GAMBLE

Global Altimeter Measurements By Leading Europeans

Project Definition version 2 (2003)

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GAMBLE – Global Altimeter Measurements By Leading Europeans

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Distribution (Public Document):

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2. All Gamble Partners, by email
3. GAMBLE Steering Group (by email)
4. To be posted on GAMBLE web site (http://www.altimetrie.net)

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Contents

1. INTRODUCTION 4
2. PROJECT WORK PLAN OVERVIEW 5
2.1 Work Packages 5
2.2 Deliverables 6
2.3 Risks Associated with Changes to Work Plan 6
3. MILESTONES 6
4. WORKSHOPS 8
5. RESPONSIBILITIES 8
6. WORK PACKAGE DESCRIPTIONS 10
7. REPORTING AND COMMUNICATION 23
8. THE CONSORTIUM 24
Partner Roles 25
Other interested parties 30

1. Introduction

This document is the second version of the GAMBLE Project Definition (Deliverable D1), modified in January 2003 following some agreed changes to the GAMBLE timetable.

GAMBLE is a thematic network to investigate the synergy between European satellite altimeter missions before launch, primarily for ocean applications. GAMBLE aims to:

- Complement and help co-ordinate existing research and development activities;
- Stimulate existing user groups and integrate new users;
- Identify possible areas of new research;
- Enhance the state-of-the-art by extending the uses of satellite altimetry;
- Increase awareness within the marine industry of the relevance of satellite altimeter products to their operations.

The activities within GAMBLE are in the form of workshops and discussion forums whereby new results and existing expertise are brought to bear to help maximise the benefits of independently initiated satellite projects. The network will review and assess the results of recent research, and where appropriate co-ordinate new RTD activities. The aim is to establish a wide and inclusive network and engage as wide a community as possible. Thus most of the deliverables will be publicly accessible through a project web site, and open e-mail discussion forum. Only interim reports and GAMBLE management reports will be have restricted distribution. The time scale for GAMBLE is 21 months, with a view to providing timely recommendations for possible GANDER, SWIMSAT and AltiKa missions, and for scientific research programmes. However, it is planned that the network will be maintained beyond the 21 month time frame, through the stimulation of users groups within GAMBLE, and there is a specific work package (exploitation) which is designed to work towards this aim.

The GAMBLE Thematic Network is supported by the EC – EESD programme under Framework V. The project formally kicked off following contract signature completion in February 2002. A GAMBLE kick-off meeting was held at LEGOS (Laboratoire d,'Études en Géophysique et Océanographie Spatiale), Toulouse, France on 21st March 2002.

Where there are departures from the first version of the Project Definition (Deliverable D1) explanation for these departures is given.

2. Project Work Plan Overview

The work programme is arranged along scientific *themes*, running parallel to the necessary management and co-ordination activity. Each of the scientific/technical work packages addresses a specific issue, and will provide recommendations as to the best ways to combine, or modify, proposed missions in order to maximise the scientific and operational benefit. These *themes* are:

- Sea Surface Heights – Error Budgets and Feature Detectability
- Sea State – Error Budgets and Feature Detectability
- Orbit Determination and Satellite Tracking
- Marine Operator's Requirements
- Developing a Coordinated Research Programme
- Optimising Mission Parameters for Constellations of Satellite Altimeters

2.1 Work Packages

Table 1 lists the eleven work packages (described in more detail in Section 6). Where there are differences from the earlier GAMBLE Project Definition, they have been highlighted. The reasons for these changes are outlined below.

Table 1: Work Package List

Work Package No.	Work Package Title	Lead Partner	Start Month	End Month	Deliverable No.
1	Kick Off / Proj. Definition	CNES	T0 Feb 2002	T0+2 Apr 2002	D1
2	**Sci/ Tech Theme 1** SSH Error Budgets / Feature Detectability	CLS	T0+2 Apr 2002	T0+14 Apr 2003	D2, D3
3	**Sci/ Tech Theme 2** Sea-state Error Budget / Feature Detectability	ISDGM	T0+2 Apr 2002	T0+14 Apr 2003	D4, D5
4	**Sci/ Tech Theme 3** Orbit Determination / Tracking	DUT	T0+2 Apr 2002	T0+14 Apr 2003	D6a, D6b
5	**Sci/ Tech Theme 4** Mar. Operator's Workshop	SOS	***T0+14 May 2003***	***T0+16 June 2003***	D7
6	Mid Term Progress	DUT	T0+10 Dec 2002	T0+12 Feb 2003	D8 (D13)
7	**Sci/ Tech Theme 5** Research Programme	SOC	T0+12 Feb 2003	*T0+16 June 2003*	D9 / ***M1***
8	**Sci/ Tech Theme 6** Constell. Optimisation	CNES	T0+16 June 2003	T0+18 Aug 2003	D10, D11 /***M2***
9	Final Workshop	SOC	T0+18 Aug 2003	T0+20 Oct 2003	D12
10	Management / Reporting	SOS	T0+0 Feb 2002	T0+21 Nov 2003	D13, D14, D15, D16, D17, D18
11	Exploitation / Outreach	SOS	T0+3 May 2002	T0+21 Nov 2003	D19

Changes from Previous Project Definition

WP5 – Moved from T0 +7-9, to T0 +14-16, in order to coincide with a meeting of Offshore Operators and so maximise attendance and interest from the widest possible range of offshore operators. It is intended to hold the GAMBLE Operators' workshop on Monday 19th May in Stavanger, Norway, during the OGP "JIP" week (OGP – International Association of Offshore Oil and Gas Producers, JIP – Joint Industry Projects). This means that the Deliverable D7 will be available 6 months later than planned, and will come after the conclusion of GAMBLE work packages 2, 3 and 4. The consequence is that rather than feeding into the reports from WP 2,3, and 4, WP5 will use the reports from these earlier work packages to advise the Offshore Operators the way that the research community is thinking. The report from WP5 will still be available to contribute towards the end of WP7 (Research Recommendations) and at the early stages of WP8 (Constellation Optimisation). This issue will be discussed in the Mid-Term Review to see if it may be necessary to prolong WP7, and so delay the delivery of D9, by one month. It is not believed that this alteration to the programme will have an impact on the delivery of the project aims.

2.2 Deliverables

Table 2 lists the 19 deliverables for GAMBLE. As before, changes from the previous Project Definition have been highlighted. Note (from above) that the delivery date for D9 may be delayed by one month.

Changes from Previous Project Definition

D7 – Report on Marine Operator's requirements postponed until T0+16 (June 2003), after the Operator's workshop

2.3 Risks Associated with Changes to Work Plan

The later delivery date for D7 still allows it to contribute to WP8. However, WP7 is due to finish on the same month that D7 is now due. This issue will be discussed in the Mid-Term Review to see if it may be necessary to prolong WP7, and so delay the delivery of D9, by one month.

3. Milestones

GAMBLE is working towards the achievement of two milestones:

M1 June 2003 (month T0 + 16): The definition of a research programme to make best use of data from missions studied under GAMBLE. The main aim of this programme will be to create a methodology for combining these data sets into higher level data products for research and applications.

M2 August 2003 (month T0 +18): Recommendations for the optimisation of forthcoming altimeter missions missions (orbits, tracking, orbit maintenance, payload specifications, scheduling).

Table 2 Deliverables List

Deliverable No.	Deliverable Title	Delivery Date	Completed	Dissemination Level.
1	Project Definition	T0+ 2 April 2002	May 2002	RE
2	Interim Report on SSH Error Budgets / Feature Detectibility, for Tracking Workshop	T0+ 5 July 2002	November 2002	PU
3	Final Reports on Error Budgets / Feature Detectability	T0+ 14 April 2003		PU
4	Interim Report on sea-state error budget/Impact of GAMBLE in sea-state analysis and forecasting	T0+ 5 July 2002	July 2002	PU
5	Final Report on sea-state error budget/Impact of GAMBLE in sea-state analysis and forecasting	T0+ 14 April 2003		PU
6a	Interim Recommendations for Orbit Determination and Tracking	T0+ 9 Nov 2002	November 2002	PU
6b	Final Recommendations for Orbit Determination and Tracking	T0+ 14 April 2003		PU
7	Report on Marine Operator's Requirements	***T0+ 16 June 2003***		PU
8	Report on Error Budgets and Potential Solutions	T0+ 14 April 2003		PU
9 / ***M1***	Framework for Recommended Research Programme	T0+ 16 June 2003		PU
10 / ***M2***	Orbit Recommendations	T0+ 18 Aug. 2003		PU
11 / ***M2***	Satellite and payload specification recommendations	T0+ 18 Aug. 2003		PU
12	Workshop report	T0+ 20 Oct. 2003		PU
13	Interim Management Report	T0+ 6 Aug. 2002	August 2002	PU
14	Interim Management Report	T0+ 12 Feb 2003		PU
15	Mid term Report	T0+ 12 Feb 2003		PU
16	Interim Management Report	T0+ 18 Aug 2003		PU
17	Draft Final Report	T0+ 19 Sept 2003		RE
18	Final Report	T0+ 21 Nov 2003		PU
19	Website and exploitation report	T0+ 21 Nov 2003		PU

Dissemination : RE – Restricted
PU – Public

Note: Where dates are given in italics, they have been altered from the previous Project Definition.

4. Workshops

Seven workshops were planned within GAMBLE.

	Work Package	Description	Location /Responsible Partner	Proposed Date	
1	WP1	Kick-Off	LEGOS/CNES	21 March 2002	***completed***
2	WP3	Sea State: Error Budgets and Feature Detection	ISDGM/ISDGM	30 Sept 2002	***completed***
3	WP2,4	Sea Surface Height and Sea State: Error Budgets and Feature Detection / Orbits and Satellite Tracking	DUT/DUT & CLS	7-8 Nov 2002	***completed***
4	WP6	Mid Term Review	SOC/SOC	17 Jan 2003	
5	WP5	Marine Operators	Stavanger/SOS(OGP)	19 May 2003	
6	WP8	Constellation Optimisation	TBD/CNES	June/July 2003	
7	WP9	Final Workshop	TBD/SOC	Sept 2003	

TBD – Venue To Be Determined

5. Responsibilities

Responsibility for co-ordinating the sequence of events described in the Work Packages resides with SOS (Satellite Observing Systems). SOS will be responsible to the EC for all administrative and finance purposes, and will ensure that the reports and recommendations generated by the network will be issued in a timely manner.

CNES (Centre National d'Etudes Spatiales) are joint co-ordinators of GAMBLE, and will work with SOS in all aspects of management and co-ordination. CNES and SOS will together chair a six member Project Management Committee, comprised of the Work Package leaders. These are SOS, CNES, DUT (Delft University of Technology) ISDGM (Istituto per lo Studio della Dinamica delle Grandi Masse), SOC (Southampton Oceanography Centre) and CLS (Collecte Localisation Satellites). The GAMBLE management committee will be responsible for co-ordination of activities, workshop organisation, and the initiation of actions following workshop recommendations. The approval of this committee will also be required prior to any expenditure of the GAMBLE contingency budget put aside to support the contribution of invited experts and new members.

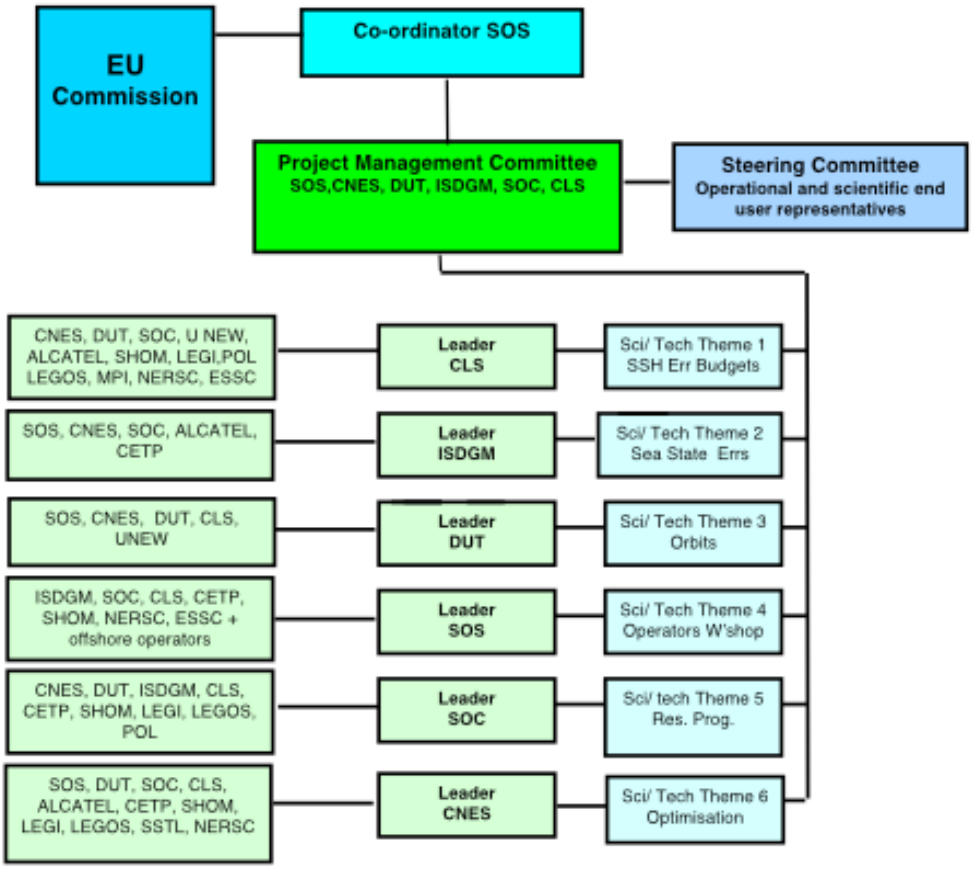

Figure 1. GAMBLE Management Diagram

The responsibilities of the remaining GAMBLE participants will be to co-ordinate with all interested parties in their scientific sphere of interest, to prepare and present the state of the art, and to participate in discussions at workshops or in scientific "expert groups".

An independent steering committee has been appointed, and authoritative representatives of industry and the scientific community have agreed to take part in this capacity. The independent role of the steering committee will be central to GAMBLE. They will be asked to review and oversee progress on behalf of the user community and the EU. Thus they will ensure the work and subsequent recommended programmes are well focused to meet the general needs of the wider community.

At the first level communications will be through e-mail, with all information being mirrored between SOS and CNES. CNES will take responsibility to ensure that all members based in France are kept informed, SOS will maintain contacts with all other partners.

With support from SOC, SOS will establish a GAMBLE web site which will contain all reports and documentation, and will be open to the wider European altimeter community.

The reporting lines are indicated in the management diagram, Figure 1. Where Work Packages include workshops, the WP leader takes responsibility for the organisation of the workshop. SOS will assist in workshop preparation.

6. Work package descriptions

There are eleven work packages in all.

Six of the work packages address specific scientific or technical issues (Figure 1). These Work Packages (WP) will be managed by GAMBLE partners who are recognised as leading international experts in the field addressed by the WP. Other GAMBLE members with appropriate expertise will form the core of expert user groups whose task will be to compare results and identify best practice, and to evaluate emerging and existing technology. The WP lead partner will be responsible for management of the work package, co-ordination, and organisation of any workshops, and have been allocated staff time accordingly. The other partners participating in the work package have been allocated effort for co-ordinating with the lead partner, and with other organisations outside GAMBLE who can provide useful contributions. The exact time allocated depends on the effort that the organisations have indicated that they are able to provide and on the contribution that is expected from them.

All parties with relevant expertise should be invited to contribute to expert group discussions, including those who are not partners in the original GAMBLE network proposal. A contingency fund has been included in the budget to allow GAMBLE to support contributions from organisations not presently within the network. Suggestions for use of this fund should be made to SOS/CNES.

In the following pages more detailed descriptions of the expected outputs from each work package are presented. The allocated staff time for each partner (months) in shown in brackets. The leaders of each work package are responsible for ensuring the deliverables are completed on time. An early activity for each work package leader should be to generate a description and timetable of expected activities. This plan should be provided to the GAMBLE coordinators (SOS/CNES) within the first quarterly report.

WP 1 INITIAL PROJECT DEFINITION AND KICK OFF MEETING

Start Date T0 (Feb 2002) Finish Date T0+2 (April 2002) Total person months 3 WP Leader, CNES Participants, SOS (0.75), CNES (0.5), DUT (0.5), ISDGM (0.25), SOC (0.5), CLS (0.5), and Steering Group
Objectives: To generate detailed work plan and establish expert groups. Establish GAMBLE Steering Group.
Inputs: GAMBLE work plan
Methodology: Convene workshop at which the GAMBLE team will: • Define the best approach to apprehend the whole problem • Define the best approach to simulate the combined missions of the future • Identify resources • Assign responsibilities • Establish a series of topic specific expert review groups
Deliverables D1 Project Definition T0 +2 (April 2002)

Description / Report

The main purpose of this work package was to generate the Project Definition, to provide the work plan for the rest of the duration of GAMBLE. It was also important to co-ordinate the GAMBLE timetable with that of the satellite missions under consideration, to ensure that recommendations from GAMBLE are made in a timely fashion.

Secondary aims were be to set dates and venues for the GAMBLE workshops, to establish the working groups which will address the various scientific and technical themes, and to define the remit of the Steering Group.

The Kick-off meeting was held at the offices of LEGOS (Laboratoire dÉtudes en Géophysique et Océanographie Spatiale) Toulouse, France, on 21 March 2002. Minutes have been generated and distributed.

At the Kick Off meeting the GAMBLE team were asked to name candidate organisations who could contribute to GAMBLE. No extra organisations were suggested, and so no initial allocations from the contingency fund are being considered for the time being.

WP 2 SCIENTIFIC / TECHNICAL THEME 1 : SEA SURFACE HEIGHT ERROR BUDGETS, FEATURE DETECTIBILITY

Start Date T0+2	April 2002		
Finish Date T0+14	April 2003		
Total Person months 5.5			
WP Leader, CLS			
Participants: CNES (0.5), DUT (0.75), SOC (0.75), CLS (0.5), UNEW (0.5), ALCA (0.5), SHOM (0.25), LEGOS (0.25), POL (0.25), LEGI (0.5), MPI (1.0), NERSC (0.25), ESSC(0.0)			
Objectives: To generate requirements for accuracy , space-time sampling of altimeter measurement and orbit maintenance/ measurement to provide detectability of target oceanic features.			
Inputs: D1: Project Definition Conclusions/recommendations from most recent workshops, reports and literature. Jason, GANDER, AltiKa, SWIMSAT mission specifications documents.			
Methodology: Engage expert advice, review and assess state of the art knowledge from most recent workshops and literature. Analysis of past and present records, and results from simulations. A joint workshop will be held with WP3, provisionally at ISDGM in November 2002 • Discuss and investigate possible error budget and sampling of GANDER-only measurements of topography • Discuss and investigate possible error budget and sampling of GANDER/Jason/AltiKa/SWIMSAT measurements of ocean topography • Report on offshore features that may be detected including major current boundaries, mesoscale variability, thanks to a GANDER-only constellation and a combined GANDER/Jason/AltiKa/SWIMSAT constellation • Report on coastal features and tide components that may be detected with improved altimeter techniques and sampling capabilities.			
Deliverable	D2 – Interim Report	T0 + 5	July 2002
	D3 – Final Features/ Errors Report	T0 + 14	April 2003

Technical Description

The main activities of this work package will be the presentation and discussion of recent research involving the use of combined data from different altimeter missions with relation to applications (scientific and operational) of ocean sea surface height measurements. The aim will NOT be to duplicate the work of such groupings as the TOPEX/JASON Science Working Team, or ENVISAT symposia – but to build on the work presented at these meetings. The aim is to establish (a) the best way to combine data from different missions, and (b) the optimum combination of orbits and sampling patterns that will allow key ocean features to be studied.

Activities should also consider latest developments in altimetry, including for instance the implications of an improved geoid from current gravity missions, the possible applications of the SAR/interferometer mode on the CRYOSAT altimeter, the proposals for Wide Swath Altimeters, and others.

Initial efforts will establish the key features to be investigated, and the accuracy of height data and sampling rates that will be required. These findings will then feed into the discussions about suitable sampling regimes, and the best arrangements of orbits from multi-mission scenarios.

A joint WP2/WP4 workshop was held at DUT, Delft, The Netherlands, on 7-8 November 2002. Presentations made at that meeting are available at the GAMBLE web-site. The Interim Report D2 was completed in November 2002.

WP 3 SCIENTIFIC / TECHNICAL THEME 2 : SEA-STATE ERROR BUDGETS, FEATURE DETECTIBILITY

Start Date T0+2 April 2002
Finish Date T0+14 April 2003
Total Person months 3.0
WP Leaders, ISDGM
Participants: SOS (0.75), CNES (0.25), ISDGM (0.75), SOC (0.5), ALCA (0.25) CETP (0.5)

Objectives:
To generate requirements for accuracy, space-time sampling of altimeter measurement and orbit maintenance/ measurement to provide detectability of target sea-states.

Inputs:
D1: Project Definition.
Conclusions/recommendations from most recent workshops, reports and literature.
Jason, GANDER, AltiKa, SWIMSAT mission specifications documents.

Methodology:
Engage expert advice, review and assess state of the art knowledge from most recent workshops and literature. Analysis of past and present records, and results from simulations. A joint workshop will be held with WP2, provisionally at ISDGM , in November 2002.

- Discuss and investigate possible error budget and time-space coverage to GANDER only measurement of sea-state.
- Discuss and investigate possible error budget and time-space coverage to GANDER/Jason/AltiKa/SWIMSAT measurements of sea-state.
- Report on the contribution of wave spectral information as provided by SWIMSAT together with a GANDER type constellation (providing high density wave-height and wind speed) towards a better understanding of the physics of ocean waves.
- Report on the contribution/assimilation of a GAMBLE constellation, including SWIMSAT spectral observation, into models for sea-state analysis and forecast.

Deliverable	D4 – Interim Report	T0 + 5	July 2002
	D5–Final Features/ Errors Report	T0 + 14	April 2003

Technical Description

The main activities of WP3 will be similar to those of WP2, applied to a different scientific theme. Thus recent developments and research will be discussed to establish the best way to combine data from different missions and the optimum combination of orbits. The results from new assimilation schemes in wave models will be investigated and the best way to approach the problems of different temporal and spatial scales in different ocean regions (e.g. North Atlantic, Mediterranean Sea) will be considered.

It is hoped to include a consideration of results from a new assimilation scheme being implemented at Météo France. Once implementation is complete Météo France plan to perform wave data assimilation experiments using simulated data from various type of instruments (SAR, RAR, altimeters). Although assimilation of satellite derived wave height and wind speed have been identified as important reasons for improved forecasting skills, other studies have demonstrated that the assimilation of buoy derived wave spectral data also improves operational forecasts. So, the impact of the combination of several altimeters with instruments providing directional wave spectra information in wave predictions will be investigated.

Again the activities should consider latest developments in altimetry, including for instance possible applications of the SAR/interferometer mode on the CRYOSAT altimeter, the proposals for Wide Swath Altimeters.

The WP3 workshop was held at ISDGM, Venice, Italy, on 30 September 2002. Minutes have been generated and distributed. The Interim Report D2 was completed in July 2002.

WP 4 SCIENTIFIC / TECHNICAL THEME 3 : ORBIT DETERMINATION AND SATELLITE TRACKING WORKSHOP

Start Date T0+2 April 2002
Finish Date T0+14 April 2003
Total Person months 3.0
WP Leader, DUT
Participants, SOS (0.75), CNES (0.25), DUT (1.0), CLS (0.25), UNEW (0.5), SSTL (0.25)

Objectives:
To provide recommendations for optimum orbits, orbit maintenance and satellite tracking and expected orbit error budget for GANDER

Inputs:
D1, Project Definition; D2 and D4 – Initial Reports on Error budgets

Methodology:
Engage expert advice, review and assess state of the art knowledge from most recent workshops and literature. Analyse past and present records, and results from simulations. Issues to be addressed include

- Ascertain how much tracking of GANDER microsats is needed to sufficiently characterise features as determined in D2, in a GANDER-only constellation
- Ascertain how much tracking of GANDER microsats is needed, in a combined GANDER/Jason/AltiKa/ SWIMSAT constellation
- Estimate overall accuracy of height determination, in a GANDER-only and a combined constellation with and without GANDER laser tracking
- Recommend if all or some GANDER microsats require modification to design .

A workshop is planned, provisionally to be held at DUT in early September 2002. The orbit/tracking agenda will allocate generous time for discussions. The aim is to bring experts in orbit determination of altimetry satellites together with experts in the field of each of the tracking systems, in order to talk about future developments. Conclusions of the workshop will form the basis of Deliverable 6a, and will be presented at the WP2 / WP3 workshop. They will address three issues
1 - A description of the current state of orbit determination and tracking systems
2 - Initial estimates of the orbit error contribution for input into the WP2 workshop (based on experience with current missions and past simulation studies)
3 - A recommendation for further study (by orbit determination simulations into the types of orbits and tracking) that should be considered for the future GAMBLE missions.

The final report (D6b) will contain recommendations for the specific orbits of the future missions, including an assessment of the attainable orbit determination accuracy.

Deliverable	D6a Interim Orbit and Tracking recommendations	T0 +9 Nov 2002
	D6b Final Orbit and Tracking recommendations	T0 +14 April 2003

Technical Description

This activity will take in the accuracy and sampling requirements from WP2 and WP3, and make recommendations regarding orbits and satellite tracking. A number of complex issues need to be addressed and understood. The considerations should include a discussion of the latest developments in altimetry, including for instance possible applications of the SAR/interferometer mode on the CRYOSAT altimeter, the proposals for Wide Swath Altimeters, and possible bi-static altimeter missions.

To be able to make benefit of all three principle measurements of satellite radar altimeters (wave height, wind speed and range), one needs to know the position of the satellite accurately at any time. The way in which the position is determined depends on the required accuracy, which in turn is application driven.

To meet the mission goals concerning the measurement of wave height and wind speed, it is, in principle, sufficient to know the position of the altimeter footprint with an accuracy of about 100 m. These 100 metres are still dwarfed by the size of the footprint itself.

The range measurement of the radar altimeter, the distance between the satellite and the ocean surface, is only useful when it is compared with an independently determined altitude of the satellite above a given reference surface. The difference between the orbital altitude and the altimeter range then defines the height of the sea level. When the orbit of the satellite is accurately known, it very easy to derive from this the footprint

location and the orbital altitude. But to determine the orbit accurately we first need to model all forces acting on the satellite, and secondly, because this is an impossible task, we need to track the satellite and use this tracking information to adjust the computed orbit and our knowledge of the forces and other relevant parameters. The complicated process of modelling the orbit dynamics, adjusting the parameters and the orbit is called precise orbit determination (POD). Many levels of accuracy of the POD process are conceivable. Nowadays, satellite orbits can be determined, at any time around the orbit, with an accuracy of around 5 cm. However, this number is heavily determined by the quality and the quantity of satellite tracking data.

It is not difficult to realise that the accuracy at which the sea level can be determined is fully driven by the accuracy of the determination of the satellite altitude. Conversely, the POD accuracy is driven by the applications that are foreseen with the use of the altimeter range measurement. It is therefore important first to make an analysis of the intended mission goals, forthwith translate this to the required sea level and orbital altitude requirements, and finally which tracking system would meet these requirements. On top of that there may also be operational considerations that drive the type of tracking system or even the POD method.

It is important to realise that the altimeter range measurement itself can assist the orbit determination. Converted to sea level height using a low-precision orbit, the difference of this sea level with respect to a mean sea surface model or, even better, a sea level determined by another satellite is indicative of the precision of the orbit. Although there is no implicit relation between the sea level differences and the orbit error because of other errors involved in the construction of the sea level measurement out of the altimeter range, an abundance of these sea level differences can be used for a more precise determination of the satellite orbit. This strategy has been used effectively for the improvement of orbits of the low-flying ERS satellites using sea level measurements of the TOPEX/Poseidon satellite. Where the two ground tracks of the satellites cross the sea level measurements made by the two satellites are compared. The resulting crossover height difference is assumed to be due to errors in the least accurate orbit, that of ERS. These height differences can then be used in a POD process.

Likewise, orbits of a constellation of altimeter satellites can be improved by using the crossover height differences of several satellites. In principle it is not even necessary to assume that one has the higher precision: all orbits can be adjusted simultaneously.

A joint WP2/WP4 workshop was held at DUT, Delft, The Netherlands, on 7-8 November 2002. Presentations made at that meeting are available at the GAMBLE web-site. The Interim Report D6a was completed in November 2002.

WP 5 SCIENTIFIC / TECHNICAL THEME 4 : MARINE OPERATOR'S WORKSHOP

Start Date	T0+14	April 2003
Finish Date	T0+16	June 2003

Total person months 3.5
WP Leader, SOS
Participants, SOS (1.0), ISDGM (0.75), SOC (0.5), CLS (0.5), CETP (0.25), SHOM (0.25), NERSC (0.25), ESSC (0.0) + representatives of offshore operators.

Objectives:
To gain input from operational end-users and determine required provision of near real time seastate and ocean current information.

Inputs:
D1, Project Definition, D2 and D4
Return from on-going experiments in operational oceanography and marine meteorology (e.g. SOPRANE, MERCATOR programmes and sea-state forecast services).

Methodology:
Convene a Workshop of marine/ocean applications operators – in May 2003 (During OGP "JIP" week in Stavanger, Norway). Funds have been allocated for 30 attendees.

- Determine more precisely their requirements for near real-time information on sea state and current regime.
- In particular establish with what accuracy currents and severe sea-state information may be detected and delivered to ships at sea within a specified time-frame.

Deliverable	D7 Report on Operational Requirements	T0+ 16	June 2003

Technical Description

Offshore operators are working to specifications that become more challenging year by year. These specifications can relate to operational activities, e.g. the need to operate within precise sea state limits, or for advance knowledge of "weather windows", or they can form part of the design procedure (operational planning or vessel design). It is a priority of Gamble to consider input from offshore operators, so that the requirements for future missions are driven as much by the needs (on account of commercial, safety or environmental considerations) of offshore operators as they are by those of the scientific community. Thus the workshop will allow operators to communicate their priorities, and to engage the GAMBLE partners in a dialogue as to the best way that these requirements can be satisfied.

WP 6 MID TERM PROGRESS REVIEW

Start Date	T0+10	Dec 2002
Finish Date	T0+12	Feb 2003

Total person months 3.75
WP Leader, DUT
Participants, SOS (0.75), CNES(0.25), DUT (0.75), ISDGM (0.75), SOC (0.5), CLS (0.5), UNEW (0.5) + steering group

Objectives:
To assess progress at GAMBLE mid-point, and consolidate programme for 2nd year.

Inputs:
All Deliverables to date

Methodology:
Report on progress to date. Gain feedback from Steering Group and assess 2nd year work programme. In particular:

- Review GANDER height error budget and consider how it might be reduced.
- Define what can be measured within this error budget.
- Define the role of JASON, AltiKa and SWIMSAT in enhancing GANDER's ability to observe and quantify marine features and ocean circulation at the level of accuracy required by users.
- Define the role of JASON in 'calibrating' GANDER orbital heights.
- Review the joint role of all missions in providing sea state information to forecast models and direct to operators.

Funds for 16 attendees have been allocated. (8 GAMBLE partners plus the steering group)

Deliverable	D8 Report on Error Budgets and potential solutions (also D14 – see WP10)	T0 + 12 Feb 2003

Description

The main purposes of this work package are twofold: To review progress over the first year of GAMBLE, and, in the light of this review (and of other developments external to GAMBLE), to reassess, and if necessary, redefine the programme for the second year. The Steering Group will play a central role in this activity. The second purpose is to produce the report on Error Budgets which will feed into Work Packages 7 and 8.

The management committee will consider if other organisations outside GAMBLE could contribute to GAMBLE in its second year, and whether it is able to offer financial support to any of these organisations.

WP 7 SCIENTIFIC / TECHNICAL THEME 5 : DEFINE RESEARCH PROGRAMME

Start Date T0+12 Feb 2003
Finish Date T0+16 June 2003
Total Person months 5
WP Leader, SOC
Participants, SOS (0.25), CNES (0.25), DUT (0.75), ISDGM (0.75), SOC (1.0), CLS (0.25), CETP (0.5), SHOM (0.25), LEGOS (0.5), POL (0.25), LEGI (0.25)

Objectives:
Define a recommended programme of research to be pursued by research centres (outside the terms of the GAMBLE thematic network) during the life of the GANDER, JASON and ENVISAT missions.

Inputs:
D1, D3, D5, D7, D8

Methodology:

- Establish work to be done to ensure that wave, wind and current data products can be generated and expeditiously delivered for
  a) Climate studies
  b) Routine marine operations
- Investigate potential impact on ground segment system designs, including data processing, distribution etc.

No Workshop is supported for this activity.

Deliverable D9 / Milestone M1
Framework for Recommended Research *T0 + 16 June 2003 To be confirmed*

Technical Description

The main purpose of this work package is to generate recommendations for the production of high-level multi-mission data products, for scientific research and operational applications.

Through missions such as TOPEX/POSEIDON and ERS-1 and 2, radar altimeters have made a major contribution to oceanographic science. One of the major limitations of such data arises from the narrow footprint of the instrument. Whereas other remote sensing instruments have broad swaths of hundreds of kilometres across, the radar altimeter only takes measurements in a very narrow (c 10 km) swath directly below the satellite. There are two ways around this problem, one is to design wide swath altimeters, the other is the GAMBLE approach, to make use of data from different altimeter missions. The main advantage would be the ability to look in more detail at the mesoscale. Because of the wide spacing of the tracks mesoscale eddies are lost by the present day altimeter systems. For example, depending on the number of satellites involved a constellation should be able to track eddies as they propagate across the ocean. Similarly there are many small scale, topographically forced, features we have probably not even seen with the data we have at the moment. The other area where we expect scientific advances is in the area of mapping ocean characteristics. By having more passes in a given area we will gain a better understanding of the processes being mapped. This will not only lead to a better understanding of mean fields but also to what extent we can use satellite data to make inferences about extreme events.

WP 8 SCIENTIFIC / TECHNICAL THEME 6 : CONSTELLATION OPTIMIZATION WORKSHOP

Start Date T0+16 June 2003
Finish Date T0+18 August 2003
Total Person months 5.5
WP Leader, CNES
Participants, SOS (0.75), CNES (0.5), DUT (0.75), SOC (0.5), CLS (0.5), ALCA (0.5), CETP (0.5), SHOM (0.25), LEGOS (0.25), SSTL (0.5), LEGI (0.25), NERSC (0.25)

Objectives:
Provide recommendations for orbits, orbit maintenance and tracking, orbit phasing, and satellite / payload specifications.
Provide preliminary GAMBLE multi-satellite configurations/scenarios.

Inputs:
D3, D5, D6, D7, D8

Methodology:
Convene Workshop. Funds have been allocated for 14 attendees.
Bring GANDER, Jason, AltiKa, SWIMSAT project people together with experts in multi-satellite simulations to:

- Evaluate existing and emerging technologies
- Analyse simulation outputs
- Issue recommendations for possible improvements to the GANDER constellation with respect to user requirements (from marine/ocean applications and science users) and to the performance/cost ratio.

  (a) Orbit specifications
  (b) Modifications to satellite and instrument specifications

Deliverables

D10 Recommendations for GANDER, SWIMSAT, AltiKa Orbits T0 +18 August 2003

D11 Recommendations for GANDER, SWIMSAT, AltiKa satellite and payload specifications

T0 +18 August 2003

D10 and D11 together constitute Milestone M2

Technical Description

The specifications (orbits, payload) of some missions (e.g. JASON, ENVISAT) have for a long time been established in line with the science programmes towards which the missions are addressed. The aim of this work package is to take a wider view than any single mission and to investigate and recommend possible modifications to missions that are still at the planning process. For instance the scientific output of a GANDER microsat constellation might be improved significantly by the relatively inexpensive addition of an on board GPS orbit determination and maintenance capability. In addition the orbits could be phased to maximise the benefit, in terms of cross-overs with other satellites, or temporal spatial coverage, for scientific investigations without adversely affecting the performance with regard to operational provision of Near Real Time data.

WP 9 FINAL WORKSHOP

Start Date	T0+18	August 2003
Finish Date	T0+20	October 2003

Total person months 6
WP Leader, CNES
Participants, SOS (0.75), CNES (0.25), DUT (0.75), ISDGM (0.75), SOC (0.75), CLS (0.5), UNEW (0.5), ALCA (0.5), CETP (0.25), SHOM (0.25), LEGOS (0.25), POL (0.25), SSTL (0.25), LEGI (0.25), ESSC(0.0) + steering group

Objectives:
Provide final recommendations for co-ordinated European activity on Altimeter Ocean measurements

Inputs:
All deliverables to date (D1-D11)

Methodology:
Bring modellers and marine operators together with satellite programme managers. Convene Final Workshop which will provide forum for interested parties to discuss GAMBLE project and contribute to final recommendations. Funds have been allocated for 25 attendees.

Deliverable	D12 Workshop report	T0+20 October 2003

Description

The workshop will agree the final recommendations to be made to all relevant parties (satellite mission managers, national and international science programme managers, bodies that represent the interests of offshore operators). The GAMBLE team will also agree a dissemination strategy for the GAMBLE results, and work to ensure that the user groups established within GAMBLE will continue to work together in the future.

WP 10 MANAGEMENT AND REPORTING

Start Date T0+0 Feb 2002
Finish Date T0+21 Nov 2003
Total person months 5.25
WP Leader, SOS
Participants, SOS (2.5), CNES (0.25), DUT (0.5), ISDGM (0.75), SOC(0.5), CLS(0.5), and Steering Group

Objectives:
Management of GAMBLE thematic network and reporting to European Commission.

Methodology:
Appoint Project Manager, and establish GAMBLE website and exchange forum.

Provide three Interim Management reports at T0+6 , 12 and 18 months.

Provide Mid-term and Final reports of Work Packages to the Commission.

All five reports will be written in English and delivered to the Commission in three copies.

Provide reports to Steering Group, and convene Steering Group meetings which will provide guidance to GAMBLE project managers.

Provide cost statements at T0+6, T0+12, T0+18 and T0+21 months.

Deliverables

D13	First Management Report	T0+6	August 2002
D14	Second Management Report	T0+12	Feb 2003
D15	Mid term Report	T0+12	Feb 2003
D16	Third Management Report	T0+18	August 2003
D17	Draft Final Report	T0+19	Sept 2003
D18	Final report	T0+21	Nov 2003

The First Management Report D13 was completed in August 2002.

WP 11 EXPLOITATION AND OUTREACH

Start Date T0+3 May 2002
Finish Date T0+21 Nov 2003
Total Person months (2)
WP Leader, SOS
Participants, SOS (1.0), SOC (0.5), DUT (0.5)

Objectives:
To ensure that the widest possible group of interested parties are aware of the GAMBLE network, to enable this community to contribute to discussions and gain access to the recommendations and reports.

Methodology:
It is important to ensure that the GAMBLE network will bring in and involve all members of the European altimeter and ocean using community who can make a valid contribution. It is also important that the co-ordination activity initiated by GAMBLE will continue beyond the initial 21 month phase for which Framework V support is requested.

- Ensure that all relevant organisations (research institutes, space agencies, offshore operators, funding bodies) are informed of GAMBLE recommendations.
- Establish a GAMBLE web site which will contain all reports and documentation, and which will be open to view for the wider community. The web site will feature an open feedback option, so that all interested parties can keep up to date with progress and contribute to the ongoing GAMBLE network discussions.
- Establish an information network through which future satellite plans can be disseminated and discussed.

Deliverable	D16 Web Site and Exploitation Report	T0 +21	November 2003

7. Reporting and Communication

Communications will mostly be through email. A GAMBLE Web Site has been established at http://www.altimetrie.net. Summary reports of the progress made will be made at intervals of at most 3 months. The conclusions of the 3 planned Workshops will be reported in written form. Where possible workshops will be convened to co-ordinate with other meetings, to reduce cost and increase attendance.

A draft Final Report containing recommendations for future missions and research activity will be prepared and distributed prior to the final Workshop which brings all 3 communities together - operators, oceanographers, and satellite trackers. The main recommendations will be discussed at this Final Workshop, and a series of pilot trials will be decided. These will be forwarded to the programme managers of JASON, GANDER, AltiKa and SWIMSAT.

8. The Consortium

The principal contractors and members of the GAMBLE consortium are listed below:

GAMBLE Main Contractors

UK	CO1	For GANDER	Satellite Observing Systems (SOS)
F	CR2	For JASON	Centre National des Etudes Spatiales (CNES)
NL	CR3	Orbit analysis	Delft University of Technology (DUT)
IT	CR4	Sea-state, Mediterranean Studies	Istituto per lo Studio della Dinamica delle Grandi Masse (ISDGM)

GAMBLE Members

		Organisation	**Interest**
UK	MB5	Southampton Oceanography Centre (SOC)	Large scale oceanographic circulation and climate studies
F	MB6	Collecte Localisation Satellites (CLS)	AltiKa, oceanographic circulation studies
UK	MB8	Univ. Newcastle (UNEW)	Satellite Tracking, JASON PI
F	MB9	ALCATEL	Altimeter Instrumentation
F	MB10	Centre d'Etudes des Environnements Terrestre et Planetaires (CETP)	Leader of SWIMSAT proposal
F	MB11	Service Hydrographique et Oceanographique de la Marine (SHOM)	AltiKa. Responsible for French Navy and global Mercator ocean forecasting systems, JASON PI
F	MB12	Universite Joseph Fourier (UJF)	Principal Investigator of Altika. Multi-satellite studies, JASON PI
F	MB13	Laboratoires d'Etudes en Geophysique et Oceanographie Spatiale (LEGOS)	Tidal modelling, JASON PI
UK	MB14	Proudman Oceanographic Laboratory (POL)	Tidal Modelling, Coastal Studies, JASON PI
UK	MB15	Surrey Satellite Technology Ltd. (SSTL)	Microsat technology.
F	MB16	Universite Versailles St Quentin (UVSQ)	Linked to MB10 as joint research unit
F	MB17	Laboratoires des Ecoulements Geophysiques et Indistriels (LEGI)	Linked to MB12 as joint research unit
F	MB18	Institut National Polytechniqe de Grenoble (INPG)	Linked to MB12 as joint research unit
DE	MB19	Max Planck Institut (MPI)	Meteorology, modelling
UK	MB20	Environmental Systems Science Centre (ESSC)	Assimilation, modelling
NO	MB21	Nansen Environment and Remote Sensing Centre (NERSC)	Climate and environment studies, operational forecasting, modelling

The roles of MB12 , MB16 and MB18 are purely administrative for initial contract purposes. They will not play an active part in the thematic network.

To assist and guide the work to be carried out and to make recommendations when necessary we will establish a Steering Committee representative of future clients. The steering committee will have a balanced membership with equal representation from the "operational" and "scientific" communities. The following have all agreed to participate in such a role (Letters of acceptance from have been received by SOS):-

Steering Committee

OceanRoutes	Cdr John Thompson
Shell International Exploration and Production	C Shaw
BP AMOCO Exploration	C Grant
DockWise	C Leenaars
EuroGOOS	T Guymer
CLS	P Gaspar
Meteo France	M Dandin
ENEA	G Manzella

Partner Roles

The individual roles of partners are detailed below. Often expertise of individual organisations spreads across a number of fields, and GAMBLE partners may contribute to several of the Scientific Themes. Table 3, at the end of this section, shows the amount of staff effort each partner is providing to each work package.

CO1 Satellite Observing Systems (SOS)

Total Staff Effort 9.25 Months

SOS are the Co-ordinating Principal Contractor in GAMBLE. They lead the Project management Work Package (WP10), and will be responsible for project administration, and co-ordination with the EU including the provision of all project deliverables and reports, according to the project timetable. SOS will co-chair the project management committee (6 members). In addition they lead WP11, Exploitation.

SOS also lead WP5 (Marine Operator's Workshop) and will organise the workshop. As Work Package leaders they will be responsible for reporting on the findings of the workshop, and generating the project deliverables. SOS will attend, and report to the Kick-Off workshop (WP1), the Mid term Review Workshop (WP6), and the Final Workshop (WP9). They will assist CNES in the organisation of the workshops for WP1 and WP9, and assist DUT in the organisation of the workshop for WP6. SOS will present results of technical studies carried out for GANDER to WP4 (Orbit Determination), and WP8 (Optimisation). In WP3, SOS will also present their experiences of providing services based on altimeter data to offshore operators.

CR2 Centre Nationale D'Etudes Spatiales (CNES)

Total Staff Effort 3 Months

CNES are, with SOS, joint co-ordinators of GAMBLE. They will assist SOS in project administration, and co-ordination with the French partners in GAMBLE. CNES will co-chair the project management committee, and share responsibility for the generation of project reports. Thus CNES will contribute directly to WP10 – Project Management.

CNES have the responsibility for the organisation of the Kick Off workshop (WP1) and the final workshop (WP9), and will contribute to the Mid Term Review (WP6). CNES also will contribute to WP2 (Sea surface height error budgets), WP3 (Sea state error budgets), WP4 (Orbit studies), and WP7 (Research Programme). They will lead WP8 (Optimisation), and will be responsible for organising the workshop, for reporting on the findings, and generating the WP deliverables.

CR3 Delft University of Technology

Total Staff Effort 6.5 Months

Delft University of Technology lead the GAMBLE activities relating to orbit determination. DUT will be a member of the project management committee, and will contribute to project reports. They will also contribute to exploitation and outreach (WP11).

DUT will lead WP4 (Orbit Determination) and will be responsible for organising the workshop, reporting on the findings, and generating the deliverables due from WP4. DUT will present the most recent "State of the Art" with regard to orbit determination at the Kick Off workshop (WP1), and to WP2 (Sea surface height error budgets). DUT will organise the Workshop for the Mid Term Review (WP6), and present WP4 results to WP7 (Research Programme) and WP8 (Optimisation). In addition they will contribute to the final workshop WP9.

CR4 Istituto per lo Studio della Dinamica delle Grandi Masse (ISDGM)

Total Staff Effort 4.75 Months

ISDGM will be responsible for assessing the use of multi-satellite altimeter data sets in the Mediterranean Sea, with special regard to sea state. ISDGM will be a member of the project management committee, and will contribute to project reports.

ISDGM lead WP3 (Sea State Error Budgets). They will jointly organise and chair a joint workshop with WP2, and be responsible for reporting the findings, and generating the project deliverables for WP3. ISDGM will attend and present the special case of using altimeter data in semi-enclosed seas at the Kick Off workshop (WP1), WP3, and WP5 (Marine Operators workshop). They will contribute to the Mid Term Review (WP6), and present recommendations to WP7 (Research Programme). In addition they will contribute, scientifically and as members of the Project Management Committee, to the final workshop WP9.

MB5 Southampton Oceanography Centre

Total Staff Effort 6 Months

Southampton Oceanography Centre lead WP7 (Definition of Research Programme). SOC will also sit on the Project Management Committee and will also assist SOS in WP11 (Exploitation) by supporting the GAMBLE web site.

SOC will present results of recent studies, with an emphasis on multi-satellite sampling and error budgets, at the Kick Off workshop (WP1). They will make important contributions to WP2 (Sea surface height error budgets) and WP3 (Sea state error budgets). They will be responsible for presenting UK plans for operational oceanography to the Marine Operators workshop (WP5). As leaders of WP7 (Research Programme) they will co-ordinate with all GAMBLE partners who are contributing to this WP, and solicit contributions from organisations external to GAMBLE. SOC will be responsible for generating the deliverables due from WP7. SOC will present the results of WP7 at the optimisation workshop (WP8). Finally, SOC will contribute, scientifically and as members of the Project Management Committee, to the Mid Term Review (WP6) and the final workshop WP9.

MB6 Collecte Localisation Satellites CLS

Total Staff Effort 4 Months

CLS will lead WP2 (Sea Surface Height Error Budgets) and will be members of the Project Management Committee.

CLS will present results of recent studies of multi-satellite sampling and error budgets, at the Kick Off workshop (WP1) and at the WP2/WP3 workshop. They will be jointly responsible (with ISDGM) for the organisation of the joint WP2/WP3 Workshop, and for generating the deliverables from WP2. WP2 activities will take place over a period of 12 months, and over that time CLS will be responsible for co-ordinating with all other contributors to WP2. CLS will also contribute to WP4 and WP5 . CLS will contribute their own expertise, and report on the recommendations from WP2, to WP7 (definition of research programme), and to WP8 (Optimisation). They will also contribute to the Mid Term Review (WP6) and the final workshop WP9.

Météo France (MF)

Total Staff Effort 0 Months

Unfortunately MF, member 7 in the original proposal, are unable to commit to the GAMBLE contract due to a heavy workload, and therefore withdrew from formal membership of the team (before contracts were signed and exchanged). They are still interested in the project and will contribute as part of the steering committee.

MB8 University of Newcastle (UNEW)

Total Staff Effort 2 Months

UNEW will contribute to WP2 (Sea surface height error budgets), and WP4 (Orbits). In addition they will contribute to the Mid Term Review Workshop (WP6) and the Final Workshop (WP9).

MB9 ALCATEL

Total Staff Effort 1.75 Months

ALCATEL will contribute to WP2 (Sea surface height error budgets), and WP3 (Sea state error budgets). They will provide a key contribution to the Optimisation Workshop (WP8), and will attend the Final Workshop (WP9) to help form the final recommendations.

MB10 Centre d'études des Environnements Terrestre et Planétaires

Total Staff Effort 2 Months

CETP will contribute expert opinion and a review of the state of the art of wave measuring radar to WP3 (Sea state error budgets), and help to form recommendations from the Marine Operator's Workshop (WP5), which may impact on plans for SWIMSAT. Similarly SWIMSAT plans will be important in the development of the definition of the research programme (WP7). It is also clearly important that SWIMSAT plans are co-ordinated with those of other missions (GANDER, Altika) at the Optimisation Workshop (WP8). CETP will also contribute to the Final Workshop (WP9) where the final recommendations will be developed.

MB11 Service Hydrographique et Oceanographique de la Marine

Total Staff Effort 1.25 Months

SHOM will contribute to WP2 (Sea surface height error budgets), WP5 (Marine Operator's Workshop), and WP7 (Research programme). Their experience with operational models will also help to inform the discussion of optimum sampling strategies within the Optimisation Workshop (WP8). SHOM will also contribute to the Final Workshop (WP9).

MB12 Universite Joseph Fourier (UJF)

Linked to MB17 (LEGI) as a joint research unit but not committing staff time.

MB13 Laboratoire d'Etudes en Géophysique et Océanographique Spatiale (LEGOS)

Total Staff Effort 1.25 Months

LEGOS will contribute to WP2 (Sea surface height error budgets), and will participate in the development of a combined research programme (WP7). The presentation of results of multi-satellite studies will also form an important contribution to the Optimisation Workshop (WP8). LEGOS will also contribute to the Final Workshop (WP9).

MB14 Proudman Oceanographic Laboratory (POL)

Total Staff Effort 0.75 Months

POL will present their recommendations for multi-satellite applications of altimeter data to WP2 (Sea surface height error budgets) and WP7 (Research Programme). POL will also contribute to the Final Workshop (WP9).

MB15 Surrey Satellite Technology Limited (SSTL)

Total Staff Effort 1 Month

SSTL will contribute to the discussions of the Orbits workshop (WP4), and the Optimisation Workshop (WP8). SSTL will present their experiences and technical studies to the workshop, and contribute to the development of the subsequent recommendations. SSTL will also contribute to recommendations from the Final Workshop (WP9).

MB16 Universite Versailles St Quentin (UVSQ)

Linked to MB10 (CETP) as a joint research unit but not committing staff time.

MB17 Laboratoire des Ecoulements Géophysiques et Industriels (LEGI)

Total Staff Effort 1.25 Months

LEGI will present its experiences to WP2 (Sea surface height error budgets) and contribute to WP7 (Research programme). The presentation of results of multi-satellite studies will also form an important contribution to the Optimisation Workshop (WP8). LEGI will also contribute to the Final Workshop (WP9).

MB18 Institut National Polytechnique de Grenoble (INPG)

Linked to MB12 (UJF) as a joint research centre but not committing staff time.

MB19 Max Planck Institut (MPI)

Meteorology and Climate research institute in Hamburg with interests in altimeter assimilation and modelling. Involved in WP2 – Sea surface height error budgets (staff time 1 month).

MB20 Environmental Systems Science Centre (ESSC)

Part of the University of Reading, ESSC now includes a specialist group in data assimilation and modelling. Will attend workshops for WPs 2, 5 and 9.

MB21 Nansen Envionment and Remote Sensing Centre (NERSC)

Research institution linked to university of Bergen with interests in climate research and operational oceanography. Involved with WPs 2, 5 and 8, and will also attend the kick-off meeting (WP1) and final workshop (WP9) (staff time 0.75 months).

Other interested parties

It is intended that the GAMBLE network should be an inclusive network, welcoming contributions from all with the relevant expertise. To allow for this, a contingency fund has been included in the GAMBLE budget under "other costs" for SOS. This fund is sufficient to support travel and subsistence for an extra four participants in each of WP2, WP3, WP4, WP5, WP7, WP8, WP9. The allocation of this fund will be decided by the GAMBLE Project Management Committee, subject to approval by the EC programme officer.

European Space Agency (ESA)

Representatives of the ENVISAT Radar Altimeter programme at ESA were contacted regarding GAMBLE, and expressed enthusiasm for the project. Whilst it is administratively difficult for ESA to become a partner in GAMBLE, a number of the GAMBLE partners are ENVISAT PIs. Thus the contribution of the ENVISAT altimeter will be included in all the discussions for multi-mission applications.

Manpower Table (Staff months / work package)

	WP1 Kick-Off	WP2 SSH	WP3 Sea State	WP4 Orbits	WP5 Marine Ops	WP6 Mid Term Rev	WP7 Res. Prog.	WP8 Optim	WP9 Final W'shop	WP10 Manag	WP11 Exploit	Total
SOS	0.75	0	0.75	0.75	1.0	0.75	0.25	0.75	0.75	2.5	1	9.25
CNES	0.5	0.5	0.25	0.25	0	0.25	0.25	0.5	0.25	0.25	0	3.0
DUT	0.5	0.75	0	1	0	0.75	0.75	0.75	0.75	0.75	0.5	6.5
ISDGM	0.25	0	0.75	0	0.75	0.75	0.75	0	0.75	0.75	0	4.75
SOC	0.5	0.75	0.5	0	0.5	0.5	1	0.5	0.75	0.5	0.5	6.0
CLS	0.5	0.5	0	0.25	0.5	0.5	0.25	0.5	0.5	0.5	0	4.0
UNEW	0	0.5	0	0.5	0	0.5	0	0	0.5	0	0	2.0
ALCA	0	0.5	0.25	0	0	0	0	0.5	0.5	0	0	1.75
CETP	0	0	0.5	0	0.25	0	0.5	0.5	0.25	0	0	2.0
SHOM	0	0.25	0	0	0.25	0	0.25	0.25	0.25	0	0	1.25
LEGOS	0	0.25	0	0	0	0	0.5	0.25	0.25	0	0	1.25
POL	0	0.25	0	0	0	0	0.25	0	0.25	0	0	0.75
SSTL	0	0	0	0.25	0	0	0	0.5	0.25	0	0	1.0
LEGI	0	0.5	0	0	0	0	0.25	0.25	0.25	0	0	1.25
INPG	0	0	0	0	0	0	0	0	0	0	0	0
MPI	0	1.0	0	0	0	0	0	0	0	0	0	1.0
ESSC	0	0	0	0	0	0	0	0	0	0	0	0
NERSC	0	0.25	0	0	0.25	0	0	0.25	0	0	0	0.75
TOTAL	**3.0**	**5.5**	**3.0**	**3.0**	**3.5**	**3.75**	**5.0**	**5.5**	**6.0**	**5.25**	**2.0**	**45.5**