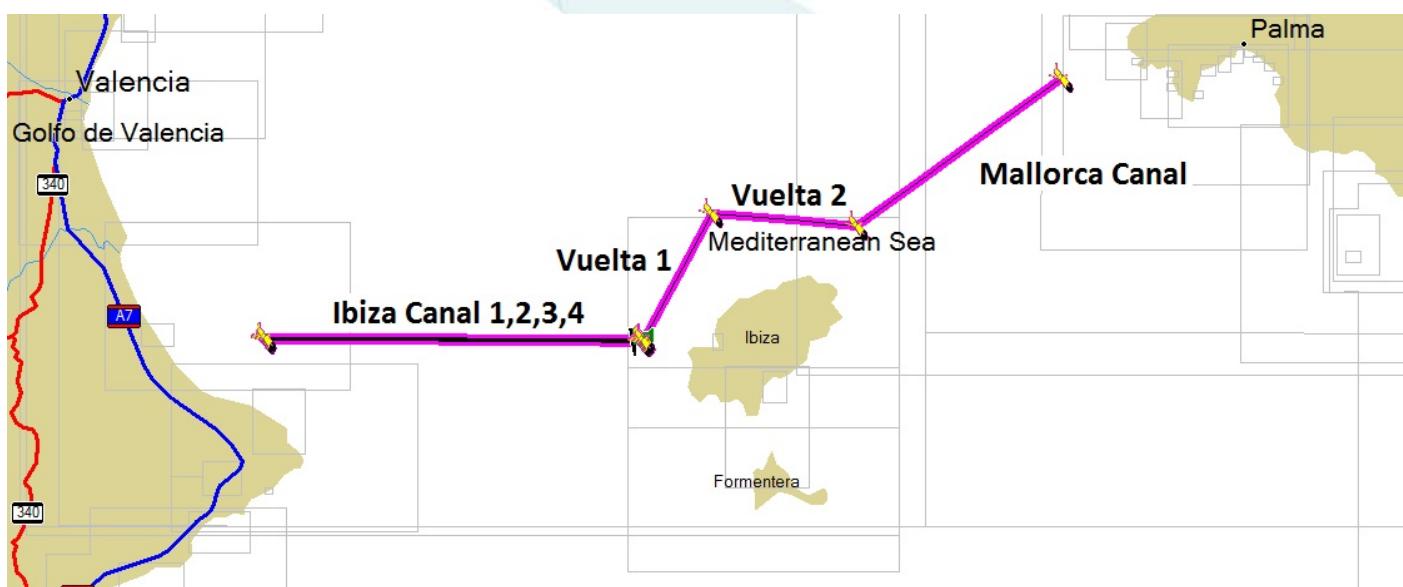
el día

Este instrumento es un pequeño vehículo tubular, de colores amarillo y negro, midiendo 1.5 metros de longitud, 21.3 centímetros de diámetro y pesando 52 Kilogramos aproximadamente. Adicionalmente, no dispone de propulsión mecánica (avanza gracias a dos alas laterales y el empuje que generan al modificar el vehículo su flotación mediante un pistón hidráulico que altera su volumen) y es alimentado por pilas alcalinas. Capaz de comunicarse mediante Modems *Radio*, *Iridium* y *Argos*, es monitorizado diariamente estableciendo comunicación con nuestro centro de control alemerger periódicamente cada horas a la superficie así como al alcanzar un *Waypoint*.

El objetivo principal de la misión es



La ruta programada, que puede ser alterada ligeramente debido a causas climatológicas o amenazas directas a la integridad del vehículo, se muestra en la figura siguiente. Los Waypoint que definen este recorrido son los siguientes (nos place invitarle a consultar la última posición conocida, clickando sobre el icono amarillo, visitando <http://apps.socib.es/gapp>):



Sin ningún otro particular, y permaneciendo a su disposición para cualquier aclaración y/o consulta, aprovechamos la ocasión para enviarle nuestros más cordiales saludos y agradecimientos por su colaboración.

Firma: Marc Torner Tomàs como Glider Operator en SOCIB

en Esporlas, a XXXXXX de XXXXXXXXXXXXXXXXXX del año XXXXXXXX

De:

IMEDEA-SOCIB
 C/Miquel Marqués 21. CP 07190
 Esporles (Illes Balears)

Marc Torner (mtorner@socib.es)
 Telf: 971611825, Fax: 971611761

Simón Ruiz (simon.ruiz@uib.es)
 Telf: 971611231, Fax: 971611761

Para :

D. Joan Ferrer

Dª Virginia Marí

Cap de Secció d'Agricultura, Ramaderia, Pesca,
 Caça i Cooperació Municipal

Consell d'Eivissa
 Fax: 971195912

FECHA: 19 de Septiembre de 2011

ASUNTO: Misión de Planeador Submarino del IMEDEA

Estimado Sr.,

El departamento TMOOS, junto al consorcio público SOCIB, lleva a cabo misiones de caracterización de la estructura de temperatura y salinidad en la zona del canal de *Mallorca* y *Eivissa* con el fin de estimar los flujos de agua Atlántica a través de dichos canales.

Los datos que sustentan estos estudios son recopilados por un vehículo submarino autónomo llamado comúnmente Glider (ver Figura 1 izquierda). Este vehículo realiza inmersiones hasta 200 metros de profundidad, navegando siguiendo un perfil de diente de sierra a 0,5 nudos aproximadamente y emergiendo periódicamente a la superficie (cada 6 horas) para transmitir parte de la información registrada.

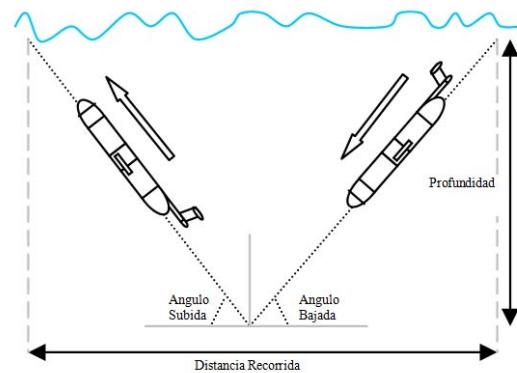


Figura 1 – Vehículo (Glider) utilizado para la adquisición intensiva de datos relativos a la densidad de las aguas que atraviesa –

La próxima misión se ejecutará en el canal de *Eivissa* y constará, según lo planeado, de 2 ó 3 recorridos de ida y vuelta en línea recta entre puntos frente a las costas Oeste de la isla (WP_SCI1) y la de Gandía (WP_SCI2) en la Península Ibérica,

comenzando en: el punto WP_SCI1 (Ver Tabla 1),

el día: Martes 20 de Septiembre de 2011

y terminando en: el mismo punto WP_SCI1 (salvo que el presupuesto energético permita regresar hacia Mallorca),

el día: Martes 11 de Octubre de 2011.

La ruta programada, que puede ser alterada ligeramente debido a causas climatológicas o amenazas directas a la integridad del vehículo, se muestra en la figura siguiente (Figura 2). Los Waypoint que definen este recorrido son los siguientes (nos place invitarle a consultar la última posición conocida, clickando sobre el icono amarillo, visitando <http://apps.socib.es/gapp>):

WP_SCI1	N38 58.888 E1 05.829
WP_SCI2	N38 58.888 E1 05.829
WP_NAV1	N38 58.888 E1 05.829
WP_NAV2	N38 58.888 E1 05.829
WP_NAV3	N38 58.888 E1 05.829

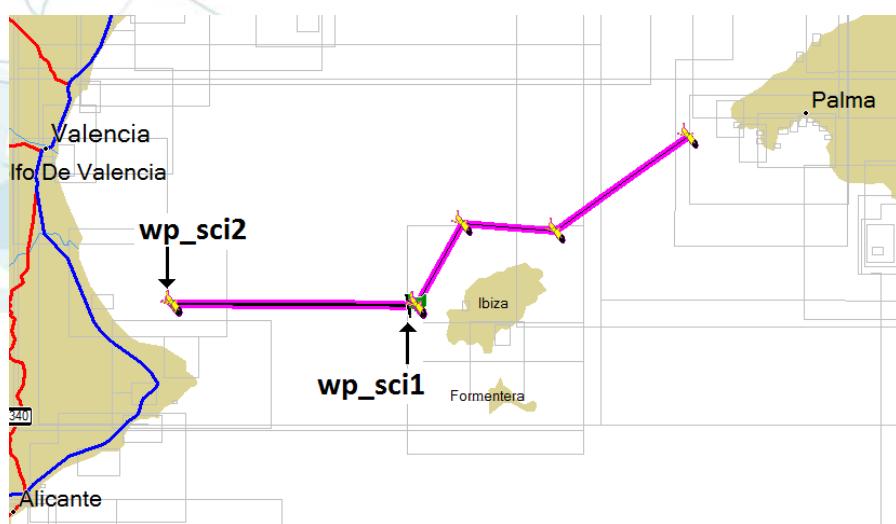


Tabla 1 (izquierda) y Figura 2 (derecha) – Lista de Waypoints que definen la ruta programada y mapeo de los mismos –

Para llevar a cabo el inicio de la misión, **SE SOLICITA** el uso de la embarcación Rodman 7m del *Consell d'Eivissa* durante la mañana del Martes 20 de Septiembre de 2011. La operación será dirigida por dos técnicos del IMEDEA/SOCIB que se desplazarán a *Eivissa* el mismo día.

Sin ningún otro particular, y permaneciendo a la espera de recibir noticias suyas, aprovechamos la ocasión para saludarle cordialmente y agradecerle la atención prestada.

Fdo. Simón Ruiz – Responsable de Proyecto –

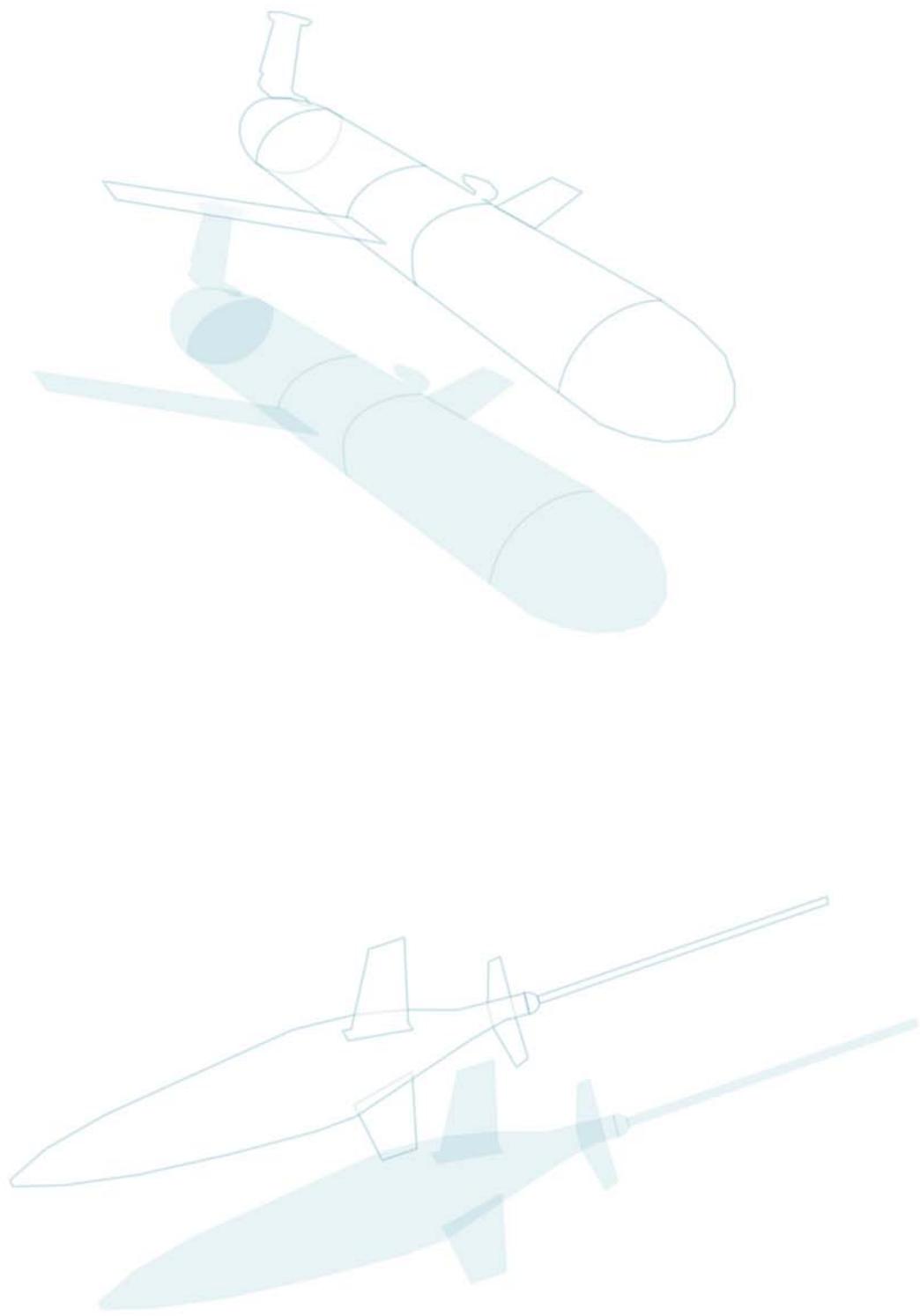
IV.1.3- Mission Summary Chart

General			
Involved Platform(s)	Icoast00		
Navigation Area	Ibiza Channel		
Start Date	20/09/2011	End Date	06/10/2011
Distance to Cover	280nm	Project	SOCIB
Principal Investigator	J. Tintoré (jtintore@uib.es) / S. Ruiz (simon.ruiz@uib.es)		

Technical	
Sensors Onboard	CTD, FLNTU, Optode
Battery Cells	220 (C)
Current Correction	1
Target Water Max. Temp.	26,25 C°
Pitch	-3.151°
Checklist Notes	Rear leak detector male connector detached from red cable
Auxiliary Missions Loaded	none
Communication Motives	No comms 4 while, when utc time, no heading, hit a wpt
Aborts	Overtime, overdepth, undervolts, same depth for

Scientific	
Overall Sampling (platform, sensor, rate, maneuver)	
Icoast00, CTD-FLNTU-OXY, 0.5Hz, climbing&diving	
Real-Time Transmission (platform, sensor, rate, maneuver)	
<code>m_present_time / sci_m_present_time / m_gps_lat / m_gps_lon / m_gps_status → every value on diving</code> <code>m_final_water_vx / m_final_water_vy / x_dr_state → every value on diving only</code> <code>sci_water_pressure / sci_water_cond / sci_water_temp → every value, on diving, 3 half-yos</code>	

Logistical			
Launching Point	N38 58.948 E1 06.261	Recovery Point	N39 00.155 E0 18.376
Deploying Vehicle	Consell Ibiza's Rodman		
Glider Team	M. Torner	S. Cusí	M. Martínez



IV.1.4- Ballasting and H-moment Adjustments WorkSheet

Ballasting Tasks

Start Date		End Date	
------------	--	----------	--

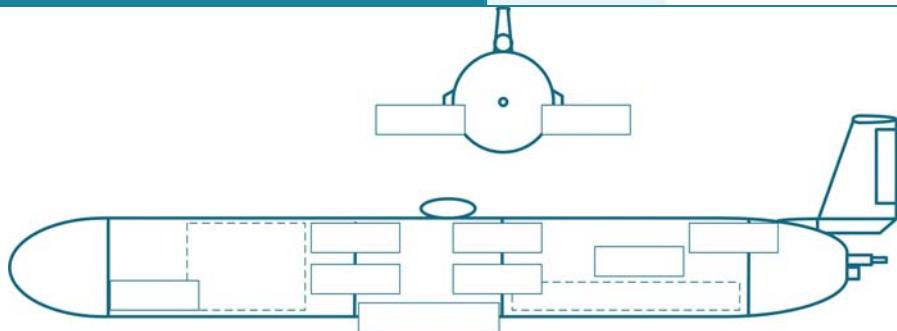
Campaign

Name	
Programmed Start	
Target Water Max. Temp.	Target Water Min. Salinity

Glider

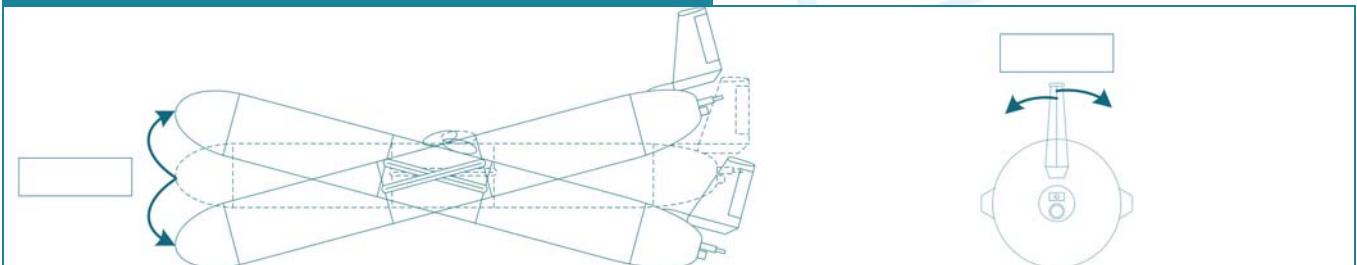
Unit Reference Number		Name		Type	
Glider Displacement					
Tank Temp.		Tank Conductivity		Weight Adjustement	
Vacuum			Batt. Level		

Weight Configuration (gr)



Extra Modifications					
Description					
Weight (gr)					

Achieved Pitch and Roll (degrees)



Stability

H-Moment		Pitch Range	
----------	--	-------------	--

IV.1.5- Pre Mission Checklist

Item	X	Status	Notes
<i>Pre Sealing Check</i>			
Fore			
Pump lead screw clean and greased	X		Self lubricated
Pitch lead screw clean and greased	X		
Leak detect board fixed, clean and connected	X		
Ballasting bottles secured	X		
O-ring inspected and lubed	X		New
Exterior nose/bellow clean of debris	X		
Interior clean of debris	X		
Desiccant installed	X		New (on navigation)

Payload			
Science Sensors			
1 CTD A2637 0041		4	
2 FLNTUSLO-696		5	
3 OPTODE 3835 429		6	
Wiring dressed	X		
O-ring inspected and lubed	X		All new
Payload weights properly secures	X		
CF card fully backed up, seated and loaded	X		Capacity= 2GB
Persistor button batteries checked	X		V= 3,071V
Interior clean of debris	X		

Aft			
Iridium SIM card installed	X		
SIM number	X		89881 69214 00066 3072
Aft tray wiring dressed	X		
CF Card backed up, seated and loaded	X		Capacity=2GB
Persistor button batteries checked	X		Vfront= 3,095V Vback=3,073V
Ballasting bottle secured	X		
O-ring inspected and lubed	X		New

Battery Voltages			
Fore Batt. Packs –Starboard–	X		V=15,73 Cells = 1 Ref#= cost_012
Fore Batt. Packs –Port–	X		V=15,73 Cells = 1 Ref#= cost_012

Pitch Batt. Pack	X		V= 15,40 Cells = 12 Ref# = cost_017
Roll Batt. Pack	X		V=15,41 Cells = 10 Ref# = deep_006
General @ J13 motherboard connector	X		V= 15,70 Cells= Ref#=
Emergency @ J31	X		V=15,76 Cells= Ref#=

Sealing			
Anode to main tray continuity	X		
Threaded rod clean and greased	X		
O-rings clean of debris before hull assembly	X		
15 in/lb torque	X		
Umbilical cord connected to pump and motherboard	X		
Vacuum pulled and Screw torqued to 15 in/lb	X		6,26 inHg

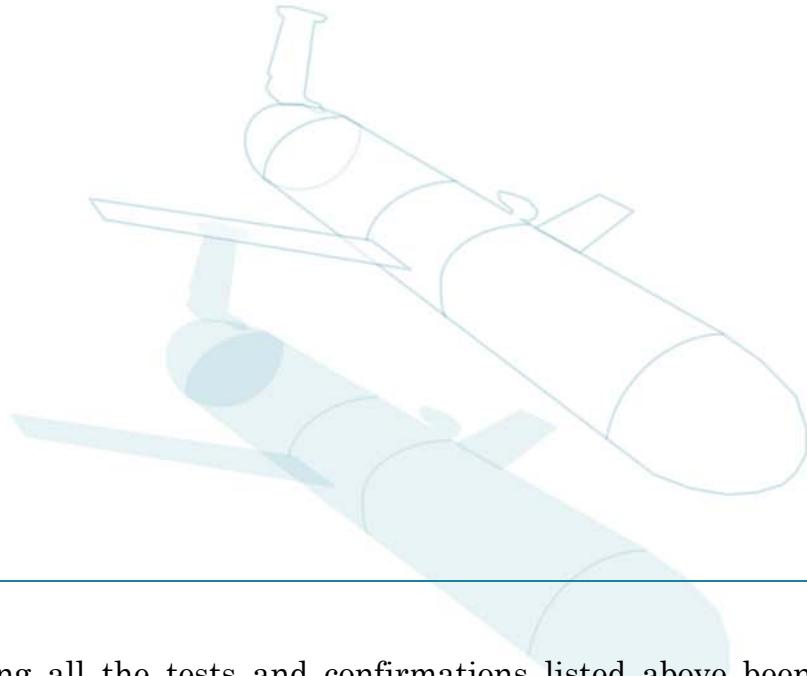
Post Sealing Check			
General			
Pick-point installed	X		
Wing rails installed	X		
Exterior connectors secured and fastened	X		
Altimeter	Aanderaa		BurnWire
X	X		X
MS plug seated	X		
Ejection weight assembly not seized	X		
Pressure sensors clear and clean (aft & science)	X		
Continuity Aft anode to Tail boom	X		
Bladder visual inspection	X		
Cowling installed	X		

Inside 'lab_mode on' Software Tests			
report ++ m_vacuum*** ,for 1 minute	X		in/Hg =6,33 inHg
report ++ m_battery ,for 1 minute	X		V = 14,98V
wiggle on ,for 15 minutes	X		Oddities = 0 Warnings = 0 Errors = 0
get [sensor_name] ,for the following:	X		
x.hardware_ver = 128	x.software_ver = 7,4		m_tot_num_inflections = 12
u_use_current_correction = 1	x_last_wpt_lat = 4137.998		x_are_simulating = 0
m_at_risk_depth = 221,2	m_digifin_firmware_version =		m_tcm3_is_calibrated = 0
u_use_ctd_depth_for_flying = 0	m_air_fill = 0		***m_veh_temp = -1
m_disk_usage = 0	m_disk_free = 0		sci_m_disk_usage = 0
sci_m_disk_free = 0	m_iridium_redials = 0		m_iridium_dialed_num = 38
m_iridium_call_num = 10	m_coulomb_amphr_total = 0		

Verifying Science			
put c_science_on 2	X		
put c_science_all_on 2	X		
put c_science_send_all 2	X		

Outside 'lab_mode on' Software Tests			
put c_argos_on 3 ,for 3 hours	X	<1 hour	Quality 1
m_argos_sent_data > 0 ?		m_argos_is_xmitting > 0 ?	
Confirm receipt of messages at Argos		Lat: 39° 45' 27" Lon: 2° 25' 24'	
Check or set the following:		X	
m_tot_horz_dist = 0	m_avg_speed = 0	m_mission_avg_speed_diving = 0	
m_mission_avg_speed_climbing = 0	m_iridium_failover_retries = 5	m_iridium_attempt_num = 1	
c_iridium_phone_num = 00971611753		c_iridium_phone_num_alt = 00971611846	
m_iridium_call_num = 0	m_iridium_redials = 0	m_iridium_dialed_num = 0	
m_coulomb_amphr = 0	m_coulomb_current = 0		
u_dbd_sensor_list_xmit_control = 1		u_sci_dbd_sensor_list_xmit_control = 1	
Confirm GPS (report ++ m_gps_status, =2?)		X	Lat: 3939.971N Lon: 234.872E
Confirm compass		X	
↑roll when rotating clockwise?		↓pitch when rising aft?	↑heading when turning Starboard?
DockServer Comms			
DockServer Machine up and running	X		>report ++ m_iridium_status if necessary
Execute 'see_dockserver' and check	X		
Scripts present and executable	X		
Start GliderTerminal and check for green	X		
Modems up and running	X		
FTP access and use (i.e. WinSCP)	X		
SSH access (i.e. Putty)	X		
Create test.MI file and send to /to_glider	X		
>callback 1 0 (calling primary number)	X		
>callback 1 1 (calling secondary number)	X		
>dockzr test.MI , check /missions	X		
>s -f irid test.MI , check /from_glider	X		
Check failing over to secondary number if primary occupied (i.e. turning off primary modem)	X		
Portable DockServer ready to use	X		
>run status.mi	X		

Notes



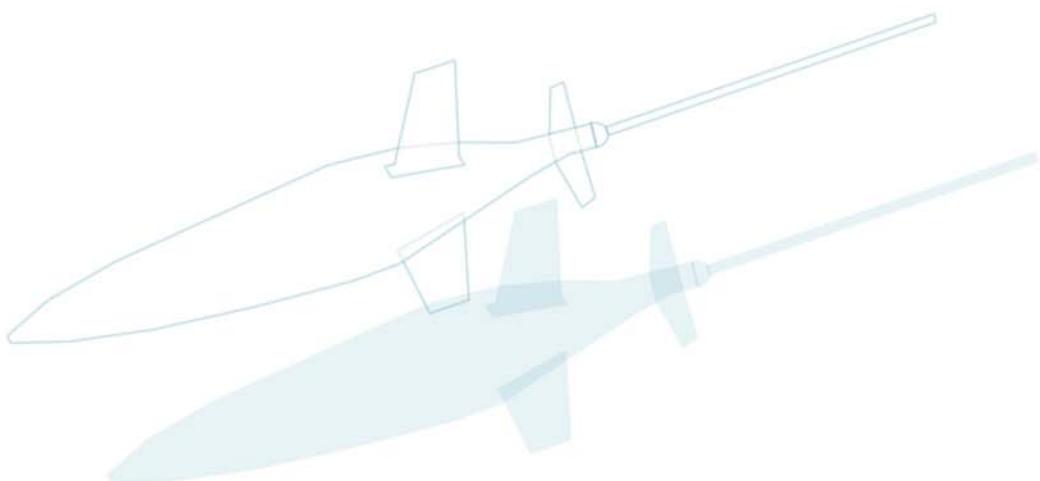
Having all the tests and confirmations listed above been performed and results taken into account, glider technician Simó Cusí states that vehicle icoast00

X is ready to be deployed and to execute mission

.

is not in perfect conditions. However, limited use is accepted.

SHOULD NOT be deployed under any circumstance.



IV.1.8- Mission Equipment Checklist

Intervention Kit (Optional) –Yellow ToolBox –			
Should always be in the box			
Glider Tools (15lbs torque limited, short&long hex key, hull separators)	X		
O-ring Set (at least 4 of G24)	X		
15V emergency pack with connector	X		
2 ballasting bottles (863gr)	X		
Green & Red plugs	X		
Silicon grease tube	X		
Head flashlight	X		
Glider screw set	X		
Screw diver	X		
American metric allen kit	X		
Duck tape	X		
Nylon fixing strips	X		
Cotton towels	X		
2 spring-based dynamometers	X		
Could be dispersed across the lab	X		
Vacuum pump with manometer	X		
Handheld flashlight	X		
Yellow tow straps	X		
Red plastic spatula	X		
Multimeter	X		
Alcohol 96° bottle	X		
Scissors and/or knife	X		
Mission Specific (Additional)			
Pair of gloves	X		

Mission Kit (Mandatory) – Black ToolBox –			
Communications			
FreeWave Modem (for each glider)	X		
Acoustic FW signal buzzer	X		
2 serial cables	X		
USBtoCOM adapter	X		
Iridium phone and complements	X		

	GPS Garmin receiver	X		
	RF Antenna and Cable	X		
	Internet USB Modem	X		
	Computers (with power suppliers)	X		
	Linux based portable DockServer	X		
	Personal laptop (ProComm, Matlab, Java, ...)	X		
	Energy supply	X		
	DC to AC converter 300W	X		
	Automotive Car (70A)	X		
	15V emergency pack with connector	X		
	4 socket electric supply switch	X		
	AC to DC Supply for Glider (2 cables)	X		
	AC to DC FW Modem Power Supply	X		
	General	X		
	Cotton towels	X		
	Red&Green glider plugs	X		
	Inflatable buoy	X		Ethernet switch and cables X

General				
Personal		X		
	Bag pack	X		
	Security Shoes	X		
	Seasonal Clothes	X		
	Food&Water	X		
	Seasickness medicine (ex: biodramina)	X		
	Sun protection	X		
	Personal Cell Phone	X		
Vehicle		X		Nissan Pick-Up
	Glider loaded and securely fastened	X		
	CTD Profiler	X		
	Yellow or Black tool case	X		
	Personal belongings	X		
	Automotive Battery	X		
	Reflective plate	X		
Notes				19 Sept @ 18:00h -> Ready

III.2- Glider Technical Specifications

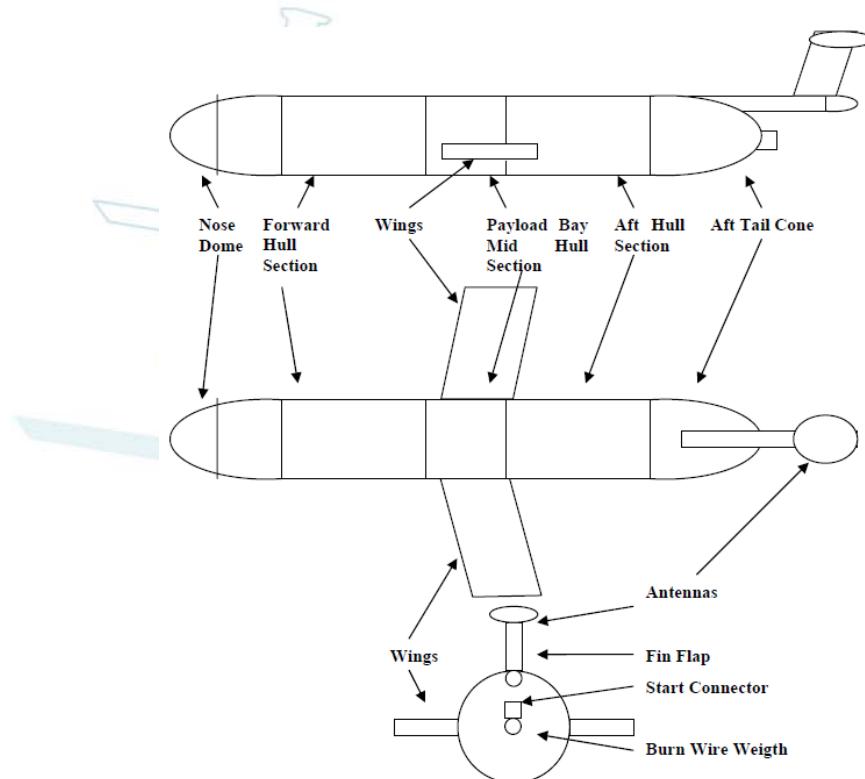


Figure IV.2.1 – Identification of the main structural parts in a glider –

Slocum Electric specifications:

Weight in air:	52 Kg
Weight in water:	Neutrally buoyant
Hull Diameter:	21.3 cm / 8 3/8 Inch
Width including Wings	100.3 cm / 39 1/2 Inch
Vehicle Length:	1.5 meters
Depth Range:	4 - 1000 meters (Deep) / 4 – 200 meters (Coastal)
Speed, projected:	0.4 m/sec horizontal
Energy:	Alkaline Batteries
Endurance:	Dependent on measurement and communication, type. 30 days
Range:	1500 km
Navigation:	GPS, and internal dead reckoning, altimeter
Sensor Package:	Conductivity, Temperature, Depth, Fluorescence, turbidity and oxygen
Communications:	RF modem, Iridium satellite, ARGOS, Tele-sonar modem



Behaviour

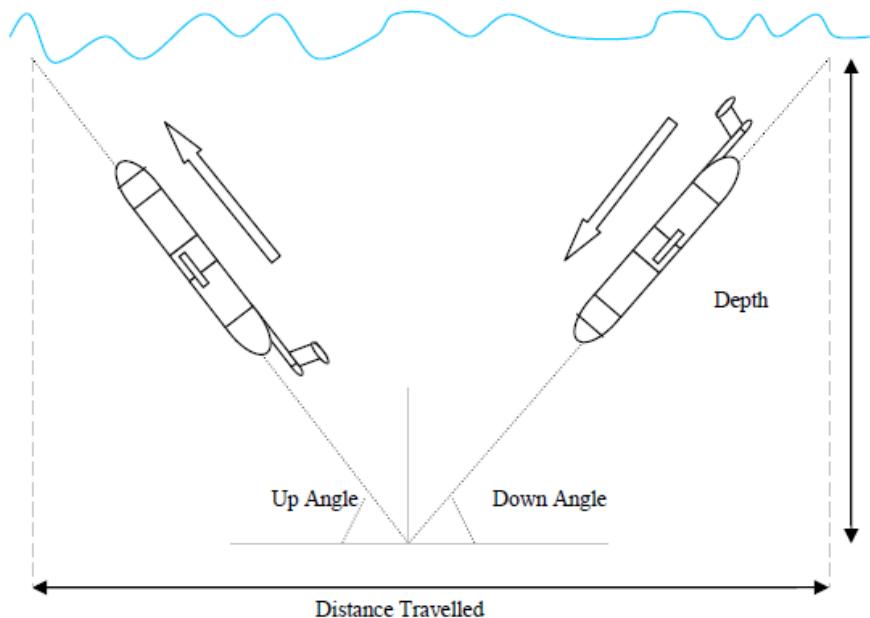


Figure IV.2.2 – The glider navigates following a tooth-saw trajectory. This is the result of modifying its buoyancy, adjusting the position of the pitch battery and mounting a pair of wings –

Distance travelled:

$$\text{Distance} = \text{Depth} * (1 / \tan(\text{Down Angle}) + 1 / \tan(\text{Up Angle}))$$

If

$$\begin{aligned} \text{Up Angle} &= \text{Down Angle} = 26^\circ \\ 1 / \tan(26^\circ) &= 2,05 \end{aligned}$$

Then

$$\text{Distance} = \text{Depth} * 4,1$$

Horizontal Speed (theoretical - without currents):

$$\text{Speed} = 0,4 \text{ [meter/sec]} * (1 \text{ mile} / 1852 \text{ meter}) * (3600 \text{ sec} / 1 \text{ hour}) = 0,777 \text{ [miles / hour]}$$

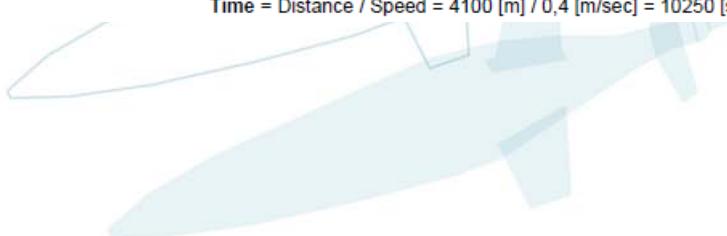
Inflection Time (Up and Down)

$$\text{Time} = \text{Distance} / \text{Speed} = \text{Depth} * 4,1 / 0,4 = \text{Depth} * 10,25 \text{ [sec]}$$

Per example:

$$\begin{aligned} \text{Then} \quad \text{Depth} &= 1000 \text{ meter} \\ \text{And} \quad \text{Distance} &= 4100 \text{ meter} \end{aligned}$$

$$\text{Time} = \text{Distance} / \text{Speed} = 4100 \text{ [m]} / 0,4 \text{ [m/sec]} = 10250 \text{ [sec]} = 170 \text{ [min]} = 2 \text{ [h]} + 50 \text{ [min]}$$



III.3- Configuration Mission Files

III.3.1- Glider

III.3.1.1- Mission File (canset11.mi)

```

=====
METADATA =====
#= Filename: canset11.mi =
#= 19-SET-2011 marc.torner@socib.es adapted from deep to coastal =
#= mission. Changed/modified: (*) =
=====

#
===== SENSOR INIT =====
sensor: f_max_working_depth(m) 220 # (*)Clips maximum depth to 220m
sensor: u_use_current_correction(nodim) 1 # Enables current correction
sensor: u_sci_dbd_sensor_list_xmit_control(enum) 1 # 1 = transmit header on initial mission
segment only
=====
#
===== ABORT CONDITIONS =====
behavior: abend
  b_arg: overtime(s) 1728000.0 # (*)Abort after 18 days
  b_arg: max_wpt_distance(m) 100000.0 # Abort if WP1<-100Km->WP2
  b_arg: overdepth(m) 210.0 # (*)Abort if diving deeper than 210m
  b_arg: overdepth_sample_time(s) 10.0 # ...and check for this that often
  b_arg: samedepth_for(s) 240.0 # (*)Abort if stuck 4min at = depth
  b_arg: samedepth_for_sample_time(s) 30.0 # ...and check for this that often
  b_arg: undervolts(volts) 11.0 # Abort if voltage decreases 11V
  b_arg: undervolts_sample_time(sec) 60.0 # ...and check for this that often
=====
#
===== BEHAVIOR HIERARCHY =====
#
# -- SURFACE AFTER Nth HOURS WITHOUT COMMS -----
behavior: surface
#
  b_arg: args_from_file(enum) 10 # Enables reading from mafiles/surfac10.ma
#
# -- SURFACE AT A SPECIFIC dd/mm, hh:mm -----
behavior: surface
#
  b_arg: args_from_file(enum) 11 # Enables reading from mafiles/surfac11.ma
#
# -- SURFACE WHEN MISSION DONE (no heading) -----
behavior: surface
#
  b_arg: args_from_file(enum) 12 # Enables reading from mafiles/surfac12.ma
#
# -- SURFACE WHEN REACHING A WAYPOINT -----
behavior: surface
#
  b_arg: args_from_file(enum) 13 #Enables reading from mafiles/surfac13.ma
#
# -- SET THE LIST OF WAYPOINTS -----
behavior: goto_list
#
  b_arg: args_from_file(enum) 10 #Enables reading from mafiles/goto_l10.ma
#
# -- SET THE ENVELOPE -----

```

```

behavior: yo
#
  b_arg: args_from_file(enum)      50 #Enables reading from mafiles/yo50.ma
#
# -- SAMPLING TECHNICS CONF -----
  behavior: sample
#
  b_arg: args_from_file(enum)      10 #Enables reading from mafiles/sample10.ma
#
# -- PREPARE FOR A DIVING SEQUENCE -----
  behavior: prepare_to_dive
#
  b_arg: args_from_file(enum)      10 #Enables reading from mafiles/prepar10.ma
#
# -- TURN MOST SENSORS OFF -----
  behavior: sensors_in
=====

```

III.3.1.2- Mafiles

a) surfac10.ma

```

behavior_name=surface
# surfac10.ma configures NO COMMS FOR A WHILE Surface Behavior
# 11-Jul-11    marc.torner@socib.es added params. after blank line

<start:b_arg>
  # arguments for climb_to when going to surface
  b_arg: c_use_bpump(enum)          2 # 2:Buoyancy Pump absolute
  b_arg: c_bpump_value(X)           1000.0 # Clipped to max. allowed(~273cc)
  b_arg: c_use_pitch(enum)          3 # 1:battpos 2:setonce 3:servo
  b_arg: c_pitch_value(X)           0.4528 # 26 deg

  b_arg: start_when(enum)          12 # BAW_NOCOMM_SECS 12, when have not had comms for WHEN_SECS
secs
  b_arg: when_secs(sec)            21600 # maximum of 6 hours between surfacing, only if
start_when==6,9, or 12
  b_arg: end_action(enum)          1 # 0-quit, 1 wait for ^C quit/resume, 2 resume, 3 drift til
"end_wpt_dist"
  b_arg: gps_wait_time(s)          300 # how long to wait for gps
  b_arg: keystroke_wait_time(sec)  300 # how long to wait for control-C
  b_arg: force_iridium_use(nodim)  1 # 1:Dockserver will act as a second console to receive .sbd
files
<end:b_arg>
```

b) surfac11.ma

```

behavior_name=surface
# surfac11.ma configures COME UP AT UTC TIME Surface Behavior
# 12-Sep-11    marc.torner@socib.es (*):added/modified

<start:b_arg>
  # arguments for climb_to when going to surface
  b_arg: c_use_bpump(enum)          2 # 2:Buoyancy Pump absolute
  b_arg: c_bpump_value(X)           1000.0 # Clipped to max. allowed(~273cc)
  b_arg: c_use_pitch(enum)          3 # 1:battpos 2:setonce 3:servo
  b_arg: c_pitch_value(X)           0.4528 # 26 deg

  b_arg: start_when(enum)          13 # when UTC time
  b_arg: end_action(enum)          0 # 0-quit, 1 wait for ^C quit/resume, 2 resume, 3 drift til
"end_wpt_dist"
  b_arg: when_utc_min(min)         00 # (*)0-59, -1 any minute
  b_arg: when_utc_hour(hour)       09 # (*)0-23, -1 any hour
  b_arg: when_utc_day(day)         06 # (*)1-31, -1 any day
  b_arg: when_utc_month(month)     10 # (*)1-12, -1 any month
```

```

b_arg: gps_wait_time(s)      300 # how long to wait for gps
b_arg: keystroke_wait_time(sec) 300 # how long to wait for control-C
b_arg: force_iridium_use(nodim) 1 # 1:Dockserver will act as a second console to receive .sbd
files
<end:b_arg>

```

c) surfac12.ma

```

behavior_name=surface
# surfac12.ma configure WHEN MISSION DONE Surface Behavior
# 11-Jul-11    marc.torner@socib.es added params. after blank line

<start:b_arg>
  # arguments for climb_to when going to surface
  b_arg: c_use_bpump(enum)          2 # 2:Buoyancy Pump absolute
  b_arg: c_bpump_value(X)          1000.0 # Clipped to max. allowed(~273cc)
  b_arg: c_use_pitch(enum)         3 # 1:battpos 2:setonce 3:servo
  b_arg: c_pitch_value(X)          0.4528 # 26 deg

  b_arg: start_when(enum)          3 # 3-heading idle
  b_arg: end_action(enum)          0 # 0-quit, 1 wait for ^C quit/resume, 2 resume
  b_arg: gps_wait_time(s)          300 # how long to wait for gps
  b_arg: keystroke_wait_time(s)    600 # how long to wait for control-C
  b_arg: force_iridium_use(nodim) 1 # 1:Dockserver will act as a second console to receive .sbd
files
<end:b_arg>

```

d) surfac13.ma

```

behavior_name=surface
# surfac13.ma configures COME UP EVERY WAYPOINT Surface Behavior
# 11-Jul-11    marc.torner@socib.es added params. after blank line

<start:b_arg>
  # arguments for climb_to when going to surface
  b_arg: c_use_bpump(enum)          2 # 2:Buoyancy Pump absolute
  b_arg: c_bpump_value(X)          1000.0 # Clipped to max. allowed(~273cc)
  b_arg: c_use_pitch(enum)         3 # 1:battpos 2:setonce 3:servo
  b_arg: c_pitch_value(X)          0.4528 # 26 deg

  b_arg: start_when(enum)          8 # 8-when hit waypoint
  b_arg: when_wpt_dist(m)          100 # how close to waypoint before surface,
  b_arg: end_action(enum)          1 # 0-quit, 1 wait for ^C quit/resume, 2 resume
  b_arg: report_all(bool)          0 # T->report all sensors once, F->just gps
  b_arg: gps_wait_time(s)          300 # how long to wait for gps
  b_arg: keystroke_wait_time(s)    600 # how long to wait for control-C
  b_arg: force_iridium_use(nodim) 1 # 1:Dockserver will act as a second console to receive .sbd
files
<end:b_arg>

```

e) yo50.ma

```

behavior_name=yo
# yo50.ma
#
# 19-Sept-11 marc.torner@socib.es (*):added/modified

<start:b_arg>
  b_arg: start_when(enum)          2 # pitch idle (see doco)
  b_arg: end_action(enum)          2 # 0-quit, 2 resume

  b_arg: num_half_cycles_to_do(nodim) -1 # Number of dive/climbs to perform (<0 infinite)

  # arguments for dive_to
  b_arg: d_target_depth(m)          190 # (*)Depth at which the inflection starts
  b_arg: d_bpump_value(X)          -1000 # cc's to be retracted when diving
  b_arg: d_target_altitude(m)       15.0 # (*)When bottom nearer than this, inflection starts

```

```

b_arg: d_use_pitch(enum)           3 # 1:battpos 2:setonce 3:servo
b_arg: d_pitch_value(X)          -0.4528 # -26 deg

# arguments for climb_to
b_arg: c_target_depth(m)          15 # (*)When surface nearer than this, inflection starts
b_arg: c_target_altitude(m)        -1 # No sense to track bottom while climbing
b_arg: c_bpump_value(X)          1000.0 # cc's to push forward when climbing
b_arg: c_use_pitch(enum)           3 # 1:battpos 2:setonce 3:servo
b_arg: c_pitch_value(X)          0.4538 # 26 deg

<end:b_arg>

f) goto_l10.ma
behavior_name=goto_list

# Mission DESTIN02 Sept-2011
# goto_l10.ma
# 19/09/2011 marc.torner@socib.es Waypoint List Definition

<start:b_arg>
  b_arg: num_legs_to_run(nodim)    -2 # traverse list once (stop at last in list)
  b_arg: start_when(enum)          0 # BAW_IMMEDIATELY
  b_arg: num_waypoints(nodim)      11 # last_index + 1
  b_arg: initial_wpt(enum)         -1 # 0 to N-1:wp in list,-1:one after first one achieved,-
2:closest
<end:b_arg>

<start:waypoints>
#      longitude      latitude      index
# -----
  106.259       3858.890      # 0:last achieved=launch wpt
  105.829       3858.888      # 1: WP_SCI1 (mission start)
  007.569       3859.168      # 2: WP_SCI2
  106.000       3859.007      # 3: WP_SCI1_2
  007.709       3859.312      # 4: WP_SCI2_2
  106.117       3859.133      # 5: WP_SCI1_3
  007.855       3859.402      # 6: WP_SCI2_3
  106.294       3859.250      # 7: WP_NAV3
  116.895       3914.264      # 8: WP_NAV2
  139.203       3912.852      # 9: WP_NAV1
  210.894       3930.424      #10: WP_NAV1

<end:waypoints>

g) prepar10.ma
behavior_name=prepare_to_dive
# prepar10.ma
# 11-JUL-2011 marc.torner@socib.es initially written from scratch

<start:b_arg>
  b_arg: start_when(enum)          0 # 0-immediately, 1-stack idle 2-depth idle
  b_arg: wait_time(s)            300 # 5 minutes, how long to wait for gps
<end:b_arg>

h) sample10.ma
behavior_name=sample
# sample10.ma
# 05-July-11 tgarau@socib.es Started from sample10.ma
# 05-July-11 tgarau@socib.es Changed to sample the upper layer at high frequency
# 31-Aug-11 mtorner@socib.es Moved back to one sample behavior

<start:b_arg>
  # arguments to configure the sampling procedure of the vehicle
  b_arg: sensor_type(enum)        0 # All on

```

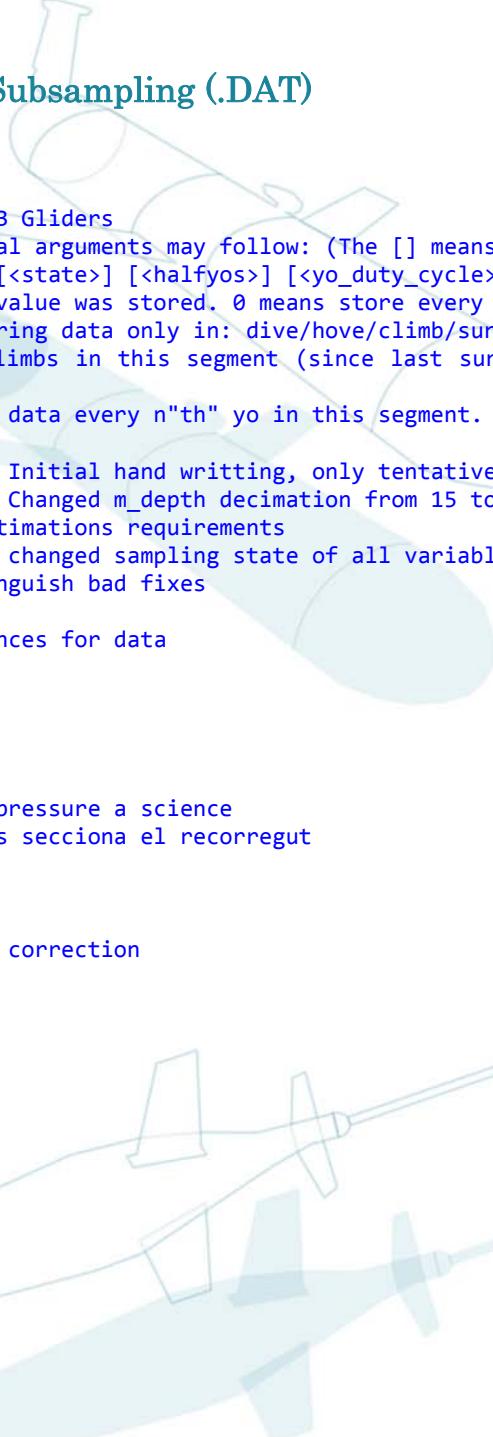
```

  b_arg: intersample_time(s)          2 # Sample at 0,5Hz
  b_arg: state_to_sample(enum)        5 # Bit-field, combine: 8 on_surface, 4 climbing, 2 hovering,
1 diving
  b_arg: intersample_depth(m)         -1 # Intersample_time not supersed
  b_arg: min_depth(m)                -5 # Minimum depth to collect data
  b_arg: max_depth(m)                2000 # Maximum depth to collect data
<end:b_arg>

```

III.3.1.3- Data Subsampling (.DAT)

a) sbdlist.dat



```

# SBDLIST.DAT for IMEDEA/SOCIB Gliders
# Whitespace delimited optional arguments may follow: (The [] means argument is optional)
# <sensor_name> [<interval>] [<state>] [<halfyos>] [<yo_duty_cycle>]
# <interval> Secs since last value was stored. 0 means store every value.
# <state> Binary mask for storing data only in: dive/hove/climb/surface
# <halfyos> Number of dive/climbs in this segment (since last surfacing). -1 means stored for all
dive/climbs
# <yo_duty_cycle> Only stores data every n"th" yo in this segment. <= 1 means every dive&climb.

# 05-Jan-2011 tgarau@socib.es Initial hand writting, only tentative
# 11-Jan-2011 tgarau@socib.es Changed m_depth decimation from 15 to 20
# commented, water current estimations requirements
# 05-Jul-2011 tgarau@socib.es changed sampling state of all variables to 8 (surface)
# added m_gps_status to distinguish bad fixes

# Spatial and temporal references for data
m_present_time
sci_m_present_time
m_gps_lat 0 8
m_gps_lon 0 8
m_gps_status 0 8
#m_depth 20 5 pq tenim water pressure a science
#c_wpt_lat 0 4 de moment no es secciona el recorregut
#c_wpt_lon 0 4

# Glider attitude
# m_pitch 15 5 no thermal lag correction
# m_heading 15
# m_speed 15

# Inflections state
# x_inflecting
# m_tot_num_inflections

# Water currents estimations
# m_dr_fix_time
# m_gps_fix_x_lmc
# m_gps_fix_y_lmc
# m_dr_postfix_time
# m_gps_postfix_x_lmc
# m_gps_postfix_y_lmc
# m_gps_status
# m_water_vx
# m_water_vy
m_final_water_vx 0 8
m_final_water_vy 0 8
x_dr_state 0 8

```

b) tbdlis.dat

```

# TBDLIST.DAT for IMEDEA/SOCIB Gliders
# Whitespace delimited optional arguments may follow: (The [] means argument is optional)
# <sensor_name> [<interval>] [<state>] [<halfyos>] [<yo_duty_cycle>]

```

```

# <interval> Secs since last value was stored. 0 means store every value.
# <state> Binary mask for storing data only in: dive/hove/climb/surface
# <halfyos> Number of dive/climbs in this segment (since last surfacing). -1 means stored for all
dive/climbs
# <yo_duty_cycle> Only stores data every n"th" yo in this segment. <= 1 means every dive&climb.

# 05-Jan-2011 tgarau@socib.es Initial hand writting, only tentative
# 11-Jan-2011 tgarau@socib.es Commented oxygen sensors
# 05-Jul-2011 tgarau@socib.es Changed CTD sampling to full resolution, diving and three half yos

# Temporal references for data
sci_m_present_time

# CTD data, full temporal resolution, when diving, three half yos (two of them diving)
sci_water_pressure 0 1 3
sci_water_cond 0 1 3
sci_water_temp 0 1 3

# Oxygen data
# sci_oxy3835_oxygen
# sci_oxy3835_saturation
# sci_oxy3835_temp

# FLNTU data
# sci_flntu_temp

# fluorescence
# u_flntu_chlor_do
# u_flntu_chlor_sf
# sci_flntu_chlor_ref
# sci_flntu_chlor_sig
# sci_flntu_chlor_units

# turbidity
# u_flntu_turb_do
# u_flntu_turb_sf
# sci_flntu_turb_ref
# sci_flntu_turb_sig
# sci_flntu_turb_units

```

III.3.2- GAPP

```

<?php

// ES MOLT IMPORTANT QUE AIXO ESTIGUI BE,
// CADA GLIDER NOMES POT TENIR 1 MISSIO ACTIVA

$AGLIDERMISSION = array(
    "icoast00" => array(
        "display_name" => "Iomedea Coast 00",
        "mission_name" => "CanalesSEPT2011", // no spaces, no special chars
        "start_date" => "2011/09/20", // yyyy/mm/dd
        "start_time" => "12:00", // hh:mm (UTC)
        "end_date" => "2011/09/24",
        "end_time" => "09:00",
        "waypoints" => array(array("lat" => 39.5071, "lon" =>
2.1816), //WP_START
                                array("lat" => 39.2142, "lon" =>
1.6534), //WP_NAV1
                                array("lat" => 39.2377, "lon" =>
1.2816), //WP_NAV2
                                array("lat" => 38.9815, "lon" =>
1.0972), //WP_SCI1

```

```
0.1262)//WP_SCI2
array("lat"      => 38.9861,      "lon"      =>
) // displayed path, last modified:
Marc,27/Sept@09:45(local)
```

```
 );
?>
```

