ROSETTA SCIENCE

MANAGEMENT PLAN

RO-EST-PL-0001

DOCUMENT CHANGE RECORD

Issue / Rev.	Date	Pages affected	Brief description of change
Draft 2 Rev.0	23 Sept. 94	All	After first review
Draft 2 Rev. 1	7 October 1994	All	Editorial changes
Draft 2 Rev. 2	14 October 1994	v, vi, xvi, xxvi	SSAC changes
Issue 1	1 December 1994	All	First formal issue

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ACRONYMS

AO	Announcement of Opportunity
DSN	NASA's Deep Space Network
EID	Experiment Interface Document
ESA	European Space Agency
ESOC	European Space Operations Centre
IDS	Interdisciplinary Scientists
NASA	National Aeronautics and Space Agency
OBDH	On-Board Data Handling
PI	Principal Investigator
RF	Radio Frequency
RMOC	Rosetta Mission Operations Centre
RSWT	Rosetta Science Working Team
RSOC	Rosetta Science Operations Centre
SPC	ESA's Science Programme Committee
SSAC	ESA's Space Science Advisory Committee
SSP	Surface Science Package
SSWG	ESA's Solar System Working Group
TT&C	Telemetry, Tracking and Commanding
TWTA	Travelling Wave Tube Assembly

1. SCOPE

Rosetta is an ESA mission for the in-situ study of a cometary nucleus environment and its evolution in the inner solar system.

The main Orbiter spacecraft is developed,operated and fully funded by ESA with the exception of the scientific instruments.

To enhance the scientific capabilities of the mission the Orbiter spacecraft will carry up to two Surface Science Packages (SSPs) provided by consortia under the auspices of National Space Agencies. The text of this SMP is consistent with the assumption that two SSP will be provided.

The Rosetta Science Management Plan outlines the management scheme to be implemented for the scientific programme from mission selection to the post operations and archiving phase.

The main areas addressed in the plan are the interfaces with the scientific community via external science teams, participation of scientists in the programme and the science operations including distribution of, and rights to, scientific data products.

In particular, the plan defines the responsibilities of the Rosetta Science Working Team, Lander Science Working Group, Principal Investigators, Surface Science Package Lead Scientists and Interdisciplinary Scientists.

Proposals for scientific investigations for Rosetta will be notified through an ESA Announcement of Opportunity for the Orbiter Spacecraft and separate Announcements of Opportunity for each of the Surface Science Packages. The latter will be the responsibility of the Surface Science Package suppliers but the final selection of the complete scientific payload will be through the ESA Science Programme Committee (SPC) following normal detailed procedures outlined in sections 4.5 and 4.6.

The detailed description of the scientific objectives, the design reference model payload, spacecraft and system design, science operations and management are published as ESA SCI (93)7 in September 1993. Since publication of this report the baseline cometary target has changed, however, the scientific objectives remain unchanged.

2. MISSION OVERVIEW

2.1. Introduction

Rosetta is the third cornerstone mission of the ESA long term scientific programme Horizon 2000 and will be launched in 2003 with an Ariane 5 Launcher. The mission is dedicated to the in-situ study of a comet for at least one year, from the onset of activity beyond 3 AU to perihelion. On its way to the comet the spacecraft will fly by one, possibly two, (e.g. Mimistrobell and Shipka) main-belt asteroids. During the comet nucleus orbit phase, one or two Surface Science Packages (SSPs) will be deployed onto the surface of the comet.

Rosetta will be operated as a Principal Investigator type mission with science operations coordinated by the Rosetta Science Operations Centre (RSOC). The two Surface Science Packages will be considered in general as PI investigations. Each SSP with its full payload complement is regarded as one investigation with respect to technical and programmatic interfaces.

The scientific objectives of the mission, the reference model payload which can achieve these objectives and a general mission scenario are described in detail in the mission definition document Rosetta - Comet Rendez-vous Mission, ESA SCI (93)7. However, to provide the enhanced resources to carry a maximum of two SSPs to the comet, the baseline mission had to be changed to a rendez-vous with comet P/Wirtanen in August 2011 with the spacecraft staying close to the comet until perihelion passage in October 2013. Back-up launch opportunities exist in November 2003 to comet Wirtanen and May 2004 to comet Finlay.

ESA will be responsible for the overall spacecraft and mission design, spacecraft procurement (without Surface Science Probes and instruments for both Orbiter and SSPs), Orbiter payload integration, system testing, spacecraft operations, acquisition, distribution and archiving of the data and the Rosetta Science Operations Centre (RSOC). ESA is prepared to consider the establishment of the RSOC in an institute or research centre with funding provided by Member States if this option is offered in response to the Orbiter A.O. The Surface Science Packages will be provided by national space agencies, a group of agencies or an international group of nationally funded institutes. All scientific investigations on the Rosetta Orbiter will be provided by a Principal Investigator (PI) nationally funded through an agency, institute or an international group of institutes. SSP instruments or sensors will be provided by SSP Team members nationally funded through an agency, institute or an international group of institutes.

2.2. Scientific Objectives and Design Reference Model Payload

After the 'reconnaissance phase' of cometary comae and nuclei by the fast fly-by's of ICE at comet Giacobini-Zinner, Vega 1 and 2, Susei, Sagigake and Giotto at comet Halley and the Giotto Extended Mission to comet Grigg-Skjellerup, the Rosetta mission will offer the next major step forward in cometary science. It will provide for the detailed exploration of the comet nucleus and its close environment and will provide unique sample analysis capabilities, thus satisfying to a large extent the objectives of the original comet-nucleus sample-return mission.

It will concentrate on the in-situ investigation of cometary matter and the structure of the nucleus, with the added potential of studying the evolution of the cometary processes as a function of helio-centric distance.

The scientific objectives of the mission have been described in detail in ESA SCI(93)7 and are summarized in Table 1 and the model payload is defined in Table 2.

Table 1: Rosetta Prime Scientific Objectives

- Global characterisation of the nucleus, determination of dynamic properties, surface morphology and composition
  - Remote Imaging System
  -Visible and IR Mapping Spectrometer

- Chemical, mineralogical and isotopic compositions of volatiles and refractories in a cometary nucleus
  - Neutral Gas and Ion Mass Spectrometer
  - Visible and IR Mapping Spectrometer
  - Cometary Matter Analyser
  - Scanning Electron Microprobe
  - Surface Science Package

- Physical properties and interrelation of volatiles and refractories in a cometary nucleus:
  - Cometary Matter Analyser
  - Neutral Gas and Ion Mass Spectrometer
  - Scanning Electron Microprobe
  - Dust Flux Analyser
  - Surface Science Package

- Study the development of cometary activity and the processes in the surface layer of the nucleus and in the inner coma (dust-gas interaction)
  - Remote Imaging System
  - Visible IR Mapping Spectrum
  - Neutral Gas and Ion Mass Spectrometer
  - Surface Science Package
  - Cometary Matter Analyser
  - Scanning Electron Microprobe

- Origin of comets, relationship between cometary and interstellar material. Implications for the origin of the solar system
  - Remote Imaging System
  - Visible and IR Mapping Spectrometer
  - Cometary Matter Analyser
  - Neutral Gas and Ion Mass Spectrometer
  - Scanning Electron Microprobe
  - Surface Science Package

- Global characterisation of the asteroid, determination of dynamic properties, surface morphology and composition
  - Remote Imaging System
  - Visible and IR Mapping Spectrometer

Table 2: Orbiter Model Payload

Remote Imaging System

- Determine nucleus rotational state
- Detect and characterise active and inactive areas
- Determine variability of surface feature
- Characterise the topography of the nucleus
- Investigate surface morphology at a resolution better than 1 metre.
- Characterise and monitor dust and gas jets
- Determine scale lengths associated withe the outflow of material from the nucleus (dust acceleration)
- Determine shape and volume of the asteroid
- Determine the asteroid's rotational state
- Determine geomorphological features on the asteroid

Visible and IR Spectral and Thermal Mapper

- Characterise the nucleus surface in terms of concentration of ices, the mineralogical composition of dust and the characteristics of organic compounds
- Determine the surface temperature distribution, gas and dust distribution in the inner cometary coma
- Mapping of the asteroid's surface mineralogical composition

Gas and Ion Mass Spectrometer

- Elemental, molecular & isotopic composition of volatiles
- Temperature, density and bulk velocity field of gas and ions
- Homogenous and heterogenous reactions of gas and ions in dusty cometary coma
- Strength and distribution of gas activities on nucleus

Cometary Mass Analyser

- Elemental composition of individual dust particles (all elements)
- Isotopic composition of key elements (H, C, N, Mg etc.) in individual dust particles
- Information on molecular composition, especially of the organic material

Scanning Electron Microprobe

- Size, shape, texture and morphology of individual dust grains
- Abundance of elements ($Z>10$) in individual dust particles
- Mineralogy of individual grains

Dust Production Rate and Velocity Analyser

- Dust flux
- Dust size distribution
- Dust velocity

Plasma Package

- Investigation of the solar wind comet interaction is not a primary goal of the mission and the plasma package is limited to an Electron Density and Temperature Probe and a Solar Wind Flux Monitor

Radar Sounder (additional instrument if resources available)

Microwave Spectrometer (additional instrument if resources available)

Surface Science Package

- Accelerometer: Study during landing the mechanical strength of the cometary crust and subsurface material

- Thermal Probes: Temperature gradient

- Permittivity Probe: Measures electrical properties of cometary material close to surface. Provides 'ground truth' for possible microwave experiments

- Thermal and Evolved Gas Analyser: Measure in a pyrolysis cell the thermal behaviour of cometary material and study with a gas chromatograph and/or a mass spectrometer the chemical nature of the evolved gases

The addition of a fluorination cell using the decomposition of K_2NiF_6KF as F source would allow $\delta^{17}0$ and $\delta^{18}0$ determination for the silicates and evolved gases.

- Gamma-Ray Spectrometer: Determines major element composition (H, C, O, Si, Fe) of the cometary near surface material. Instrument detects characteristic gamma rays from capture of cosmic ray produced neutrons in elements. Volume probed $\approx$ 1 cubicmeter

- Alpha-Proton-X-Ray Spectrometer: Determines abundance of light (C, N, O) and rockforming (Mg, Al, Si, Ca, Fe) elements in cometary surface material. Instrument carries α's, protons from α, p reactions, and characteristic X-rays exited by α's. Surface area of several ten cm^2 probed to a depth of about 10 μm

- Neutron Spectrometer: Determines hydrogen concentration. Measures ratio of epithermal to thermal neutron flux for the cosmic ray produced neutrons. Probes to a depth of 0.5 to 1 meter

- In situ Imaging System: Study characteristics of local surface (morphology, texture). Set of panoramic and monitoring cameras, some with fiberoptics systems. Resolution mm to about ten μm

2.3 Spacecraft Description

The spacecraft preliminary design has a box-like shape consisting of a central cylinder with top and bottom platforms and four side panels. The central cylinder provides the interface to the launch vehicle at the lower end, and houses two propellant tanks and an inner equipment platform carrying helium pressure tanks and a 400 Newton (N) main engine. The lower platform carries most of the other components of the bi-propellant system; blocks of 10N thrusters are arranged at the four corners of the bottom platform. The top platform carries a gimballed X/S band high gain antenna with a two meter diameter dish, as well as sun sensors and thrusters on two corners. Two opposite side panels provide support to rotatable solar array wings, whose panels are folded in launch configuration, and accommodate thermal radiators with louvres plus some subsystem equipment. One further side panel is dedicated to the Orbiter payload instruments mounted to its upper half to avoid contamination from the thrusters; this panel also provides support to one of the Surface Science Packages (SSP) and accommodates equipment such as star and target trackers. The fourth side panel is basically dedicated to subsystem equipment but carries in addition the second SSP. Low gain S-band antennas are mounted on deployable booms on the rims of two opposite side panels. Fig. 1 shows the baseline spacecraft configuration.

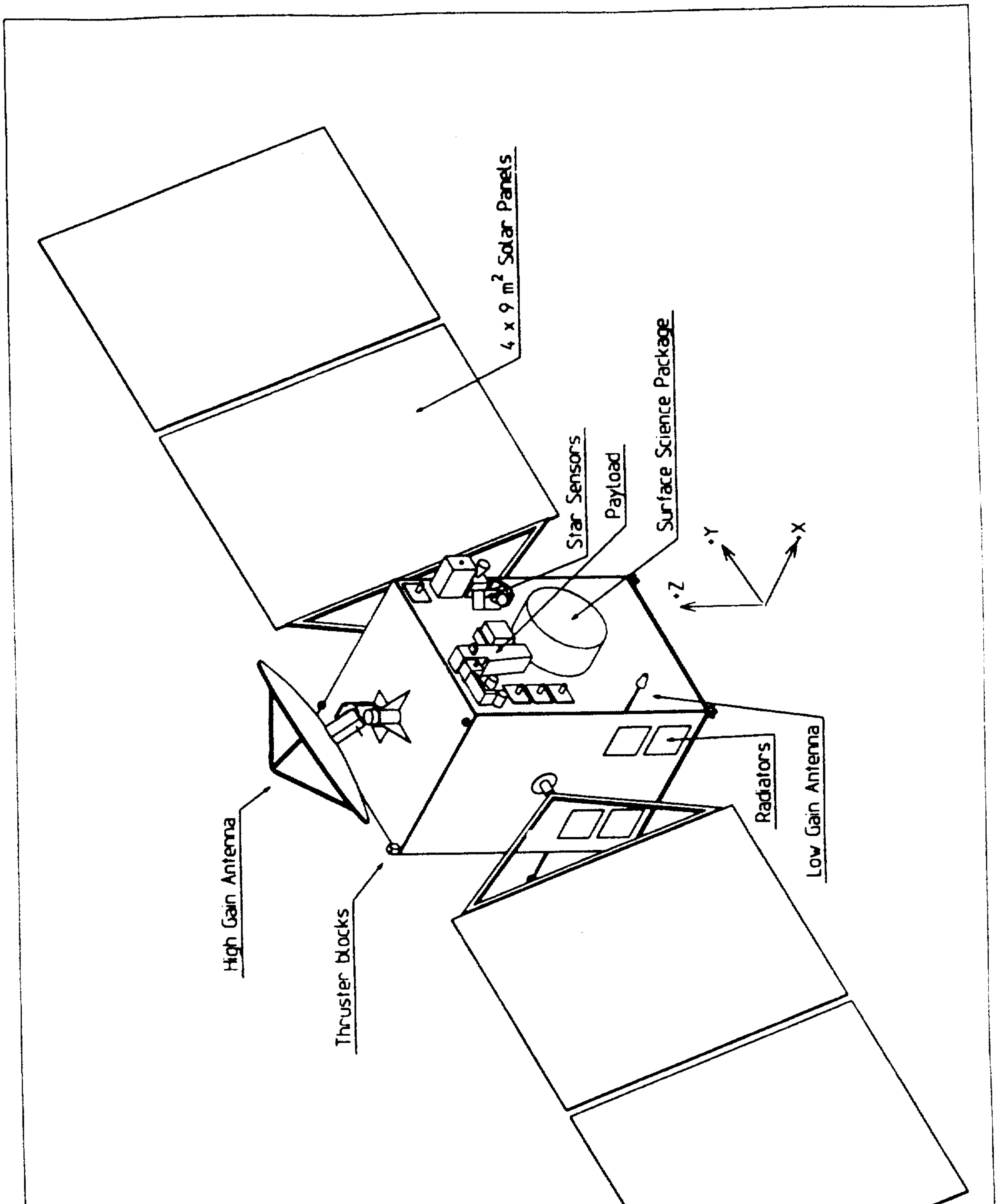
Attitude and orbiter measurement and control is achieved using sets of sun sensors. star and target trackers, gyros and reaction wheels. A computer and dedicated electronics control thruster operation, emergency sun re-acquisition and specific hibernation modes. A bi-propellant reaction control system is utilised for orbit and attitude manoeuvres by either the 400N main engine or banks of 10N thrusters Half of the launch mass of about 2900 kg is dedicated to propellant to cater for the demanding velocity increment requirements of the mission. Special measures are foreseen to provide a safe and redundant propulsion system.

The Onboard Data Handling Subsystem (OBDH) is based on packet telemetry and telecommands. It will interface at digital level with the Orbiter payload instruments and with the SSP Support Equipment remaining onboard the Orbiter after SSP separation.

The power subsystem uses special Low Intensity Low Temperature (LILT) solar cells providing high efficiency at 6AU distance from the Sun. A variable operating point concept will be implemented to leave the excess power generated at small sun distances in the Solar Array itself. A standard 28V main bus will be used. Double failure tolerant batteries will support the launch phase with the delayed ignition of the ARIANE 5 Upper Stage, will provide peak power to the subsystems and possibly also support some of the manoeuvres. Connections to the two SSPs (whilst attached to the Orbiter) will be provided by umbilicals.

The Telemetry Tracking and Command (TT&C) subsystem will transmit telemetry at rates between 1 and 20 kbps via the High Gain Antenna, depending on the RF-link performances, the high data rate being possible only via NASA DSN 70 m stations. A telecommand rate of 16 bps is

Fig. 1: Rosetta Baseline Configuration



foreseen. An antenna pointing mechanism will provide two degrees of freedom to the High Gain Antenna. Travelling Wave Tube Amplifiers (TWTA) with 20 W RF output power will be used in redundant configuration for the X-band downlink, the S-band transmitter having an RF output power of 5W. In emergency cases, access to the spacecraft via the low gain antennas can always be ensured by a DSN 70 m station.

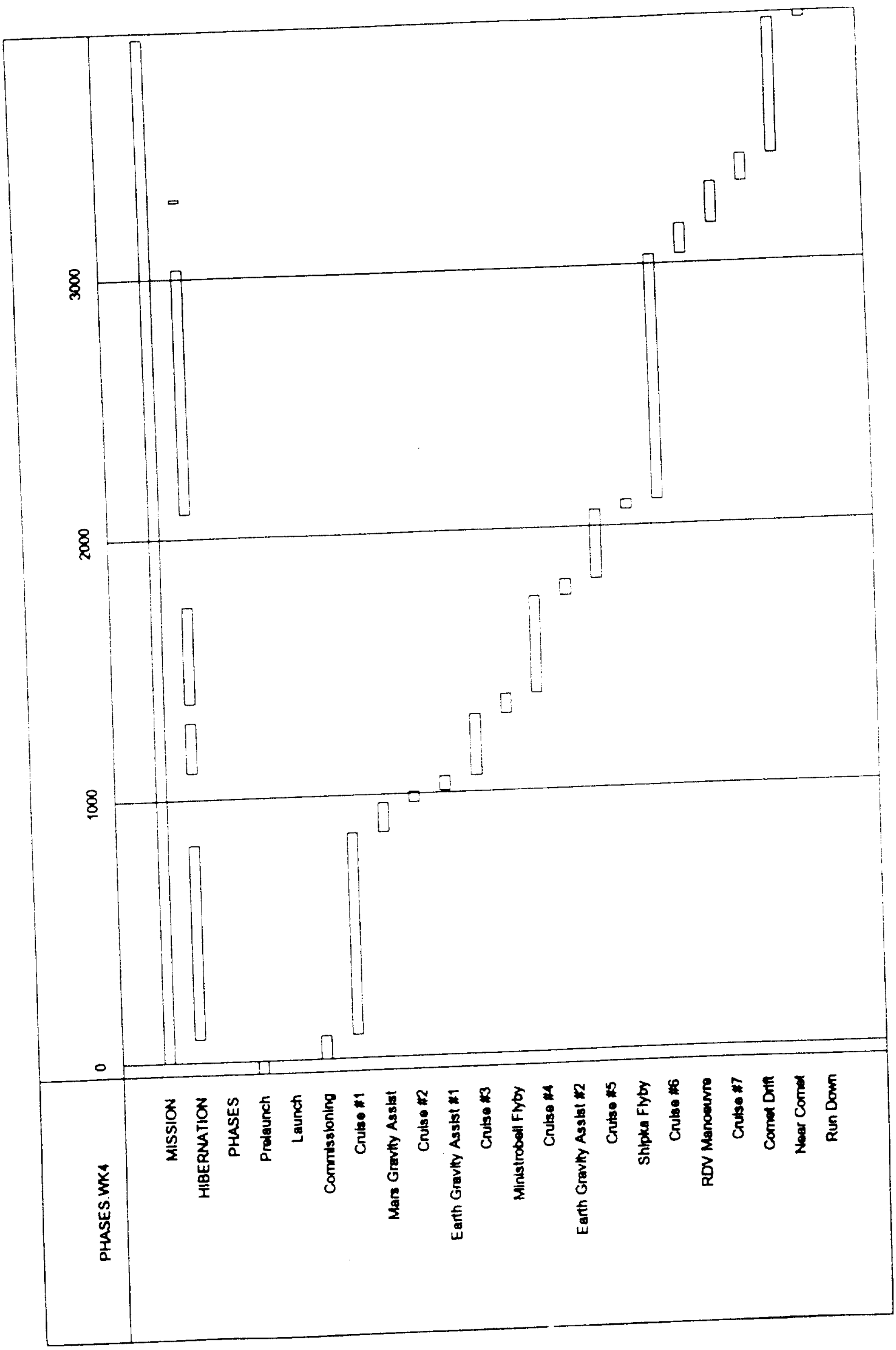
2.4 System Aspects

ROSETTA will be launched by an ARIANE 5 launch vehicle in January 2003 to meet the comet Wirtanen, the rendez-vous manoeuvre being planned for August 2011. The end of the mission is marked by the comet perihelion passage which occurs in October 2013. Roughly half-way through the mission, two asteroid fly-bys are foreseen for each mission opportunity.

After separation from the launch vehicle, the final orbit close to the comet is reached by a powered Mars gravity assist manoeuvre, followed by two Earth gravity assist manoeuvres and a major delta-V rendez-vous manoeuvre. Communication black-out periods of up to eight months exist because of spacecraft -Sun-Earth collineation. This and the extremely long passive periods between the main activities described above led to the introduction of Hibernation Periods where ROSETTA will be put into a safe mode with minimum onboard and no ground segment activities. Fig. 2 gives a timeline in days for the baseline mission.

The ground segment will use ESA 15 m stations, the Weilheim (Germany) 30 m station as well as NASA DSN 34m and 70 m stations. Operations will be performed from ESOC (Darmstadt, Germany).

Fig. 2: Baseline Mission Timeline (Days)



3. ROSETTA SCIENCE WORKING TEAM

At completion of the Rosetta Announcement of Opportunity (AO) process, the following teams of external scientists will be established:

- Rosetta Science Working Team
  and the
- Lander Science Working Group

The Rosetta Science Working Team (RSWT) will monitor and advise on all aspects of Rosetta which affect its scientific performance. The Rosetta Project Scientist will be the chairman of the RSWT. The external members of the RSWT will be:

- the Principal Investigators (PIs) whose instruments have been selected for flight on the Rosetta Orbiter
- the Interdisciplinary Scientists
- the Surface Science Package Lead Scientist and his/her Deputy (SSP Co-Lead Scientist) for each SSP.

The SSP Lead Scientists and their Co-Lead Scientists will be full members of the RSWT representing the SSP science investigations in the RSWT.

The scientists responsible for individual investigations or sensors on the SSPs are called SSP Team members, and will not automatically be members of the Rosetta SWT. They will be members of the Lander Science Working Group, co-chaired by the SSP Lead Scientist/s.

Detailed information about the roles of the RSWT members is provided in Section 4. In addition to the regular Rosetta Science Working Team Meetings, there will be meetings of the Lander Science Working Group to address specific topical problems and to prepare recommendations in its specific areas of investigation that will be discussed and agreed by the RSWT.

The tasks of the Rosetta Science Working Team are:

1. Maximise the scientific return of Rosetta within the boundary conditions.

2. Ensure that Rosetta maintains its principal characteristics as an in situ cometary exploration mission of the composition and evolution of a cometary nucleus as a function of its distance to the Sun satisfying the objectives of the scientific community at large. Especially that the ESA provided Orbiter and its payload alone will meet the prime scientific objectives of the mission

3. Act as a focus for the interest of the scientific community in Rosetta.

These tasks will be achieved by

1. reviewing the scientific goals of Rosetta at regular intervals taking into account

recent results, while considering the technical boundary conditions of the spacecraft and its payload

2. advising on the scientific aspects of the development of the Rosetta instrumentation

3. establishing a baseline payload operations timeline based on the scientific objectives of Rosetta

4. identifying areas of complementarity and redundancy between instruments to optimise the operations of the spacecraft and the payload and to maximise the scientific return

5. participating in the major project reviews

6. performing specific tasks as needed during the project's development.

The RSWT will review the tasks and activities of the Rosetta Science Operations Centre (section 5.3.). In particular the RSWT will be responsible to

- optimise the science return from a science operations point of view

- advise on the development of the science ground segment including the Rosetta Science Operations Centre with particular reference to the payload operational scenario, software, ancillary data products and the Rosetta science data base and archive.

All RSWT members are expected to provide their own funding to attend the RWST meetings. ESA will organise and in general host the RSWT meetings.

4. ROSETTA PROGRAMME PARTICIPATION

4.1. Introduction and Schedule

Through publication of the Rosetta Announcements of Opportunity (AO), the scientific community will be invited to participate in the Rosetta programme by:

1. providing scientific investigations for the Rosetta Orbiter - Principal Investigator proposals

2. providing scientific investigations for the Surface Science Package - SSP Team Member proposals

3. providing expertise in establishing models of the comet nucleus and its environment to support mission and science operations planning, and during the near nucleus phase performing integrated investigations that use data from two or more instruments provided by others - Interdisciplinary Scientists.

There will be three independent but coordinated AOs covering :

i) The AO for the Rosetta Orbiter investigations, issued by ESA

ii) Separate AO's for each of the two Surface Science Packages (SSPs) to be prepared and released by the suppliers of the SSPs in consultation with ESA.

The nominations of the two SSP Lead Scientists and Co-Lead Scientists will be the responsibility of the agencies providing the SSPs.

Further information about the participation in the Rosetta programme through provision of science investigations as well as the tasks for the other external RSWT members is provided in the following sections. The Announcement of Opportunity to solicit proposals for the Orbiter instrument Principal Investigators, the Interdisciplinary Scientists and the SSP Team Members (PI's for instruments on the Surface Science Packages) will be released after approval of the Science Management Plan by ESA's SPC. The Orbiter AO will be open to the scientific groups within those European Countries which participate in the ESA Scientific Programme and to the scientific groups in the United States of America (via NASA), in accordance with the ESA/NASA agreement on the principle of reciprocity. Scientific groups from other countries are invited to join proposing teams in ESA member states or in the USA (as Co-Investigators).

Different conditions governing the participation in the SSP programme, if applicable, will be contained in the SSP AO's.

After release of the AO, ESA will hold, jointly with the SSP suppliers, a briefing meeting for interested parties, to be held in Europe.

The schedule for the complete AO cycle is given in Table 3, whilst the baseline Rosetta programme schedule following completion of the AO process is outlined in Table 4.

Table 3: Schedule for Rosetta AO cycle

Issue of AO	1 March 1995
Proposals due	1 August 1995
Evaluation Phase	1 August 1995 - 1 November 1995
Preliminary recommendation by evaluation committee	1 November 1995
Final SSP proposals due	1 December 1995
Proposal Clarification Phase	1 November 1995 - 15 December 1995
Discussion with funding Agencies	1 November 1995 - 15 December 1995
SSWG/SSAC review	January 1996
SPC selection of payload	February 1996
Instrument Science Verification Phase	March 1996-February 1997

Table 4: Rosetta project schedule

Issue spacecraft ITT phase B	June 1996
Experiment Interface Document (EID) Freeze	15 March 1997
Spacecraft phase B	July 1997 - December 1998
Spacecraft phase C/D	January 1999 - June 2002
Instrument Structural/Thermal Model delivery	TBD
Instrument Engineering Model delivery	TBD
Instrument Flight Model delivery	TBD
RSOC build-up phase	July 1996 - December 2001
RSOC operational	January 2002
Flight acceptance review	TBD
Launch	January 2003
Asteroid fly-by 1	13 September 2006
Asteroid fly-by 2	12 October 2008
Rendez-vous with comet Wirtanen	August 2011
End of nominal mission	October 2013
Archiving phase (after end nominal mission)	2013 -2015

4.2. Programme Participation as Principal Investigator for Rosetta Orbiter Science

The proposals for the Rosetta Orbiter instruments shall be prepared bearing in mind the scientific objectives of the Rosetta programme and the current programme definition and constraints. The model payload as defined in ESA SCI (93)7 meets the scientific objectives of the mission whilst staying within the boundaries of the resources dictated by the spacecraft design. However, it should be noted that the Rosetta Science Definition Team considered and defined additional instruments (cf. Table 2) that would significantly increase the science return of the selected baseline mission.

In view of the long mission duration, the Experiment Interface Document will address and describe the schemes for proper succession of the PI and/or team members carrying specific responsibilities for the investigation.

Each instrument group shall be headed by a single person, designated as the Principal Investigator (PI), the group members participate as Co-Investigators. The PI shall nominate an Experiment Manager with appropriate hardware, software and procurement expertise and through him establish an efficient management scheme especially in the case where many institutes are providing sub-assemblies or sub-systems. Details of the management structure within a team will be agreed through the establishment of the Experiment Interface Documents (EID).

The proposal must show that the PI can exert adequate control over all aspects of the programme, including the required financial resources: where appropriate via the relevant Co-Is. As the nominated interface to ESA, the PI should be responsible for ensuring that adequate funding and budgetary control procedures are in place for all aspects of the investigation. All changes will be mutually agreed among the PI's, the respective Funding Agencies and the ESA Rosetta Project. The PIs shall not assume any funding from ESA for any part of their programme. In this context, use of ESA facilities by investigators will be on a cost reimbursement basis, other than those facilities associated with spacecraft assembly, integration and verification. The PI shall represent the single point formal interface for the instrument with the ESA Project Office.

The Co-Investigators will assist the Principal Investigator in meeting his/her responsibilities as defined in the team's internal management structure. The Principal Investigators may delegate specific responsibilities to a Co-Investigator.

After selection, an Experiment Interface Document (EID) will be established for each instrument. A draft EID will be contained in the AO package. This EID defines the Rosetta technical and programmatic requirements (including management and control procedures), specifies in detail the interface information applicable to each instrument and specifies the planning applicable to each instrument. The EID becomes the formal interface control document and formal reference for all progress reporting and it shall be placed under formal configuration and change control once agreed and signed off by the parties involved.

In general, the PI is responsible for ensuring that the complete investigations are implemented and executed within the constraints of the approved Rosetta programme. The responsibilities shall include, but are not necessarily limited to, the following:

Management:

1. Take full responsibility for the instrument programmes at all times and to retain full authority within the instrument team over all aspects related to procurement and execution of the programme. In this context the PI shall be able to make commitments and make decisions on behalf of all other participants in the instrument team.

2. Establish an efficient and effective managerial scheme which will be used for all aspects of the instrument programme.

3. Define the role and responsibilities of each Co-Investigator (Co-I).

4. Identify (by name) key team members responsible for science management, technical management and operational management.

5. Organise the effort, assign tasks and guide other members of the team of investigators.

6. Provide the formal managerial interface of the instrument to the ESA Project Office and support ESA management requirements. This will entail providing material for and participation in instrument progress reviews and spacecraft and mission programme reviews. In addition, other management requirements (e.g. change procedures, product assurance etc.) will be defined in the EID.

Scientific:

1. Attend meetings of Rosetta SWT and supporting groups as appropriate, to report on instrument development, and to take a full and active part in their work. This will include specific reviews to assess the instrument scientific capability with respect to the performance defined in the proposals in response to this AO.

2. Ensure adequate calibration analysis of all parts of the instrument both on ground and also in orbit.

3. Support the RSOC in the definition of the science operations.

4. Participate in the definition of the payload operations timeline.

5. Exploit to full depth the scientific results of the mission.

6. Provide the reduced and calibrated scientific data sets from his/her instrument in a useable form to the RSOC for inclusion in the Rosetta Science Data

Archive.

7. Provide through all mission phases adequate and active support to the public relation activities of ESA.

Hardware:

1. Define the functional requirements of the instrument and its ancillary equipment (e.g. MGSE, EGSE).

2. Ensure the development, construction, testing and delivery of the instrument. This shall be in accordance with the standards, technical and programmatic requirements outlined in the AO including its ANNEXES and subsequently reflected in the approved Experiment Interface Document.

3. Ensure adequate calibration of all parts of the instrument both on ground and also in orbit.

4. Ensure that the designs and construction of the instrumentation, and its development test and calibration programmes are appropriate to the objectives and lifetime of the mission, and reflect properly the environmental and interface constraints under which the instrumentation must operate.

5. Provide any data storage memories and/or instrument dedicated data handling capability that are required for the instrument.

6. Ensure that all procured hardware is compliant with ESA requirements as defined in the EID, through participation in technical working groups and control boards as requested (e.g. cleanliness control board) and to ensure that the hardware allows system level performance compatibility to be maintained.

7. Provide overall documentation during the project as defined in the EID.

Software:

1. Ensure the development, testing and documentation of all instrument specific software (e.g. necessary for the control, monitoring, testing, simulation, operation, and data reduction/analysis etc.) in accord with procedures and schedules as defined in the EID.

2. Ensure the delivery of such instrument specific software and its documentation including user manuals to the RSOC in accord with procedures and schedules as defined in the EID.

3. Support the instrument specific software integration and operation activities at the RSOC.

4. Ensure the development, testing, documentation and delivery of on-board

software, and software required during instrument system level tests in the real-time or off-line mode including auxiliary software (instrument EGSE and interfaces) as defined in the EID.

5. Maintain and update all software for the duration of the mission including a post-operations (archiving) phase.

Product Assurance:

1. Provide product assurance functions which are compliant with the requirements of the EID.

Payload Operations:

Operational phases include pre-launch activities (e.g. instrument software design and development, instrument calibrations), nominal operational phase and post-mission phases with a breakdown as follows: (a) pre-launch phase until launch minus two years; (b) full operational phase from launch minus two years until target comet (nominally P/Wirtanen) perihelion passage plus TBD months for post-perihelion mission if approved. One should however, note that cruise science is not planned en route to the comet. There might be extended hibernation periods and the actual science operations phase will be defined as the two asteroid fly-bys (4 months each) and the comet rendez-vous phase (June 2011 - October 2013).

The PI for an instrument will be responsible, to

1. Support all operational phases by providing the necessary manpower and/or expertise (training) to the Rosetta Project Team, and support the RSOC through expertise. The level of support shall be refined with the ESA Project Office and will be defined in the EID.

2. Make the Experiment Ground Support Equipment (EGSE) incl. software available at RSOC during critical mission phases to enable real-time scientific data analysis.

3. Support operations through his expertise including resolution of anomalies and malfunctions of the instrument including recalibrations etc. as required.

Financial:

1. Ensure (through his Co-Is, if necessary) that adequate funding is available at the required time(s) for all aspects of the instrument and its support.

4.3. Programme Participation as Interdisciplinary Scientist (IDS)

The ESA AO for Rosetta Orbiter science investigations will also solicit Interdisciplinary Scientist (IDS) proposals by individuals for specific and time-limited tasks in areas such as comet nucleus modelling and gas and dust environment modelling. This work will be utilised to support mission planning, science operations planning and hazard assessment. Due to the long mission duration ESA may release additional IDS AO's for specific mission phases at a later stage, e.g. for studies of the comet nucleus composition and its relationship with interplanetary, interstellar and circumstellar dust.

IDS proposals must be submitted by individuals and must contain a clear description of

- the scientific case
- the modelling approach and its relevance to the Rosetta mission
- the PI instrument data sets they might require to carry out a research programme
- financial endorsement by the national funding agencies, should they require funds to carry out the modelling and/or data analysis activities.

It is the responsibility of each IDS to obtain the concurrence of both the PI's and the SSP Team Members directing the hardware investigations from which data will be required. Details including mutual agreements for publication and data release will be specified in the Experiment Interface Document.

IDS proposals will be selected by the ESA SSWG and will be endorsed by SSAC and SPC. Should serious conflicts of interests arise in the SSWG, the executive will set-up an 'ad-hoc' committee.

The SSP suppliers may solicit proposals for SSP Interdisciplinary Scientists.

In the same manner as for PI's the IDS shall provide adequate and active support to the public relations activities of ESA.

4.4. Programme Participation as Surface Science Package Lead Scientist

For each of the two Rosetta Surface Science Packages one Lead Scientist and one SSP Co-Lead Scientist will be nominated by the SSP suppliers.

The two SSP Lead Scientists are responsible for coordinating the development of the SSP science payload, for the preparation of SSP science operations and the coordination of the SSP scientific requirements with the Rosetta Project Scientist.

The specific tasks, their implementation and institutional support for the SSP Lead Scientists and their deputies will be defined by the SSP suppliers.

The two SSP Lead Scientists will be responsible for organising the distribution of the science data to the individual Team Members and they will be the interface to the RSOC concerning science operations.

The two SSP Lead Scientists will be responsible for the preparation and coordination of the science data archiving for the SSP investigation.

The two SSP Lead Scientists will co-chair the Lander Science Working Group and will represent together with their deputies the SSP Team Members in the Rosetta Science Working Team.

In the same manner as for PI's the Surface Science Package Lead Scientist shall provide adequate end active support to the public relations activities of ESA.

4.5. Selection Procedure for Instrument Proposals for the Rosetta Orbiter Spacecraft

Proposals for instruments will be examined by an Peer Review Committee appointed by ESA's Director of Scientific Programme on the advice of the Solar System Working Group. The ESA Project will assess the proposals against technical, managerial and financial criteria. Attention will be paid to establish an efficient and effective management scheme of the PI team and its contactors. The financial criteria will include both the assurance of adequate funding for the proposal and the impact upon ESA accepting that proposal. After taking into account all these aspects, the Project will propose a preliminary payload, possibly with options, for consideration by the appointed evaluation committee. Both the scientific and technical assessment processes may include meetings with the proposers individually and/or collectively to clarify details and to discuss areas of overlap and complementarity. During and as a result of these meetings ESA may recommend modifications of the proposals received in order to optimise the instrumentation to satisfy the global needs of the mission. In parallel, negotiations with funding agencies will be conducted and the management scheme will be reviewed.

At the end of the evaluation phase and after confirmation of the funding and endorsement by the relevant national authorities, the evaluation committee will recommend a final payload complement to the advisory bodies of the Agency. Based on the advice of the SSWG and SSAC, the recommendation will be presented by the Executive to the SPC for approval. The selected proposals will be announced following approval by the ESA SPC. Following selection, ESA will confirm participation of PIs and CO-Is. The schedule for proposal evaluation and selection is shown in Section 4.1.

This process will be completed in time to allow the resources allocated to - and interfaces of - each instrument to be adequately defined prior to detailed contact with industry for the Phase B/C/D of the satellite.

4.6. Selection Procedure for Instrument Proposals for the Rosetta Surface Science Packages

For each of the Surface Science Packages a separate AO's will be prepared under the responsibility of the SSP suppliers. The AOs will be released by the SSP suppliers simultaneously with the Orbiter AO. The AOs for the SSP shall solicit proposals for SSP instruments or sensors that can be part of a highly integrated package that may share a common electronics/power supply and command and data handling unit. The competition for SSP science investigations shall at a minimum be open to scientists from ESA member states and NASA.

Proposals for SSP science investigations in response to the AO have to be submitted to the respective SSP suppliers with copies to ESA. Initial proposal evaluation will be the responsibility of the SSP suppliers. Exchange of information between the SSP Selection Committees and the Orbiter Payload Selection Committee will be ensured by a SSP Payload Co-ordination Working Group composed of members nominated by the SSP suppliers (2/3) and members of the Orbiter Payload Selection Committee (1/3), who will be nominated by ESA.

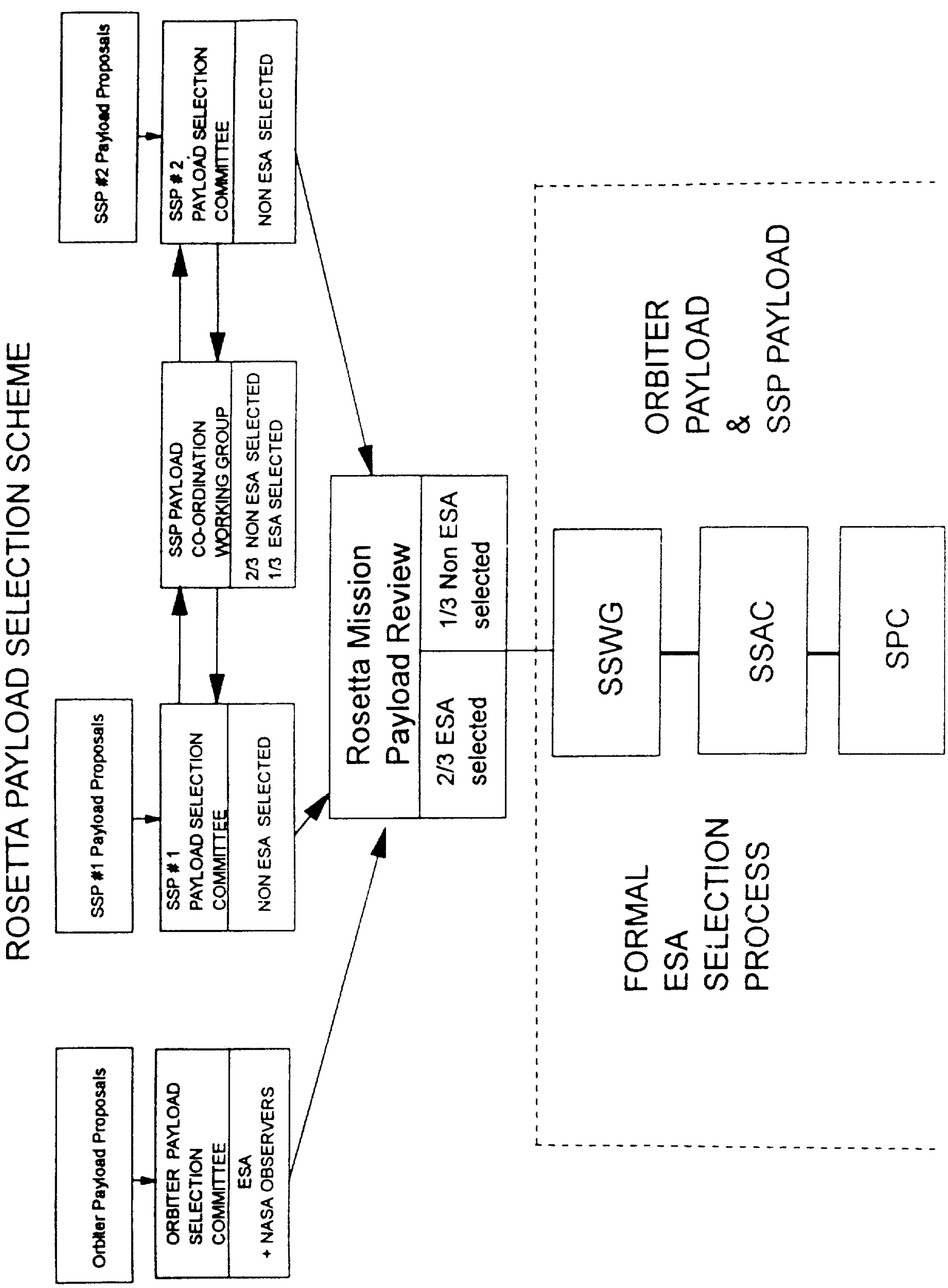
At the end of the evaluation phase and after review and endorsement by the established advisory committees of the SSP suppliers and after confirmation of the funding and endorsement by the relevant national authorities, the SSP suppliers will submit a final SSP proposal to ESA including a complete proposed payload complement.

After a formal Rosetta Mission Payload Review (Members: 2/3 ESA nominees and 1/3 SSP Suppliers and chaired by the ESA SSWG Chairman) a proposal for the full Rosetta Mission Payload complement covering both Orbiter and SSP payloads, will be submitted to the ESA SSWG and SSAC. Final endorsement will be given by the ESA SPC.

Following selection, ESA will confirm participation of the SSP Team Members and their and CO-I's. The schedule for proposal evaluation and selection is shown in section 4.1. A flow diagram of the Rosetta Investigation Evaluation and Selection Procedure is shown in Figure 3.

This process will be completed in time to allow the resources allocated to - and interfaces of - each instrument to be adequately defined prior to the issue of the invitation to tender with industry for the Phases B/C/D of the satellite.

Fig. 3: Rosetta Payload Selection Scheme



4.7. Evaluation Criteria for Instrument Proposals

Note: The Surface Science Package suppliers may issue a similar list in their individual AO's.The selection criteria for individual proposals will include the following (not in order of importance):

- Merit of specific scientific objectives of proposed instrument.
- Scientific compatibility with global mission objectives of Rosetta.
- Ability of proposed instrumentation to satisfy its scientific objectives.
- Technical feasibility of proposed instrumentation.
- Reliability and space qualification of proposed instrumentation (especially previous space heritage of detectors and other sub-systems).
- Development status of proposed instrumentation.
- Technical compatibility with available spacecraft resources and mission constraints.
- Operational constraints and complexity.
- Adequacy of proposed data analysis plan
- Competence and experience of the team in all relevant areas (e.g. scientific, space technology, proposed techniques, software development and technology etc.)
- Adequacy of proposed management scheme (including organigramme, project manager, roles of CO-Is etc.) to ensure a timely execution of instrument development and associated tasks and post launch support.
- Adequacy of human resources and institutional support to ensure a timely execution of instrument development and associated tasks.
- Previous experience in managing a space instrumentation programme.
- Credibility and compliance of costing of proposed development programme.
- Compliance with all applicable management, reporting and product assurance requirements.
- Financial impact upon ESA of proposed instrumentation.
- Assurance of adequate funding for proposed instrumentation.

For the overall integrated complement of the payload for Rosetta (Orbiter and Surface Science Packages), the selection criteria will include:

- Results of the evaluation of the individual proposals on the basis of the evaluation criteria listed above.
- Overall scientific merit of the complete payload with respect to meeting the Rosetta scientific objectives.
- Technical compatibility with available spacecraft resources and mission constraints.
- Compatibility with programme constraints.
- Assurance of adequate funding.

4.8. Agreement between Principal Investigators and ESA

An Experiment Interface Document (EID) will be drawn up involving the PI, Co-Is, their institutes, national funding agencies and ESA to cover all aspects of their relationship.

4.9. Monitoring of Instrument Development

ESA will monitor the progress of the design, development and verification of the Rosetta scientific instruments. The PIs have to demonstrate to ESA in regular reports and during formal reviews compliance with the scientific mission goals, the spacecraft system constraints, the spacecraft interfaces and the programme schedule as defined in the mutually agreed Experiment Interface Document. The scientific performance will be monitored by the ESA Project Scientist who may draw on support of the RSWT as a whole. The technical and programmatic compliance will be monitored by a dedicated engineer of the ESA Rosetta project team.

5. ROSETTA SCIENCE OPERATIONS

The primary responsibility for developing the payload operations strategy for the Rosetta Scientific Mission will be with the Rosetta Science Working Team (see Section 3.1.).

The Rosetta Science Operations Centre (RSOC) will be established to support the Rosetta Project Scientist in the planning of the science operations schedule and in the generation of coordinated operational sequences, the payload command sequences for all Rosetta instruments and their onward transmission to the Rosetta Mission Operations Centre (RMOC). In addition, the RSOC will prepare comet nucleus and comet coma models in collaboration with the Interdisciplinary Scientists, specialists from the Principal Investigator teams and the SSP teams.

5.1 Rosetta Ground Segment

The Rosetta ground segment will consist of two major elements: the Rosetta Mission Operations Centre (RMOC) and the Rosetta Science Operations Centre (RSOC), which are required to be co-located at least during the time of asteroid fly-bys and throughout the comet acquisition and rendez-vous phase. For the critical mission phases - e.g. the nucleus mapping phase, SSP deployment, the Orbiter science investigation teams and the Surface Science Package Experimenter Teams will be co-located to the RMOC/RSOC.

Local support centres for the SSP's can be implemented under responsibility of the SSP suppliers. Distribution of the science data from the investigations on the SSPs will be the responsibility of the SSP Lead Scientists or a dedicated SSP Science Centre. For ESA the interface to each of the SSPs is handled similarly to a PI instrument.

5.2 Rosetta Mission Operations Centre

The Rosetta Mission Operations Centre (RMOC) will be located at the European Space Operations Centres (ESOC) in Darmstadt, Germany.

The RMOC is responsible for the Spacecraft operations and all real time contacts with the spacecraft and payload, the overall mission planing, flight dynamics and spacecraft and payload data distribution and:

1. will directly supply the Principal Investigators and the SSP Lead Scientist Centres with raw science telemetry from their respective instruments, housekeeping and relevant auxiliary spacecraft data in an agreed format over communication links in near real time (of data arrival at ESOC),

2. will provide the RSOC with a subset of payload data,

3. will be responsible for the data lines within Europe and to one of the gateways at a NASA Centre in the United States,

4. will perform anomaly checks (out of limit checks) for a set of parameters for both spacecraft and payload in real time, and to notify RSOC on payload anomalies,

5. will in general follow a time line agreed with RSOC and not have to react in real time. This means that nominally no real time responses to experimenter requests are required. All command sequences and science operation timelines shall be prepared in advance by the RSOC. This means that under nominal conditions no experiment adjustments will be foreseen, after the verification and commissioning phase and as long as there are no anomalies and emergencies reported or declared.

5.3. Rosetta Science Operations Centre

The function and responsibilities of the RSOC are outlined below.

The long mission lifetime and the distinct mission phases will require for different tasks to be performed by the RSOC at different times. This will require a flexible and effective deployment and turnover of manpower for the RSOC.

However, in general, the RSOC will be responsible for:

- the definition of scientific operations for all mission phases with expert PI team support

- mission planning and implementation of instrument operation schedules

- supporting the PI teams in developing software for payload operations, e.g. generation of command sequences

- Coordination and pre-checking of command sequences generated by the PI teams for the operation of their payload before submission to the RMOC

- the analysis (with PI team support) of all mission critical science data necessary for spacecraft navigation and environmental hazard assessment. This includes processing and evaluation of the data from the navigation camera system

- the maintenance of a quick-look science data facility.

- Creating together with the PIs at regular intervals or for mission highlights a summary of the main scientific results

- the preparation of guidelines for science data archiving and - supported by the PI team - to create the Rosetta Data Archive.

Make pre-processed data and the scientific data archive available to the scientific community in accordance with approval procedures and schedules as defined in the EID.

5.4 Rosetta Scientific Data Archive

The Rosetta data rights will follow the established rules (ESA/C(89)93). Therefore all scientific data obtained during the full mission duration will remain proprietary of the PI teams and the SSP teams for a maximum period of one year after they have been received from ESOC. After this period, the scientific data products from the mission have to be submitted to RSOC in a reduced and calibrated form such that they can be used by the scientific community. RSOC will prepare the Rosetta Scientific Data Archive within one year of the receipt of the complete data sets from the individual Rosetta science investigations. Based on current technology, the archive would be distributed as a set of CD-ROMs.

There will be no proprietary period for data from NASA funded instruments. Data from such instruments will be placed in the public domain immediately following a short validation/calibration period.

ESA will have - with the knowledge of the Principal Investigators and SSP Team Members -unlimited access to all mission data being obtained, processed and analysed before archiving, for the sole purpose of public relations.

D R A F T

Addendum to the

ROSETTA SCIENCE MANAGEMENT PLAN

(RO-EST-PL-0001)

Defining the Participation

in the

INTEGRATED IMAGING SYSTEM

INTRODUCTION

Following the release of the ESA AO for the Rosetta Orbiter payload (RO-EST-AO-0001) a single response was received for the Remote Imaging System submitted by a team from European Institutes under the leadership of H. U. Keller from MPI für Aeronomie, the OSIRIS proposal.

The proposal was reviewed by a Peer Committee appointed by the Executive and recommendations for descoping the Infra-red and Ultra-violet channels of the OSIRIS instrument were made. The OSIRIS team responded positively to these changes and a baseline instrument was recommended by the Peer Committee for inclusion in the Rosetta Orbiter payload complement.

Subsequently the Agency held meetings with representatives of the National funding agencies principally involved in the funding of the recommended Rosetta payload complement. It became apparent during these meetings that there was a significant funding shortfall between the nationally available budgets and that required to realise the full scientific potential of the mission and the representatives of the National funding agencies agreed to support the science camera procurement through the ESA Rosetta Project office as a part of the overall industrial procurement.

The SSWG at its meeting on 11th January, in endorsing the payload recommended by the Peer Committee also reluctantly supported the provision of the science camera through the ESA Project Office. In making their recommendation, the SSWG specifically requested that the Imaging Science Team be appointed from the OSIRIS proposing team and not be selected through the response to a separate AO.

However, ESA/SPC(95)10 noted by the SPC at its meeting in February 1995 requires that if the science camera be provided as an integral part of the spacecraft navigation system, a separate AO be issued for an Imaging Science Team.

Following these guidelines the Agency has prepared this addendum to the original Rosetta Science Management Plan (RO-EST-PL-0001) to update the management scheme to be implemented for the science camera from mission selection to the post operations and archiving phase. In particular the question of the participation of scientists in the programme as Imaging Science Team Leader and Imaging Science Team Members is addressed.

PROGRAMME PARTICIPATION IN THE ROSETTA IMAGING TEAM

ESA will take full responsibility for procuring the science camera as part of an Integrated Imaging System that will comprise the science cameras together with cameras and sensors required for spacecraft navigation .

Through an additional AO following the normal selection process a Rosetta Imaging Science Team will be established to give support to the Rosetta project in the areas of definition, procurement, integration, calibration, testing and operation of the science dedicated part of the Integrated Imaging system. Moreover it will collaborate with the Flight Operations team in the evaluation and analysis of navigation images to support the mission.

The science data processing and analysis will be the full responsibility of the Rosetta Imaging Team.

The Team will be headed by the Rosetta Imaging Team Leader, who together with his/her deputy will be members of the Rosetta Science Working Team (RSWT) and will interface with the Rosetta Project Scientist.

The Agency is soliciting proposals for the Imaging Science Team (Team Leader Proposals) and from individuals (Team members), that could provide special contributions in resources (manpower, hardware), facilities or expertise.

The Imaging Science Team selected will have the priority task before phase B to confirm the scientific requirements on the camera in accordance with the recommendations of the Peer Committee as endorsed by the SSWG.

To facilitate the incorporation of these scientific requirements into the specification for the Integrated Imaging System requires that as part of the Imaging Science Team an Imaging Engineering Team will be set up to assist the ESA project in establishing an engineering specification for the integrated imaging system commensurate with the scientific requirements and the available project funding. The direct interface between the Imaging Science Team and the Rosetta Project will be the Imaging Engineering Team Leader.

Within the total ESA effort the Engineering Team would provide special inputs concerning the specification of the optical system, detectors, filters, on-board image processing software, calibration procedures and Navigation image processing on ground. Following a thorough review of these specifications by all parties these will be incorporated into the specification for the Integrated Imaging System as a part of the navigation system and used for the industrial procurement.

Once full specifications are negotiated and agreed with industry the Imaging Team leader will continue to oversee the industrial development, the calibration and verification activities through to delivery.

To ensure that the procurement of the science camera from specification to delivery is achieved with maximum efficiency within the existing constraints it is proposed that the Imaging Engineering Team Leader be co-located with the project team at ESTEC from the beginning of phase B. To enable this integrated team to work effectively he should report to the ESA Rosetta Project Manager for all aspects concerning the technical or managerial execution of the procurement.

As stated in ESA/SPC(95)10, whilst all hardware procurement will be the responsibility of the Rosetta Project through the industrial Prime Contractor, it is intended that critical items be developed within the expert institutes supported by ESA hardware funding.

To achieve this merger it is the intention of the Executive to instruct industry to seek bids from expert institutes for specific hardware and software items or for required facilities.

IMAGING TEAM LEADER PROPOSALS

The Imaging Team Leader Proposals shall define in detail the approach to the participation in the Integrated Imaging System, specify the tasks to be performed on the basis of the general scenario described above and give a clear description of the team structure with respect to the Engineering Team to be established within the Imaging Science Team.

The proposal shall clearly identify and describe the tasks and responsibilities of the Imaging Science Team and his/her deputy and of the Imaging Engineering Team Leader.

The proposal shall describe the expertise and responsibility of the Team Members (Co-Investigators) and their potential contributions with respect to resources (manpower, hardware, software) and facilities in support of the Integrated Imaging System and their role in the scientific exploitation of the data from the system.

The proposal shall define an efficient and competent Engineering Team that can closely interact with the Project in - but not limited to -

- specifying the optical system
- specifying the detectors and their electronics

- specifying the filters

- specifying the on-board imaging processing software

- specifying the calibration procedures

and

- specifying the imaging processing software for navigation.

A proposed scheme for integrating the Engineering Team into the Project Team should be outlined in detail.

The Imaging Science Team Leader (TL) is in general responsible for ensuring that the complete scientific part of the investigation is implemented and executed within the constraints of the approved Rosetta programme. The responsibilities shall include, but are not necessarily limited to, the following:

Management:

1. Take full responsibility for the science related part of the Integrated Imaging System programme at all times and to retain full authority within the Imaging Science Team over all aspects related to the execution of the scientific programme. In this context the TL shall be able to make commitments and make decisions on behalf of all other participants in the Imaging Science Team.

2. Establish an efficient and effective managerial scheme which will be used for all aspects of the science programme, especially for the interface to the Rosetta Project Team via the Imaging Engineering Team Leader.

3. Define the role and responsibilities of each Imaging Science Team Member (TM).

4. Identify (by name) key team members responsible for science management, technical management and operational management.

5. Organise the effort, assign tasks and guide other members of the team of investigators.

6. Define in collaboration with the Rosetta Project team the managerial interfaces for the Imaging Engineering Team and provide for a scheme for the Imaging Engineering Team

Leader to be co-located with the Rosetta Project at ESTEC from the beginning of Phase B.

7. Provide for the formal managerial interface of the Imaging Science Team via the Imaging Engineering Team Leader to the ESA Project Office and support ESA management requirements. This will entail providing material for and participation in instrument progress reviews and spacecraft and mission programme reviews.

Scientific:

1. Attend meetings of Rosetta SWT and supporting groups as appropriate, to report on instrument development, and to take a full and active part in their work. This will include specific reviews to assess the instrument scientific capability with respect to the performance defined by the Imaging Science Team and agreed with the Agency.

2. Ensure adequate calibration analysis of all parts of the instrument both on ground and also in orbit.

3. Support the RSOC in the definition of the science operations.

4. Participate in the definition of the payload operations timeline.

5. Exploit to full depth the scientific results of the mission.

6. Provide the reduced and calibrated scientific data sets in a useable form to the RSOC for inclusion in the Rosetta Science Data Archive.

7. Provide through all mission phases adequate and active support to the public relation activities of ESA.

Hardware:

1. Define the science requirements for the Science cameras of the Integrated Imaging System and its ancillary equipment (e.g. MGSE, EGSE).

2. Translate these requirements into hardware specifications by the Imaging Engineering Team.

3. Support through the Engineering team, the development,

construction, testing and delivery of the instrument. This shall be in accordance with the standards, technical and programmatic requirements agreed with the Rosetta Project.

4. Collaborate with the Project office to ensure adequate calibration of all parts of the instrument both on ground and also in orbit.

5. Collaborate with the Project office to ensure that the designs and construction of the instrumentation, and its development test and calibration programmes are appropriate to the objectives and lifetime of the mission, and reflect properly the environmental and interface constraints under which the instrumentation must operate.

6. Provide overall documentation during the project as agreed with the Rosetta Project.

Software:

1. Support in collaboration with the project office the specification, development, testing and documentation of all instrument specific software (e.g. necessary for the control, monitoring, testing, simulation, operation, and data reduction/analysis etc.) in accord with procedures and schedules as defined with the Rosetta Project.

2. Support in collaboration with the Project office the delivery of such instrument specific operational software and its documentation including user manuals to the RSOC in accord with procedures and schedules as agreed with the Rosetta Project Scientist.

3. Support in collaboration with the Project office the instrument specific operational software integration and operation activities at the RSOC.

4. Support, in collaboration with the Project office the development, testing, documentation and delivery of on-board software, and software required during instrument system level tests in the real-time or off-line mode including auxiliary software (instrument EGSE and interfaces) as defined and agreed with the Rosetta Project.

5. Maintain and update all software delivered by the Imaging team for the duration of the mission including a post-operations (archiving) phase.

Payload Operations:

Operational phases include pre-launch activities (e.g. instrument software design and development, instrument calibrations), nominal operational phase and post-mission phases with a breakdown as follows: (a) pre-launch phase until launch minus two years; (b) full operational phase from launch minus two years until target comet (nominally P/Wirtanen) perihelion passage plus TBD months for post-perihelion mission if approved. One should however, note that cruise science is not planned en route to the comet. There might be extended hibernation periods and the actual science operations phase will be defined as the two asteroid fly-bys (4 months each) and the comet rendez-vous phase (June 2011 - October 2013).

The TL for the Imaging Science System will be responsible, to

1. Support all operational phases by providing the necessary manpower and/or expertise (training) to the Rosetta Project Team, and support the RSOC through expertise. The level of support shall be refined with the ESA Project Office and will be defined in a special document.

2. Support operations through his expertise including resolution of anomalies and malfunctions of the instrument including recalibrations etc. as required.

Financial:

1. Ensure that adequate funding is available for the Imaging Science Team and its Imaging Engineering Team at the required time(s) for all aspects of the instrument and its support.

<u>Programme Participation as Individual Team Member in the Imaging Science Team</u>

Individuals that might be able to contribute to the Imaging Science Team by providing unique expertise in any area relevant to the programme may submit proposals as Team Members.

The proposal must clearly define the nature of the contribution, the resources to be made available (manpower, hardware or facilities) and how this could be integrated into the Imaging Science Team.

Successful individual proposers have to integrate with the Imaging Science Team or its Imaging Engineering Team and will not become members of the Rosetta Science Working Team.

Rosetta Integrated Imaging System Guest Observer Programme

At a later phase of the Rosetta programme, for the asteroid flybys and the routine comet nucleus study phase, ESA might consider to issue an Announcement of Opportunity for participation in the science analysis of the images provided by the Integrated Imaging System.