Preliminary Mission Report

SOCIB Glider Facility

Platform(s)	*ideep00*
Platform ID(s)	*unit-184 (w.m.o #68452)*
Mission	*GF-MR-0046 (BALGSIN)*
Issue	*Glider Pre-mission Report*
Description	*This document summarizes the mission definition, preparation, and logistics for the mission SOCIB_ENL_ALGERIANBASIN_MAY2016_IDEEP00_SENTINEL3 in line with SOCIB's ENDURANCE-LINE-2 (EL2) pilot program. SPRING-mission of EL2 (internal user) and, potentially, SENTINEL-3 satellite swath tracking for IMEDEA-TMOOS (external user)*
Authors	*Marc Torner and Albert Miralles*
Involved Personnel	*A. Pascual, A. Sánchez, J. Tintoré, M. Rubio, B. Casas, C. Troupin*
Report Date	*17/May/2016*

SOCIB Balearic Islands Coastal Observing and Forecasting System

Parc Bit. Ctra. Valldemossa, km. 7,4
Edifici Naorte, Bloc A

IMEDEA CSIC
Govern de les Illes Balears
GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

(this page intentionally left blank)

Document Information

Version	Date	Changes	Author
Initial	17/May/2016	Initial writing	M.Torner & A.Miralles
1.2	23/May/2016	WP_3 and WP_4 corrected (Chart 0-1 & Chart I-4)	A. Sánchez & M.Torner

Distribution List

Name	Organization	Contact Info
	SOCIB	general@socib.es
	IMEDEA-TMOOS	ldtmoos@imedea.uib-csic.es

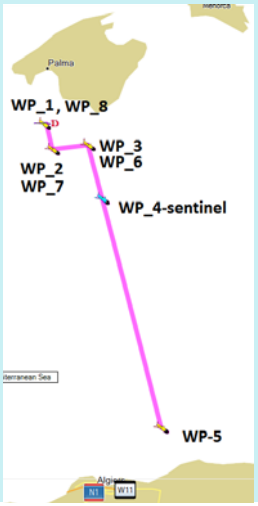
Approvement and Acceptance

Name	Facility	Date/Signature
Joaquim Tintoré	Director's Office	
Ananda Pascual	IMEDEA-TMOOS	
Benjamín Casas	ETD	
Antonio Sánchez	IMEDEA-TMOOS	

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

0 Plan Summary

TACTICS	
Area	*Algerian Basin*
Project	*ENDURANCE LINE 2 (implementation phase)*
Objective(s)	*Scientific survey (hydrography & bio-geo-chemical)*
Main Platform	*ideep00 (unit-243)*
Backup Platform	*Sdeep04 (unit-567)*
Sensors	*CTD(unpumped), Oxygen, Chlorophyll & Turbidity*
Planned Deployment Date	*25/May/2016*
Expected Recovery Date	*15/June/2016*
Total Days	*21 ± 1 days*
ESTIMATED MISSION PARAMS.	
Navigation Distance (*km/Nm*)	*500 / 271*
Waypoint List (*Lat/Lon hdd.dddd°*)	



Longitude	*Latitude*	*Index*
E 02° 38.517'	*N 39° 11.957'*	*# 0 : WP_1*
E 02° 41.431'	*N 39° 01.523'*	*# 1: WP_2*
E 02° 59.077'	*N 39° 03.275'*	*# 2: WP_3-SENTINEL*
E 03° 06.099'	*N 38° 41.479'*	*# 3: WP_4*
E 03° 35.367'	*N 37° 08.418'*	*# 4: WP_5*
E 02° 59.077	*N 39° 03.275'*	*# 5: WP_6*
E 02° 41.431'	*N 39° 01.523'*	*# 6: WP_7*
E 02° 38.517'	*N 39° 11.957'*	*# 7 : WP_8*

# of Dives (✓)	*n/a*
Max. Diving Range (*m*)	*15 to 980*
Iridium Connections (#)	*100+-15*
Sci-sampling Casts(#)	*n/a*
Battery Consumption (*Ah*)	*100+-20*
Notes	*SPRING mission of EL2 (implementation phase) between South-Mallorca and Algerian-Basin.* *SENTINEL-3 swath tracking if possible (passage 30-May-2016)* *SOCIB-R/V concurrent swath tracking (passage day only)*

Chart 0-1. Plan Summary

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

Index of Contents

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

Index of Charts

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

Index of Figures

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

I Introduction

The present report contains the key information about the main tactical and operational aspects of the oceanographic survey that SOCIB's Glider Facility will conduct by using its fleet of autonomous underwater vehicles (GLIDERS).

This document has been written after the organizational discussions between technicians and scientists involved in this adventure (Planning Phase) and prior to the beginning of the second phase, the Preparation. Chart I-1 lists the agenda of discussions held during this planning phase.

Date	Location	Attendees
12/04/2016	*SOCIB*	*J.Tintoré, M.Torner, E.Heslop*
26/04/2016	*IMEDEA*	*A. Pascual, M.Torner*
09-13/May/2016	*IMEDEA*	*A.Sánchez, B.Casas, A.Miralles*
16/May/2016	*IMEDEA*	*A. Sánchez, M.Torner*

Chart I-1. Discussion held during this mission's Planning Phase

The main aim of this report is to serve as a common and agreed compilation of documented time and task plans and, consequently, supporting as well team coordination and synergy amongst all participant staff and institutions. However, details on procedures and checklists are not provided here for simplicity. Finally, diffusion to external agents is also a possible use of this document.

The actions planed and scheduled here are to be considered preliminary and susceptible to be modified, or even skipped, depending on the necessity at each phase of the mission development. In the absence of modification notifications the mission plan contained here has to be considered valid; however, participants are encouraged to confirm with the adequate responsible person in case of doubts and/or need for confirmation.

The last output of this mission will be a full mission report, with similar structure and contents, compiling references to the results of the implementation of the plans contained in the present report. A comparison between what was planned and this results will be provided to reflect possible changes to this plans that are, as stated above, preliminary.

I.1 Objectives

The generic and main objectives of this glider mission are:

- **Hydrographic and geochemical survey of Algerian Basin (EL2 Spring-mission)**
- **Demonstration of technical and tactical feasibility of EL2 as SOCIB's endurance line**

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

- **Validation of new along-track (L3) and gridded interpolated maps (L4) altimetry products, provided among others by the Sentinel-3 altimetry mission, in the western Mediterranean Sea by using the in-situ Glider and SOCIB-R/V available observations**

Specific objectives will include:

- Preparing the Glider platform, and all its parts and sensors, according to the parameters of configuration defined in the Planning phase of this mission
- Executing the scientific plan by deploying the Glider and running the configured mission across the defined route. All this under a constant surveillance by the Glider Piloting team and with an operative field-team standing-by for an emergency and, in all cases, for a safe glider recovery and return to home-port
- Concluding the mission by saving the gathered sample files and providing them to SOCIB's data-center for subsequent processing
- Making all the possible efforts towards assuring the integrity of (1st) personnel, (2nd) vessels and infrastructures, (3rd) gliders and sensors and (4th) gathered-sample file-sets

I.2 Background

SOCIB strategic plan for 2016 includes the execution of a series of proto-missions to assess the feasibility of a Second Endurance Line (ENL2) to become operative in 2017.

ABACUS-I and ABACUS-II are the antecedents of this new candidate to ENL2 that is described here.

Additionally, taking advantage of the experience in Satellite tracking with Gliders, gathered during 2014 and 2015, SOCIB will attempt, on May-30th, to sample the swath of the recently released SENTINEL-3 satellite.

I.3 Geographical and Temporal Context

The survey of this mission will take place in the **Western Mediterranean**. Precisely, see Chart I-2, **Algerian Basin between South of Mallorca island and North of African Continent**.

Main Boundary Box	
N-W corner	*N 39º 19.759', E 02º 17.984'*
S-E corner	*N 36º 59.891', E 04º 09.842'*

Chart I-2. Coordinates of main area of action

The mission, considering the four main phases of Planning, Preparation, Execution and Closing, will occur during the estimated period of time defined in Chart I-3.

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

Overall Mission Period	
Start Date	*[Tuesday] 10/May/2016*
End-Date	*[Tuesday] 30/June/2016*
Note: water survey is expected to occur as shown in Chart II-8	

Chart I-3. Estimated overall mission period

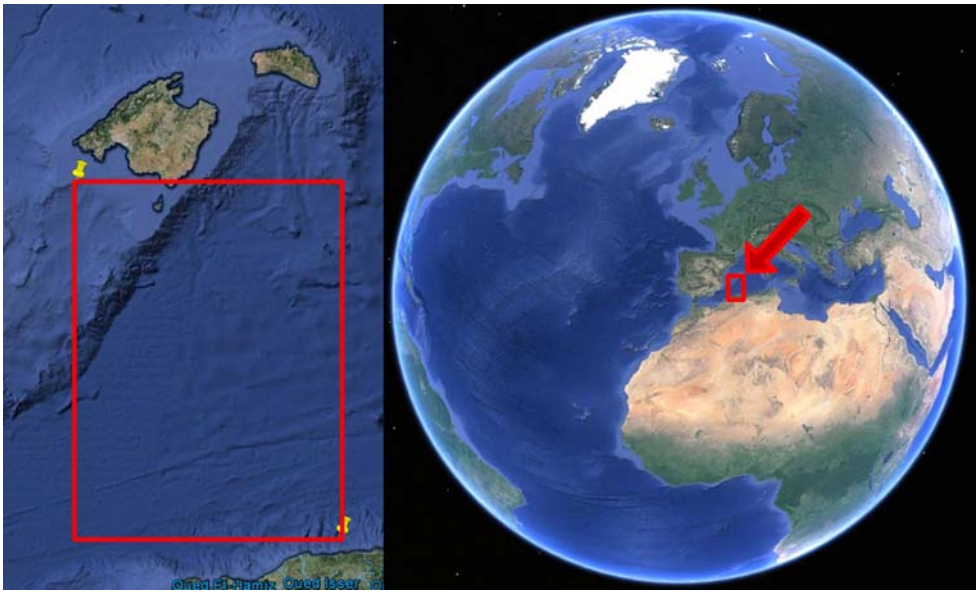


Figure I-1. Global and Local areas of glider action

I.4 Tactical Aspects

I.4.a Planned Route

Longitude	Latitude	Index/Name	Achievement Date
E 02° 38.517'	*N 39° 11.957'*	*# 0 : WP_1 (Launching Site)*	*25/May/2016*
E 02° 41.431'	*N 39° 01.523'*	*# 1: WP_2*	*26/May/2016*
E 02° 59.077'	*N 39° 03.275'*	*# 2: WP_3-SENTINEL*	*27/May/2016*
E 03° 06.099'	*N 38° 41.479'*	*# 3: WP_4*	*29/May/2016*
E 03° 35.367'	*N 37° 08.418*	*# 4: WP_5*	*04/Jun/2016*
E 02° 59.077	*N 39° 03.275*	*# 5: WP_6*	*13/Jun/2016*
E 02° 41.431'	*N 39° 01.523'*	*# 6: WP_7*	*14/Jun/2016*
E 02° 38.517'	*N 39° 11.957'*	*# 7 : WP_8*	*15/Jun/2016*

Chart I-4. Preliminary Waypoint-List

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

Figure I-2. Preliminary waypoint-list

I.4.b Platforms, Instruments & Sensors

sdeep00	
Platform Type	*Glider*
Manufacturer	*Teledyne Webb Research*
Model	*Slocum 1000m G1*
Unit Ref.	*unit-184 (w.m.o #68452)*
Battery Technology	*Lithium*
Max. Operating Depth	*1000m*
Glider Software Version	*7.13*
On-board Sensors	• *CTD -SBE- / sn 0129 / 25-Jul-2014* • *FLNTU -WetLabs- / sn2128 / 01-Feb-2011* • *OPTODE -Aandera- / sn 0993 / 23-10-2009*

Chart I-5. Main specifications of the Glider to be deployed

I.4.c Information-Technologies (IT) Infrastructure

Global[1] Primary Gateway	*881600005178*
Global[2] Backup Gateway	*17818711051*
SOCIB Primary Control Station	*130.206.32.240*
SOCIB Backup Control Station	*socib@datahost.webbresearch.com*
GSM Modem	*portal.imedea.uib-csic.es (FTP)*
SOCIB Data-Center	*Main On-line Tracker:* *apps.socib.es/dapp* *Backup On-line Trackers:*

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

	apps.socib.es/gapp *iOS & Android "socib" App* *THREDDS Catalog for near-real-time observations:* *http://thredds.socib.es/thredds/catalog/auv/glider/ideep00-ime_sldeep000/L0/2016/catalog.html*
Piloting Equipment	*Field-dockserver, Piloting laptops and GSM/3G Smartphones*
Backup Global[3] Glider Positioning	*Argos Program 3195, ID 88053*
[1, 2]: Service Provider Info. at https://www.iridium.com/ProductList.aspx?productCategoryID=9 *[3]: Service Provider Info at http://www.argos-system.org/*	

Chart I-6. IT Infrastructure key-elements

I.4.d Facilities & Vehicles

Preparation	
Facilities	*Glider-lab, Ballasting-tank, Pressure-Chamber and Calanova-Hangar*
Vehicles	*TMOOS Nissan Pickup & SOCIB Lab-Van (reservations to etd@socib.es)*
Execution	
Facilities	*Calanova-Hangar*
Vehicles	*SOCIB RIB Hurricane 9m (reservations to etd@socib.es)*
Conclusion	
Facilities	*Glider-lab, Glider-storage-cage*
Vehicles	*none*

Chart I-7. Facilities and Vehicles involved

I.4.e Auxiliary Equipment & Tools

Compass Stand for error measurements.

I.5 Partnership & Collaboration

I.5.a Institutions

Institution		Contribution
	CSIC-IMEDEA-TMOOS	*Glider owner, In-kind contributions of infrastructure space, field technician*
	SOCIB	*Backup Glider owner, technical staff, vehicles and tools*
	CLS	*Technical Information (tracks, passage date,...) about SENTINEL-3*

Chart I-8. Institutional Mission Partnership

I.5.b Staff

Chart I-9 contains a list of the personnel who is, or will be, directly involved in this mission. The list of people who contributes in some way or another is larger but their inclusion would not be relevant in the scope of this report.

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

Name	Filiation	Contact	Role
Joaquim Tintoré	*SOCIB/IMEDEA*	*jtintore@socib.es*	*Ultimate responsible of Glider Facility (specially in case of emergencies)*
Ananda Pascual	*IMEDEA*	*apascual@imedea.uib-csic.es*	*PI of external access solicitude*
Antonio Sánchez	*IMEDEA*	*asanchez@imedea.uib-csic.es*	*External access solicitor*
Benjamin Casas	*IMEDEA*	*benjamin.casas@imedea.uib-csic.es*	*Field technicians Coordinator*
Niko Wirth	*SOCIB*	*nwirth@socib.es*	*Field-team captain and tech.*
Miguel Ángel Rújula	*SOCIB*	*mrujula@socib.es*	*Data-center technician*
Joan P. Beltran	*SOCIB*	*jbeltran@socib.es*	*Post-processing technician*
Manu Rubio	*SOCIB*	*mrubio@socib.es*	*Glider technician*
Albert Miralles	*SOCIB*	*amiralles@socib.es*	*Glider Pilot*
Marc Torner	*SOCIB*	*mtorner@socib.es*	*Glider facility Coordinator*

Chart I-9. Staff list (direct participation only)

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

II Plan of Action

This section contains a detailed plan outlining actions needed to reach the goals mentioned in previous pages of the present report.

The following sub-sections contain the key information (omitted details are available under demand whatsoever) considered essential for SOCIB glider technicians and pilots in order to execute an integral mission protocol structure in the stages shown in Figure II-1.

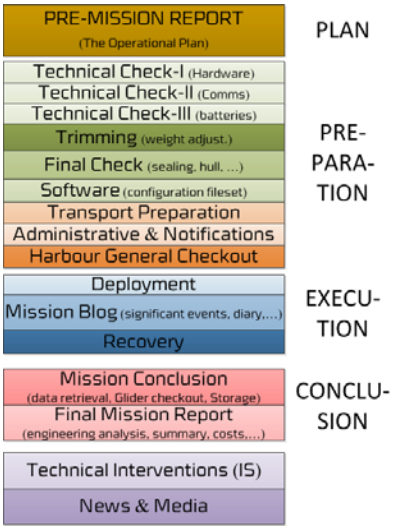


Figure II-1. Stages of the Integral Mission Protocol

II.1 Preparation

Chart II-1 summarizes forthcoming periods of time at which each check (Preparation phase only) is intended to occur. Nevertheless, this timing can be altered depending on unexpected events not necessarily related to the mission described here. Final execution dates will be available in the post-mission report to be written during the Conclusion phase of this mission (see Figure II-1).

Stage	Execution Date
Technical Checks (I, II & III)	*2nd week of May*
Trimming	*2nd week of May*
Final Check	*3rd week of May*
Software (Configuration File-Set)	*3rd week of May*
Transportation	*3rd week of May*
Admin. & Notifications	*3rd week of May*
Harbor Checkout	*3rd / 4th week of May*

Chart II-1. Execution Time-table of Preparation Phase stages

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

II.1.a Hardware & Functional Check

During this stage, the glider will be mechanically and electrically configured with all the parts and sensors to be used during the deployment. At this point, the main objective is to verify the individual performance of each part and interoperability within the glider as a whole. Three main checklists are to be fulfilled during this stage:

1. Hardware & Mechanisms (in-lab)
2. Communications - local(RF) & global(Iridium) - (outdoor)
3. Battery Capacity (in-lab)

Resulting main configuration parameters are listed in the following Chart II-2:

Hardware	
Glider Model and Type	*Slocum 1000m G1*
Specific Unit	*unit-184 (w.m.o #68452) (ideep00)*
Notes	
Communications	
Iridium Primary Number	*881600005178*
Iridium Alternative Number	*17818711051*
Notes	
Battery	
Type	*Lithium*
Required Available Capacity (Ah)	*>200Ah*
Notes	*NEW ELTEC BATTERY PACK WITH SOCIB-designed BALLASTING CHASSIS FOR PITCH BATTERY*

Chart II-2. Glider configuration for communications and battery systems

II.1.b Trimming

The glider will be tested in a salt-water tank and its weights adjusted and re-distributed as necessary in order to adapt its variable buoyancy capabilities to the hydrographic properties of the water to be navigated in the survey area.

Lowest density [gr/L] is considered the worst case as the final goal is to assure the glider capability to break into the surface. Conditions are shown in Chart II-3.

Conditions	
Max. Target Temp	*20,0 degC*
Min. Target Salinity	*37,10 psu*

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

Derived Min. Target Density	*1026.36588 g/L*
Sources of Information	
Suggested by A. Sánchez	*T=20 degC ; S=37,51 psu*

Chart II-3. Ballasting conditions for this mission's Trimming stage

IMPORTANT: Considering that target water conditions could vary as the deployment approaches, under-wingrail weight slots must be occupied at a 50% (at each wing). This is to allow overall weight reduction without having to break the vacuum sealing

II.1.c Final Check

The glider, with all its mechanisms, wiring and sealing elements (i.e. o-rings,...), will be disassembled and system-by-system checked in order to certify it is ready to be deployed.

Special Considerations
Replacing sacrifice anodes if necessary
Pressure cycle testing (3 cycles, standard procedure)
Writing, in Final Sealing checklist, the list of variables each on-board sensor will be sending
(if feasible) Painting with black spray metallic surfaces which has lost color through time

Chart II-4. Special considerations for this mission's Final Check stage

II.1.d Configuration File-set

All necessary files will be created (or updated if availing files from similar previous missions) accordingly to the requirements derived from both the navigation plan and the sampling strategy solicited by the Principal Investigator in charge. File-set to be executed will be composed of:

- Mission File: algbas1.mi
- Mission-Auxiliary Files: surfac10.ma, surfac20.ma, surfac30.ma, surfac4x.ma, surfac50.ma, yo10.ma, goto_l1x.ma, sample1x.ma
- Conf. Files: tbdlist.dat, sbdlist.dat, config.srf

The precise configuration defined by all these files is resumed in the following Chart II-5.

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

Aborting Conditions	
Max. Mission Duration	*2160000 secs (25 days)*
Max. Diving Depth	*975 m*
Min. Battery Voltage	*9,5 V*
Max. Vacuum	*12,5 inHg*
Max. working depth	*1100 m*
Surfacing Events	
Aborting condition satisfied	*Yes. Interrupts mission execution*
No heading commanded	*Yes. Interrupts mission execution*
No diving/climbing commanded	*Yes. No interruption. Brings glider to surface*
No comms during 12 hours	*Yes. No interruption. Brings glider to surface*
(Main Event) Surface at 4am, 10am, 4pm and 10pm (all UTC)	*Yes. No interruption. Brings glider to surface for periodic report*
Waypoint reached (less than 1000m from exact Lat/Lon)	*Yes. No interruption. Brings glider to surface*
Diving Strategy	
Target depth	*975 m* [1]
Buoyancy Pump position	*-190 cc*
Max. distance to bottom	*40 m (Starting pinging at 2m. of depth)*
Pitch control	*Automatic servo control to maintain -26 deg*
[1] *Note: This target depth, a 89% of the max-working-depth or this unit (see Chart I-5), is set after scientific considerations*	
Climbing Strategy	
Inflection depth	*15 m*
Buoyancy Pump position	*180 cc*
Pitch control	*Automatic servo control to maintain +26 deg*
"YO-ing" Strategy	
Consecutive Underwater YO's	*Infinite (interrupted by higher priority Surface Behaviors)*
Initial Waypoint List [2]	
Start (and deployment)	*E 02° 38.517' N 39° 11.957' (waypoint #0)*
Notes	• *Waypoint list in Chart I-4* • *Repeat list only ONCE* • *Initial-Waypoint: #0*
[2] *Note: Waypoint list is susceptible to be adapted during the execution of the mission. Changes will be documented in forthcoming post-mission report*	
Sensor Sampling	
CTD	*(sample11.ma)* *Sampling Freq.= 0,5 Hz* *Sampling during both Diving and Climbing during the whole mission* *Sampling between -5 and 2000 meters*
OXYGEN	*(sample13.ma)* *Sampling Freq.= 0,25 Hz* *Sampling during Diving during the whole mission* *Sampling between -5 and 2000 meters*

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

FLNTU	*(sample12.ma)* *Sampling Freq.= 1/8 Hz* *Sampling during Diving during the whole mission* *Sampling between -5 and 150 meters* *(sample14.ma)* *Sampling Freq.= 1/16 Hz* *Sampling during Diving during the whole mission* *Sampling between 150 and 300 meters*
Real-time Data	
Engineering	*(sbdlist.dat)* *c_battpos 20 5* *m_battery 40 5* *m_battery_inst 20 5* *m_depth 20 5* *m_final_water_vx 0 8* *m_final_water_vy 0 8* *m_gps_lat 0 8* *m_gps_lon 0 8* *m_gps_status 0 8* *m_pitch 20 5* *m_present_time* *m_water_depth 60 5* *sci_m_present_time* *x_dr_state 0 8*
Scientific	*(tbdlist.dat)* *# General* *sci_m_present_time* *# CTD* *sci_water_pressure 0 1 2* *sci_water_cond 0 1 2* *sci_water_temp 0 1 2* *# OXY* *sci_oxy3835_oxygen 2 1 2* *sci_oxy3835_saturation 2 1 2* *sci_oxy3835_temp 2 1 2* *# FLNTU* *sci_flntu_chlor_units 2 1 2* *sci_flntu_turb_units 2 1 2* *sci_flntu_chlor_ref 2 1 2* *sci_flntu_turb_ref 2 1 2*

Chart II-5. Engineering, Sampling and Real-Time configuration strategies

NOTE: Parameters in Chart II-5 might be changed anytime depending on the context (environment, glider-status, scientific-interests,...) to achieve a higher degree of optimization. For instance, when flying in >1000m waters, a new strategy could be:

- Disabling UTC surfaces
- Consecutive number of YO's set to 2
- Disabling Altimeter

II.1.e Transportation

During this stage all steps and verifications will be taken in order to guarantee that all material is put all together, loaded on the transporting vehicle and well fastened and secured to minimize damages during displacement to launching vessel. Additionally to

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

what is shown in Chart I-7, following Chart II-6 contains an estimated transport plan for this mission.

Transport Plan	
Trip 1	*From:IMEDEA(glider-lab) to: CEM forestall spot on-board: SOCIB Lab-Van carrying: glider+cart, compass stand (and accessories), yellow and black toolboxes and field-dockserver*
Trip 2	*From: CEM forestall spot to: Calanova Hangar on-board: SOCIB Lab-Van carrying: glider+cart, compass stand (and accessories), yellow and black toolboxes and field-dockserver*
Trip 3	*From: Calanova Hangar to: IMEDEA on-board: SOCIB Lab-Van carrying: compass stand (and accessories)*

Chart II-6. Transport plan for this mission's Transportation stage

II.1.f Administration and Notifications

All glider deployments must be notified to a series of internal and external agents in order to assure and efficient and beneficial total (or partial) distribution of the present report as well as fulfilling a series of administrative requirements. Chart II-7 identifies all these agents.

Notification List	
SASEMAR	*Radio alerts to marine traffic*
CUSTOMS BROKER	*Legal requirement to deploy a glider*
SPANISH MINISTRY OF DEFENSE	*To alert military submarine division about the possible presence of autonomous underwater vehicle in the area of survey*
SOCIB	*First to directly involved (ETD, DC, MOD and OD facilities) and then to the rest of SOCIB employees (via both email and corporative-network YAMMER)*
IMEDEA	*First to IMEDEA's manager and ultimately to the rest of colleagues from TMOOS Department*

Chart II-7. Notification list for this mission's Admin&Notification stage

II.1.g Harbor Checkout

ideep00 will undergo through a harbor final checkout procedure, prior to the departure of the deployment vessel.

The aim of this last check is to perform a comprehensive certification of the glider readiness for deployment. Of course, problems may occur during the cruise but those will be left for detection during pre-launch and pre-mission-execution tests at the launching location.

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

II.2 Execution

The Execution is understood here as , First, the deployment operation (with corresponding preliminary tests and verifications with the glider already in the water); Secondly, the period of time during which the glider remains at the sea surveying (SOCIB glider pilots compiled all relevant events in a registry called Mission Blog) and, Lastly, the recovery operation.

II.2.a Field Period

The survey is expected to be carried on the dates specified in the next Chart II-8:

Start	*[Wed] 25/may/2016*
End	*[Wed] 15/jun/2016*

Chart II-8. Survey period of time

II.2.b Deployment

The deployment is going to be executed (see Chart II-9) following the corresponding SOCIB's internal protocol if the following conditions are satisfied:

- personnel's (both field and remote) physical and mental faculties are correct,
- mother-platform is equipped with minimum tools, is stable and reliable to launch the glider, intercept it during surfaces and recover it if necessary,
- environmental conditions are within a tolerable range of intensity,
- the glider is in optimal status to be put in the water and initiate operations and
- communication channels between field and remote teams and glider and remote control stations are stable and offer enough throughput.

Deployment details	
Planned Date	*[Wed] 25/may/2016*
Expected glider turn-on time	*09:00am (utc)*
Expected launching time	*10:00am (utc)*
Location	*N39º 11.957' ; E02º 38.517' (waypoint #0)*
Mother-Platform	*SOCIB-I (professional 9m RIB)*
Involved Personnel	*Undefined. 1-ETD member + 2-GF members (see Chart I-9)*

Chart II-9. Launching details for this mission's Deployment stage

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

II.2.c Cruise (Survey)

The activity and performance of the glider will be constantly monitored from the beginning to the end of the survey by SOCIB's Glider Piloting Team (glidertech@socib.es) taking advantage of a variety of IT-tools (see Chart I-6).

24/7 monitoring will rely on

- (during glider surfaces) periodical analysis of telemetry and scientific sub-filesets sent in-situ by the glider (see Chart II-5);
- (during underwater periods) tactical discussions on actions to validate/correct navigational and sampling strategies and
- (in case of emergency) a 24/7 remote-surveillance shift based on robust GSM/3G and Internet connectivity to SOCIB's shore control stations.

II.2.d Recovery

The recovery plan (see estimations in Chart II-10) is comparatively futile with respect to the deployment operation. Variable factors are so determining than the info. shown here can only serve as a statement of intentions and estimations based on theoretical analysis and practical experience review.

On the other hand, both deployment and recovery operations share very similar tactical requirements (mentioned in sub-section II.2.b) and operational procedures.

Recovery details	
Planned Date	*[Wed] 15/Jun/2016*
Expected end-of-mission time[1]	*06:00am (utc)*
Expected extraction time	*07:30am (utc)*
Estimated Location	*Undefined but most likely similar to launching location*
Mother-Platform	*Undefined but most likely SOCIB-I*
Involved Personnel	*Undefined: 1-ETD, 2-GF*

Chart II-10. Extraction details for this mission's Recovery stage

II.3 Closure

The third and last phase of the SOCIB mission protocol (see Figure II-1) is the framework that contains all the actions to be done since the glider returns to home port until its status is "ready to be engaged in the next mission".

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

II.3.a Mission Conclusion

Post-mission checkout and preparation for storage

Once the vehicle will be recovered, shut down and securely fastened on-board it should not operated again until it arrives at the SOCIB's glider laboratory located in the IMEDEA building (see Chart I-7).

Similarly to what will happen during the preparation stages introduced early in this report, an exhaustive checklist will come after to assure the actions listed in Chart II-11 are executed in the appropriate order.

- Mechanical review (visual and functional)
- Data backup (full copy of glider's memory disks saving not only gathered sampling data-sets but configuration and status/engineering files as well)
- Sample data-set upload to SOCIB's FTP (initial step of post-mission processing chain)
- Comprehensive preparation of glider for storage (leaving it ready for use) and shelf storage

Post-Mission Task Plan	
Expected Date	*15-24/Jun/2016*
Main Actions	*Mechanical review (visual and functional)* *Complete Data backup (of glider internal memory cards)* *Data backup upload to SOCIB's FTP* *Comprehensive preparation of glider for storage, leaving it on the shelf and ready for use again*

Chart II-11. Post-mission task plan for this mission's Conclusion stage

Data post-processing and dissemination

SOCIB's data-center will then take the lead upon raw data-sets upload to SOCIB's FTP by Glider Facility technical staff (see Chart II-11). Direct contact to data-centre (data-centre@socib.es) is encouraged for details and further information.

In any case, glider measurements will go publicly available at SOCIB's THREDDS catalog. The THREDDS Data Server (TDS) is a web server that provides metadata and data access for scientific datasets, using OPeNDAP and other popular remote data access protocols. Users can access this mission's catalog addressing to:

- **http://thredds.socib.es/thredds/catalog/auv/glider/ideep00-ime_sldeep000/L0/2016/catalog.html?dataset=auv/glider/ideep00-ime_sldeep000/L0/2016/***_L0_***_data_dt.nc**

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

II.3.b Post-mission Report

The last stage of this mission will be writing the post-mission report (a.k.a. Field Mission Report) that will also be made public at SOCIB's webpage (www.socib.eu, Glider Facility Section).

The structure of this forthcoming report will be very similar to the one of this present document. A chapter called Analytical Review will be added containing the final execution outcome of the plan described in this pre-mission report. This will be examined in detailed and compared with what has been plan during the very beginning of this mission's protocol.

The following list contains the structured aspects applied for this review:

- Navigation
- Operational
- Engineering
- Scientific-Sampling

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

III Conclusions

The mission plan is solid, feasible and realistic within the technical and operational capabilities of the SOCIB Glider Facility.

Preparation and Execution phases will be based on an also solid know-how and proven protocols and checklists. Therefore, if the Preparation stages are fulfilled correctly and completed successfully the Execution is expected to occur most likely as planned. SOCIB's departmental structure and personnel networking should support the required degree of team coordination specially during the Execution stages.

A summary of the mission plan can be found in Chart 0-1.

Planned field operations will occur in a very familiar area in where communications and safety-conditions are very favorable for technicians, ship and glider.

The bathymetric profile of the predefined route (very shallow on Mallorca's side and >2000m in the rest) will most likely ask for a modification of mission params. in order to implement a 'deep water flying' strategy. This is part of SGF's know-how and should not imply any kind of new/important risk.

Synchronization with SENTINEL-3 passage will probably be the most important challenge considering temporal and spatial restrictions. Nevertheless, previous experience with SARAL satellite allow optimistic expectations.

Major risks considered are: (1) those inherent to glider monitoring in open waters, (2) intense ship traffic as the glider approaches Algerian-Basin West-to-East ship lane and (3) the maximum home_port<>glider distance, to be expected for this predefined route, which could increase the difficulties of an emergency recovery. Finally, (4) the manufacturing date of Unit184 (2009) is not considered to be an special issue considering that this unit is today in an (5) excellent status and all systems have been thoroughly tested. Moreover, (6) on-board battery capacity is such that provides a safety margin of 100% of the mission's expected total consumption.

In any case, the evolution of the mission will be constantly monitored and analyzed so, should any unexpected problem and/or non-assumable risk arise, the mission is susceptible to be cancelled and glider recovered to avoid undesired results.

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

IV Pertinent Literature

1-Cotroneo, Y., G. Aulicino, S. Ruiz, A. Pascual, G. Budillon, G. Fusco, J. Tintoré. Glider and satellite high resolution monitoring of a mesoscale eddy in the Algerian basin: Effects on the mixed layer depth and biogeochemistry, Journal of Marine Systems, http://dx.doi.org/10.1016/j.jmarsys.2015.12.004. 2015 (in press)

2- Pascual, A.; A. Lana; C. Troupin, S. Ruiz, Y. Faugère, R. Escudier, J. Tintoré. Assessing SARAL/AltiKa delayed-time data in the coastal zone: comparisons with HF radar observations. Marine Geodesy 8:sup1, 260-276, DOI:10.1080/01490419.2015.1019656. 2015.

3- Capet, A.; E. Mason, V. Rossi, Ch. Troupin, Y. Faugère, I. Pujol, A. Pascual. Implications of Refined Altimetry on the Estimates of Mesoscale Activity and Eddy-Driven Offshore Transport in the Eastern Boundary Upwelling Systems. Geophysical Research Letters, 41-21, p 7602-7610. DOI: 10.1002/2014GL061770. October 2014

4- Escudier, R.; J. Bouffard; A. Pascual; P.-M. Poulain; M.-I. Pujol. Improvement of coastal and mesoscale observation from space: Application to the northwestern Mediterranean Sea. Geophysical Research Letters. 40 - 10, pp. 2148 - 2153. 2013.

5- Bouffard, J.; A. Pascual; S. Ruiz; Y. Faugère; J. Tintoré. Coastal and mesoscale dynamics characterization using altimetry and gliders: A case study in the Balearic Sea. Journal of Geophysical Research C: Oceans. 115 – 10. 2010.

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79

(this page intentionally left blank)

Parc Bit. Ctra. Valldemossa, Km 7,4 · Edifici Naorte, Bloc A, Planta 2ª, Porta 3 · 07121 Palma (Illes Balears, Espanya) · Tel. +34 971 43 99 98 · Fax +34 971 43 99 79