INTERNATIONAL ROSETTA MISSION

ANNOUNCEMENT OF OPPORTUNITY

ROSETTA ORBITER INVESTIGATIONS

Proposals due: August 1, 1995

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CHAPTER I.

I. GENERAL INFORMATION

1.1 Proposal Information Package

This Announcement of Opportunity (AO) solicits proposals for the Principal Investigator participation in the Rosetta Orbiter Payload together with Interdisciplinary Scientists.

The Proposal Information Package consists of this AO together with two associated documents, the Rosetta Science Management Plan (RO-EST-PL-0001) and the Rosetta Experiment Interface Document Part A (RO-EST-RS-0002 Draft 1).

The reference document ESA Sci(93)7 - Rosetta Comet Rendez-vous Mission, gives the basic scientific description of the Rosetta mission and remains valid except for the change of target comet to P/Wirtanen and the inclusion of resources for one or more Surface Science Package.

1.2 Mission Overview

Introduction

The International Rosetta Mission 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 detailed exploration of a comet and its close environment by a comet nucleus orbiting spacecraft 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 two, (e.g. Mimistrobell and Shipka) main-belt asteroids.

In order to enhance the scientific return from the mission, resources have been made available to enable up to two surface science packages (SSP) to be accommodated on the Rosetta Orbiter. During the comet nucleus phase of the mission the SSP will be deployed onto the comet surface.

Following requests for letters of intent, two proposals were made, one by a CNES/NASA consortium and one by a German led consortium, to provide SSP's in a similar manner to a PI provided instrument.

Final proposals for the SSP's including their instrument complement are due by 1st December 1995 and will be subject to ESA Science Programme Committee endorsement together with the Orbiter payload in early 1996.

Rosetta will be operated as a Principal Investigator type mission with science operations coordinated by the Rosetta Science Operations Centre (RSOC).

As part of the international character of the mission, which embarks, the CNES/NASA SSP, NASA will provide the DSN to enhance the downlink capability for the mission.

1.2.1. 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 International 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.

The prime scientiic objectives as defined by the Rosetta Science Team and described in detail in ESA SCI(93)7 can be summarized as:

- Global characterisation of the nucleus, determination of dynamic properties, surface morphology and composition
- Chemical, mineralogical and isotopic compositions of volatiles and refractories in a cometary nucleus
- Physical properties and interrelation of volatiles and refractories in a cometary nucleus
- Study of the development of cometary activity and the processes in the surface layer of the nucleus and in the inner coma (dust-gas interaction)
- Origin of comets, relationship between cometary and interstellar material. Implications for the origin of the solar system
- Global characterisation of the asteroid, determination of dynamic properties, surface morphology and composition.

A model payload was defined by the Rosetta Science Team that meets the objectives outlined and summarized above whilst staying within the boundaries of resources dictated by the spacecraft design.

This reference model payload is based on state-of-the art design with conservative mass estimates and fits very well within the total ***mass allocation*** of about ***96 kg*** for **orbiter instrumentation.**

In addition the capacity exists for the accommodation of Surface Science Packages including instrumentation to a total mass of 90 kg.

Table 1 summarizes the resource allocation for the individual investigations as a baseline during the system definition studies. This list of instruments should not be interpreted as to be exclusive as the Rosetta Science Team had considered additional instruments that would significantly increase the science return of the selected baseline mission. These instruments had not been included in the baseline model payload,

owing to the restricted mass budget (96 kg) and possible constraints on mission design, or technological readiness issues. As most attractive additional instruments a Microwave Spectrometer/Radiometer and a Radar Mapper/Sounder were considered. The Gamma-ray Spectrometer is included in that list, as this instrument, depending on the final near comet mission scenario can be either implemented on the orbiter or on one of the SSPs. Table 2 lists the model payload elements together with their specific scientific objectives.

Table 1: Rosetta Model Payload Investigations and Mass Allocation, excluding the Surface Science Packages and their instruments

	Mass
Remote Imaging System	20 kg
VIS and IR Mapping Spectrometer	23 kg
Neutral Gas and Ion Mass Spectrometer	15 kg
Cometary Matter Analyser	14 kg
Scanning Electron Microprobe	13 kg
Dust Flux Analyser	2.5 kg
Plasma Investigation	2.5 kg
	90 kg

Additional Instruments: Radar Mapper/Sounder, Microwave Spectrometer, γ-ray Spectrometer

Mass Allocation for Orbiter Payload for original baseline mission: 96 kg

Table 2: Rosetta Model Payload Investigations and Specific Scientific Objectives

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 in the baseline 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)

1.2.2. 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 propellant tanks in 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 10 N thrusters are arranged at the four corners of the bottom platform.

The top platform carries a gimbaled 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 such as to avoid contamination from the thrusters; this panel also provides support to one Surface Science Package (SSP) and accommodates equipment such as star and target trackers. The fourth side panel is basically dedicated to subsystem equipment and could carry in addition a second SSP. Low gain S-band antennas are mounted on deployable booms on the rims of two opposite side panels.

Attitude and orbiter measurement and control is achieved using sets of sun sensors, star and target trackers, gyros and reaction wheels. A bipropellant reaction control system is utilised for orbit and attitude manoeuvres by either the 400 N main engine or banks of 10 N 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 6 AU 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 28 V 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 foreseen. An antenna pointing mechanism will provide two degrees of freedom to the High Gain Antenna. Travelling Wave Tube Amplifies (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 5 W. In emergency cases, access to the spacecraft via the low gain antennas can always be ensured by a DSN 70 m station.

The above spacecraft description should be taken as preliminary and will evolve during the current pre-phase B studies.

1.2.3 System Aspects

The International Rosetta Mission will be launched by an ARIANE 5 launch vehicle in January 2003 to meet the comet P/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 colineation. 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.
The ground segment will use the ESA 15 m stations, the Weilheim (Germany) 30 m station as well as NASA DSN stations. Operations will be performed through the Rosetta Mission Operations Centre located at ESOC (Darmstadt, Germany).

1.3 Responsibilities

1.3.1 Mission

ESA has responsibility for the overall International Rosetta mission design and execution.

1.3.2 Spacecraft

ESA has responsibility for the design, procurement, integration and verification of the Rosetta Orbiter spacecraft including at system level the scientific payload and Surface Science Package(s).

1.3.3 Orbiter Scientific Investigations

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.

1.3.4 Surface Science Package

The responsibility for design, procurement, integration and verification of the SSP's including their scientific payload resides with:

- The CNES/NASA consortium for the Champollion lander
- The DLR/MPI consortium for the Roland lander.

1.3.5 Operations

ESA has the responsibility for the launch of the Rosetta spacecraft.

ESA has the responsibility for the conduct of International Rosetta Mission Operations through the Mission Operations Centre at ESOC Darmstadt and the Science Operations Centre co-located at ESOC during critical mission phases.

As a part of the international contribution to the mission, NASA will provide the services of the DSN for telemetry and telecommand.

1.4 Participation in the International Rosetta Programme

The scientific community is invited to participate in the International Rosetta programme by responding to this Announcement of Opportunity which solicits proposals for Principal Investigators and Interdisciplinary Scientists. The purpose of this Announcement of Opportunity is to solicit proposals for the following:

- scientific investigations for the Rosetta Orbiter - Principal Investigator (PI) Proposals

- 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 Scientist Proposals

Concerning Principal Investigators and Interdisciplinary Scientists this AO is open to the scientific groups within those European States which participate in the ESA Scientific Programme (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom), and to the scientific groups in the United States (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).

Participation in the potential SSP programmes is via dedicated Announcements of Opportunity by the SSP suppliers:

for the CNES/NASA 'Champollion' lander

- an AO issued by CNES

- an AO issued by NASA

for the MPI/DLR 'RoLand' lander

- an AO issued by the RoLand consortium

Potential Proposers have to answer to the AO specific for that part of the Rosetta programme in which they wish to participate.

Potential proposers requiring resources on both the orbiter and the SSPs or from both SSPs have to respond to the respective AOs separately keeping in mind the different submission deadlines.

Individuals responding to this AO will be able to submit proposals in more than one category. However, success for an individual as a PI will automatically remove his

candidature for an Interdisciplinary Scientist position.

It is expected that instrument proposals may need to be amended after submission, in joint discussions between ESA and the proposer(s), in order to arrive at a payload complement compatible with the scientific goals of the mission and the available resources.

A Rosetta Science Working Team (RSWT) will be formed to monitor and advise on all aspects of Rosetta which affect its scientific performance. Detailed information on the RSWT is provided in the Science Management Plan.

1.5 Schedule

Table 3: Rosetta Programme Schedule

The main features of the programme are:	
Issue of AO for Orbiter Payload and SSPs	7 March 1995
Proposals due for Orbiter Payload	1 August 1995
SPC Selection of payload	February 1996
Issue spacecraft ITT phase B	June 1996
Experiment Interface Document (EID) Formal issue	15 March 1997
Spacecraft phase B	July 1997 - December 1998
Spacecraft phase C/D	January 1999 - June 2002
Instrument Structural/Thermal Model delivery	2nd quarter 1999 (TBC)
Instrument Electrical Qual. Model delivery	1st quarter 2000 (TBC)
Instrument Flight Model delivery	1st quarter 2001 (TBC)
RSOC operational	January 2002
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

Table 4: Schedule for Rosetta Investigators AO cycle

Issue of AO	7 March 1995
General Briefing Meeting	9 March 1995
Proposals due:	
Orbiter Investigations	1 August 1995
SSP Investigations:	
Champollion (CNES/NASA)	1 June 1995
RoLand (MPI/DLR)	30 June 1995
Evaluation Phase	1 August 1995 - 1 November 1995
Final SSP proposals due to ESA	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

CHAPTER II.

2. INFORMATION FOR POTENTIAL PRINCIPAL INVESTIGATORS

2.1 General Requirements

The proposals for the Rosetta orbiter instruments shall be made bearing in mind the scientific and operational objectives of the International Rosetta mission and the current programme definition and constraints. It should be noted especially that for the baseline mission there is no cruise science foreseen and that one has to account for long hibernation periods en route to the comet.

It is emphasized that the Model Payload defined by the Rosetta Science Team (ESA SCI(93)7) has been optimised to accomplish the overall scientific objectives of the mission. However, this list is by no means exclusive and actual investigations will be selected on the basis of responses to this AO.

The instrument complement will be optimised to accomplish the overall scientific aims of the mission. As a result, proposals may need to be amended after submission, in joint discussions between ESA and the proposer(s). The proposed instruments must comply with the technical requirements contained in the AO documents (EID-Part A).

However, if proposers feel that a greatly improved scientific return together with a mature and proven instrument concept may be obtained by exceeding one or more of these constraints, they may identify this as an option in their proposal, justifying it in the scientific section and explaining it in the technical section.

2.2 Programme Participation as Principal Investigator for Rosetta Orbiter Science

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 shall 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 PIs, the respective Funding Agencies and the ESA Rosetta Project. The PIs shall not assume any funding from ESA for any part of their programme.

Following Instrument selection, the formalisation of the agreement between the Agency, the Principle Investigator and his authorities will be achieved through the signature of an **Experiment Implementation Agreement** (EIA).

The EIA (Ref. ESA/SPC(95)2) will be signed by the PI, the authorities of his Institute, the Funding Agency and ESA to signify the committment of all parties to support to the best effort the agreed requirements contained in the Experiment Interface Document (EID) parts A and B with a view to successful implementation of the project.

The EIA will be signed by all parties prior to the start of the industrial phase C/D of the Project, however the response to this AO should include an EIA letter duly signed by the PI, his Institute and the funding Agency as certification that the proposed investigation is supported, in principle.

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 Investigator may delegate specific responsibilities to a Co-Investigator.

After selection, the Experiment Interface Document (EID-Part B) will be will be iterated by the project for each instrument. A draft EID-Part A is contained in this AO package. The EID-Part A and Part B define 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:

2.2.1 Responsibilities for PIs for Instruments

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:

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) and through 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:

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.

2.3 Scientific Data Policy

It is required that the Principal Investigators and their teams shall comply with the scientific data policy of ESA as defined in the Rosetta Science Management Plan (ANNEX 1), which is based on ESA/C(89)93 'Rules concerning Information and Data.

Any non-compliance with the ESA scientific data policy as defined in the Rosetta Science Management Plan shall be identified and substantiated in the appropriate section of the proposal.

2.4 Contacts with ESA

2.4.1. Contacts with ESA Prior to Proposal Submission

Any requests for further information and clarification for PI Proposals should be addressed to:

John Credland
Rosetta Project Manager
ESTEC
P.O. Box 299
NL-2200 AG Noordwijk
The Netherlands
Fax: Int. +31-1719-46280, e-mail: jcredlan@vmprofs.estec.esa.nl
Telex: 39098

with copy to:

Gerhard Schwehm
Rosetta Project Scientist
ESTEC
P.O. Box 299
NL-2200 AG Noordwijk
The Netherlands
Fax: Int. +31-1719-84697, e-mail: gschwehm@vmprofs.estec.esa.nl (Internet)
Telex: 39098

2.4.2 Contacts with ESA During Instrument Selection

The ESA Project Office may arrange meetings with either individual proposer(s) or groups of proposers (or both) for engineering clarification of the proposal(s), and for scientific and/or engineering optimization of the overall payload and its scientific complementarity. In addition, presentation to the ESA evaluation panels and the external evaluation committee may be requested. All proposers should be prepared to travel to ESA establishments for at least two such meetings. Further meetings will be scheduled to discuss management aspects and financial matters during the evaluation phase.

2.4.3 Contacts with ESA After Instrument Selection

Following the selection of the instruments, an Experiment Implementation Agreement will be drawn up involving the PI, Co-Is, their institutes, national funding agencies and ESA to cover all aspects of their relationship (see Section 1.4).

Formal PI contact shall be with the ESA Project Manager for all technical and programmatic matters and with the ESA Project Scientist for scientific matters.

General contact with ESA on all scientific matters relevant to Rosetta shall be through the ESA Project Scientist and on all technical matters through the ESA Payload Manager, who has responsibility for the overall payload including monitoring the technical an managerial aspects of the instruments. The Payload Manager reports directly to the ESA Project Manager, who is the head of the Rosetta project.

2.4.4 Monitoring of Instrument Development

ESA will monitor the progress of the design, development and verification of the scientific instruments of Rosetta.

The PIs shall demonstrate to the ESA Project Office in regular reports and during formal reviews technical and programmatic compliance with the scientific mission goals, the spacecraft system constraints, the spacecraft interfaces and the programme schedule as defined in EID-Part A. The ESA Project Office must receive monthly status reports during design, development, fabrication and testing phases. Separate formal reviews for each instrument will be conducted by the ESA Project Office to establish the current development status of all items to be delivered. This will also include schedule, performance and calibration activities.

The scientific performance shall be monitored by the ESA Project Scientist who may draw on support of the Rosetta Science Working Team (RSWT) as a whole. The PIs shall be required to present a report on the state of development of their instrument to each meeting of the RSWT.

2.5 Contents of the Proposal

2.5.1 General Requirements

Proposals shall respond to the objectives and programme constraints described in this AO and shall provide all requested information to permit full evaluation against the criteria listed in Section 2.7. In particular, the proposals shall provide clear interface data as to monitor the assessment and preliminary definition of detailed interfaces. Part I of the AO proposal shall not exceed 40 pages (details are provided below). There are no page limitations on the other parts. Each part shall be written in English, shall be separately bound and all pages shall be numbered.

2.5.2. Proposal Contents List

The table of contents (section 2.4.3) shall be adhered to in preparing the instrument proposals by potential PIs. The detailed requirements on the proposal content are described below. Reference is also made to the selection and evaluation criteria described in Section 2.7.

Part II (EID-Part B Vol. 1-7) will be available on the Server by 1 May 1995 in form of an outline to be completed by the proposers. Hard copies willl be available from the Rosett project office on request. This outline will be placed on the Rosetta AO server on 1 May, 1995. The purpose of EID-Part B is to document the PIs response to the technical and programmatic requirements of EID-Part A. This document is established in such a format, that after selection they will become Draft 1 of EID-Part B and will be maintained and updated throughout the mission.

Each proposal will be composed of three parts:

1. Part I: Scientific and Technical Plan
2. Part II: Experiment Interface Document (EID-Part B)
3. Part III: Cost Proposal

The following Section 2.5.3. describes the detailed requirements for the contents of instrument proposals. The requirements for the contents of IDS proposals is given in Section 3.3.

2.5.3 Detailed Requirements for the Contents of PI Investigation (Instrument) Proposals

The requirements for each part of the proposal are outlined in detail below. Part I must not exceed 40 single-spaced typewritten A4 pages, including illustrations, without reduction, and excluding cover page, executive summary and table of contents.

Part I: Scientific and Technical Plan.

This part shall be self explanatory and shall contain all information needed for an evaluation of the proposal. This part shall include:

- Cover page
- Executive Summary (2 pages)
- Table of contents
- Scientific objectives and capabilities
- Technical description
- Data reduction and scientific analysis plans
- Test and calibration plans
- System level assembly, integration and verification
- Flight Operations
- Brief description of qualification and experience of the PI team and principal technical staff (3 pages)

The Cover Page shall include:

- The title of the proposal
- The name, address, telephone, telefax, telex numbers and e-mail addresses of the Principal Investigator (PI) and Co-Investigators (Co-Is).

The Executive Summary shall include the title of the proposal, the names and institutions of the investigators and summary information. The following aspects shall be addressed within the 2 (two)-page limit:

- Objectives of the proposal
- Performance of the instrument proposed to fulfil its anticipated goals
- Summary of required spacecraft resources
- Management scheme
- Funding status
- Departures from constraints stated in this AO (incl. the Annexes)

It is anticipated that the proposals will remain within the technical and programmatic constraints of the Rosetta programme as described in this AO. If proposed options violate any of these constraints a clear statement of each violation together with justifications shall be included in the Executive Summary. Further details of each violation shall be provided by the proposer in the appropriate sections.

The section on Scientific Objectives and Capabilities shall state both the general scientific capabilities of the proposed instrument as well as the scientific objectives of the PI team. These should be discussed in the light of the global objectives of the Rosetta mission.

The capabilities of the proposed instrument should be explained and compared, if relevant to those of the reference model payload and synergism with laboratory studies and ground-based or space-based observation programmes shall be addressed. The capabilities of the proposed instrument should be explained. For example, the anticipated performance of the instrument in its nominal operation mode(s) under nominal in-orbit conditions should be described.

The baseline performance envelope of the instrument and performance evaluation criteria should be explicitly stated and summarized in tabular form.

Expected results should be outlined and discussed, as far as possible, in both qualitative and quantitative terms. If a proposal contains one or more options in the design which leads to violations of technical or programmatic constraints, the scientific justification shall be given in this section.

The section on Technical Description shall include a comprehensive detailed technical description of the proposed instrument. The compatibility of the basic design with the technical constraints of ANNEX 2 (EID-Part A) shall be demonstrated; design options which lead to violation of technical or programmatic constraints shall be clearly identified.

Attention shall be drawn to those aspects of the instrument design which help to ensure the required in-orbit operational lifetime, i.e. fail-safe elements, redundancy, reliability, back-up modes.

The current status and availability of the proposed technologies in a baseline design shall be defined together with the risk associated in any assumption of developing technologies. Ideas for, and the feasibility of, incorporating new advanced technologies should be clearly defined and identified as an option to the baseline design. The impact of these options upon scientific return for instruments, interfaces, schedule etc. should be explained together with provision of a risk assessment. The extent to which the proposed instrument design utilizes space qualified and space experienced hardware shall be stated.

The different operating modes of the proposed instrument shall be stated and explained. Modes which place different requirements on the spacecraft should be minimized and these should clearly be described. Modes which place different requirements on scientific operations and data analysis shall be described.

Detailed information on the interfaces between the instrument and the spacecraft should be given in the Experiment Interface Document Part B (ANNEX 2 of this AO), to be completed and submitted as Part II of the proposal.

The section on Data Reduction and Scientific Analysis Plans shall contain a detailed description of the instrument specific software provided by the instrument PI team to the RSOC and RMOC (e.g. monitoring of the instrument state-of-health, quick-look analysis, processing: see EID-Part A in ANNEX 2, Vol. 6). It is required that the PI shall comply with the scientific data policy of the Agency as defined in the Rosetta Science Management Plan (ANNEX 1, and AO Section 2.3). Any non-compliance shall be identified and substantiated in the appropriate section of the proposal.

The section on Test and Calibration Plans shall describe all test and calibration (ground/pre-launch and in-orbit) plans and procedures deemed necessary to verify the correct functioning of the proposed instrument in order to achieve its scientific goals.

The availability of suitable test and calibration facilities (e.g. vacuum, thermal vacuum, detector laboratories, accelerators, computer facilities etc.) either in-house or in industry shall be demonstrated. The ground test and check-out equipment to be supplied for the instrument level testing shall be described in Part II (EID-Part B, Vol. 5) of the proposal.

The section System Level AIV should state how the investigation complies with the project provided pre-launch AIV programme at spacecraft system level (see ANNEX 2, EID-Part A). Instrument requirements that do not comply should be identified together with any special requirements. The ground test and checkout equipment to be supplied by the PI to support the system level test programme shall be described in Part II (EID-Part B, Vol. 5) of the proposal. Special services required from the launch vehicle shall be identified.

The section Flight Operations shall describe the operational concept of the proposed instrument. ANNEX 1 (Science Management Plan) and SCI(93)7 provide an outline of the science operations. Details (e.g. frequency of calibrations, mode changes etc.) should be provided. This section should identify any requirements for flight operations support including mission planning.

The section on Brief Description of Qualifications and Experience should provide bibliographical information for the PI and all Co-I's plus key technical personnel. Extensive bibliographies are not required although key publications or key activities of particular relevance to the proposal should be listed. Attention should be drawn to previous experience in the particular field of the proposal including science data analysis and management of large collaborative projects.

Part II: Experiment Interface Document - Part B

The proposers are requested to complete the outlined EID-Part B as provided on the Server on 1 May 1995. The purpose of EID-Part B is to document the PI's response to the requirements of EID-Part A (ANNEX 2) in terms of:

- System requirements
- Interface requirements
- Development and verification
- Product assurance
- Programme requirements including management plan and deliverable items

The information requested from the proposer is explained under each chapter heading. Further information not covered within the standard format may be added at the discretion of the proposer. Although there may be some duplication of information to be provided, the purpose of part II is mainly to provide factual information on all aspects of the proposed investigation, whereas discussion, justification and risk assessment, etc. is to be provided in part I of the proposal.

After selection, this document will become draft 1 of EID-Part B and will be maintained and updated throughout the mission.

Part III: Cost Proposal

The PI shall include separate sections for his/her own resource requirements and funding status as well as for the resource requirements and funding status of each of the proposed CO-I's with the details of estimated resources for each PI or CO-I activity with justification:

- internal manpower resources
- other internal institute resources
- external contracts
- total funding requirements

The requirements on national sources for funds and manpower shall be stated and justified. The authorities for these resources shall be identified and the current status of the application stated. If the funding is not firm, the procedure to be followed to obtain the funding and the date by which a decision is expected shall be given.

The authorities responsible for providing the funding will be required to signify compliance by signature of the Experiment Implementation Agreement (EIA) prior to the start of the industrial phase C/D.

Proposers may submit a copy of the detailed cost proposal submitted to the national authorities (see also Section 2.5.2 for non-European parties).

2.6 Proposal Submission Procedure

2.6.1 Proposal Submission

All proposals shall be submitted to ESA in accordance with the table (below). Each part shall be separately bound. Proposers (Principal Investigators and Co-Investigators) are responsible for submission of a copy of the proposal directly to their respective national funding authority SPC representative (for the addresses see Annex A). The proposals must be received at ESTEC **not later than 1 August, 1995.** (see Section 1). The proposer shall notify (telex/fax/e-mail) the addressee in the table below when the proposal has been mailed stating the actual mailing date. ESA will notify in writing the proposers that the proposal has been received. The addressee in the table should be contacted in case the confirmation is not received two weeks after submission.

Part III of the proposal (Cost Proposal) may be sent under separate cover and if confidentiality is required this should be clearly stated.

Addressee: Original plus copies as below to:

John Credland
Rosetta Project Manager
ESTEC
P.O. Box 299
NL-2200 AG Noordwijk
The Netherlands
Fax: Int. +31-1719-46280
e-mail: jcredlan@vmprofs.estec.esa.nl
Telex: 39098

Item	Copies to be sent
Executive Summary	75
Part I (Science/technical plan)	50
Part II (EID-Part B)	20
Part III (Costs)	5

One complete copy by mail to:

Marcello Coradini
Coordinator, Solar Systems Mission
ESA HQ, D/SCI
8-10 Rue Mario Nikis
F-75738 Paris Cedex 15
France
Fax: +33 1 5369 7236
e-mail: mcoradini@esa.bitnet

2.6.2. Proposals from U.S. Investigators or with U.S. Investigator Involvement

Potential proposers for investigations involving U.S. Principal Investigators and U.S. Co-Investigators requiring NASA support of any amount should send each twelve copies of their proposals to the address stated below at the same time as the submission to ESA. The proposals should include or be accompanied by a detailed cost proposal covering the costs of the complete investigations to their funding authorities. Proposals should be addressed to:

Jürgen Rahe
Solar System Exploration Division
Code SL
NASA Headquarters
Washington, DC 20546-0001
U.S.A.
e-mail: jrahe@sl.ms.ossa.hq.nasa.gov
fax: +1 202 358 3097

Proposals from U.S. PIs and Co-Is will undergo a NASA endorsement review prior to entering the ESA evaluation process. NASA endorsement indicates that the proposal merits careful consideration by ESA. The endorsement review is expected to be completed by 15 September, 1995. The endorsement criteria will include scientific and technological merit of the proposed investigation, its relevance to established mission plans and objectives, total cost and management considerations, adequacy of the proposed instrument for the proposed investigation, competence and relevant experience of the proposer, and technical and cost uncertainty associated with the investigation.

NASA support for scientific instruments for the Rosetta orbiter will be cost constrained; it is expected that not more than approximately $20M (real-year dollars) will be available for instrument development support for U.S. PIs and CO-Is selected in response to the Rosetta orbiter AO.

2.7 Selection Procedure and Evaluation Criteria

Proposals for instruments will be examined and assessed by a Peer Review Committee appointed by ESA's Director of Scientific Programme on the advice of the Solar System Working Group. The ESA Project Group will assess the proposals against technical, managerial and financial criteria. Attention will be paid to the establishment by the PI of an efficient and effective management scheme of the team and its contractors. 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, a preliminary payload will be proposed, possibly with options for consideration by the appointed Peer Review 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 in full agreement with the Peer Review Committee 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 Peer Review 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 given in chapter I.

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 development.

Evaluation Criteria for Instrument Proposals

- 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, 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.

2.7.1 Agreement between Principal Investigators and ESA

An Experiment Implementation Agreement (EIA) will be drawn up involving the PI, Co-

Is, their institutes, national funding agencies and ESA to cover all aspects of their relationship (see Section 1.4). It will take the form of a cover note to EID-Part B of the individual experiments.

2.7.2 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.

CHAPTER III

3. INFORMATION FOR POTENTIAL INTERDISCIPLINARY SCIENTISTS

3.1 Programme Participation as Interdisciplinary Scientist (IDS)

This AO for Rosetta Orbiter science investigations also solicits Interdisciplinary Scientist (IDS) proposals by individuals for specific and time limited tasks (a maximum of five years), initially 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, but not limited to, studies of the comet nucleus composition and its relationship with interplanetary, interstellar and circumstellar dust. The Interdisciplinary Scientists shall be capable of making personal contributions to the Rosetta programme during both development and operational phases.

Should data be required from any Rosetta hardware investigation, it will be the responsibility of each IDS to obtain the concurrence of those responsible for directing that hardware investigation. Details including mutual agreements for publication and data release will be individually defined.

Concerning Interdisciplinary Scientists, the AO is open to candidates from ESA member states and USA. Initially up to three IDS's will be appointed. In case that not all tasks are fully covered and/or new tasks and new areas of independent expert advise require attention during the course of the programme, the number of IDS's may be increased by the ESA Directorate of Scientific Programme following standard procedures.

In general, the Interdisciplinary Scientists are expected to:

- attend all meeting of the Rosetta Science Working Team and to take a full and active part in its work

- establish and maintain close contact - through the Project Scientist - with the Rosetta programme and provide the Project with their expert support for mission and operations planning

3.2. Contacts with ESA

Prior to appointment, prospective Interdisciplinary Scientists should contact ESA on matters of Rosetta through the Rosetta Project Scientist. After appointment, they will interact with the Rosetta Project through the Rosetta Science Working Team and the Rosetta Project Scientist.

Requests for further information for IDS proposals should be send to the Rosetta Project Scientist, only written requests will be answered.

3.3 Contents of the IDS Proposal

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 set 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.

Proposals should be as complete and informative as possible but should be limited to a maximum of 20 single-spaced, typewritten A4 pages in length including the cover page and a one (1) page Executive Summary.

Proposals shall be written in English. All pages must be numbered. The proposal shall contain the proposer's name, position, institute, address, telephone number, telefax number and e-mail address.

The scientific and technical experience and expertise of the applicant relevant to Rosetta in any or all fields of planetary research or astrophysics, and in the light of the specific proposed task, should be described. The fraction of their time available for work on Rosetta shall be stated.

The necessary support provided by the proposer's institution should be explicitly stated to ensure that the investigation can be completed satisfactorily.

The main body of the proposal should consist of an explicit statement of the investigations which the proposer wishes to conduct and a specific work schedule.

Applicants should explain how they would contribute to Rosetta both inside the RSWT and also in a more general sense through interactions with the general planetary science community. They should also state how they would plan to maintain contact with the PI teams, should that be required to perform their task.

It is required that Interdisciplinary Scientists shall comply with the scientific data policy of the Agency as defined in the Rosetta Science Management Plan (ANNEX 1). Any non-compliance shall be identified and substantiated (see Section 2.3).

3.4 Proposal Submission Procedure

Twenty-five (25) copies of the proposal, each separately bound, must be sent to the Rosetta Project Scientist:

Gerhard Schwehm
Rosetta Project Scientist
ESTEC
P.O. Box 299
NL-2200 AG Noordwijk
The Netherlands
Fax: Int. +31-1719-84697, e-mail: gschwehm@vmprofs.estec.esa.nl (Internet), Telex: 39098

and one copy to:

Marcello Coradini
ESA HQ, D/SCI
Coordinator Solar System Missions
8-10 rue Mario Nikis
F-75738 Paris
France
Fax: +33 1 5369 7236, e-mail: mcoradini@esa.bitnet

and received not later than the date given in the AO (Chapter I). The Rosetta Project Scientist should be notified (e.g. fax or e-mail) when proposals are dispatched. ESA will notify in writing the proposers that the proposal has been received. The addressee in the table should be contacted in case the confirmation is not received two weeks after submission. The Cost Proposal may be sent under separate cover and if confidentiality is required this should be clearly stated.

Potential IDS's are responsible for submision of a copy of their proposal directly to their national funding agencies and SPC delegations (the addresses are listed in Appendix A).

For U.S. proposals please refer to the information given in section 2.5.2.

3.5 Selection procedure and Evaluation Criteria

The Interdisciplinary Scientist proposals will be evaluated, assessed and ranked by the SSWG with support from the Project and - where appropriate - by additional scientists. The selected IDS's will be endorsed by SSAC and SPC. The ESA Director of Scientific Programme will appoint the IDS's for a fixed period (TBD). The selection procedure will be arranged to eliminate conflicts of interest.

The following criteria will be used in assessing the individual proposals:

1. Experience of proposer in one or more areas relevant to the tasks proposed to be performed and specified in the proposal.

2. Merit of proposed general contribution to Rosetta and Rosetta mission implementation.

3. Stated availability of time.

3.6 Finance

For their attendance at meetings of the Rosetta Science Working Team, the Interdisciplinary Scientists - from ESA member states - will have their travel expenses and a per diem paid by ESA. In general, ESA will host the RSWT meetings. No other activities will be financed by ESA. Any U.S. Interdisciplinary Scientists, if any, will be expected to provide their own funds for travel and subsistence, as no exchange of funds is possible.

APPENDIX A

4.1 DEFINITIONS

Investigation or Experiment: This constitutes the complete activity leading to achievement of the proposed objectives. It embraces all hardware, software and analysis, managerial functions and/or procurements needed to support the achievement of the proposed objectives.

Instrument: This constitutes the specific hardware and software needed to perform the science measurements in support of achieving the proposed science investigations.

Principal Investigator (PI): The nominated person who is totally responsible for completion of the investigation and achievement of the proposed objectives. To this end the PI has full decision and management authority within the investigation team.

Co-Investigator (Co-I): A member of the investigation team who is collaborating with the PI performing a specific task or tasks or functions in contribution to achieving the proposed objectives of the investigation. these CO-I's tasks or functions would normally exploit the expertise available to the Co-I and form a fundamental contribution to the investigation. The Co-I would be expected to share in the data and to abide by the data policy.

shall: Thoughout the document, the word "shall" is used to indicate a mandatory requirement.

4.2 ACRONYMS

AIV	Assembly, Integration, Verification
AO	Announcement of Opportunity
AU	Astronomical Unit
CO-I	Co-Investigator
CNES	Centre National d'Etudes Spatiales
DLR	Deutsche Forschungsanstalt für Luft- und Raumfahrt e.V.
DSN	NASA's Deep Space Network
EGSE	Experiment Ground Support Equipment
EIA	Experiment Implementation Agreement
EID	Experiment Interface Document
ESA	European Space Agency
ESOC	European Space Operations Centre
ESTEC	European Space Research and Technology Centre

HST	Hubble Space Telescope
ICE	International Comet Explorer
IDS	Interdisciplinary Scientist
ISO	Infrared Space Observatory
ITT	Invitation to Tender
JPL	Jet Propulsion Laboratory
LILT	Low Temperature Low Intensity
MGSE	Mechanical Ground Support Equipment
MPI	Max-Planck Institut
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

APPENDIX B

SPC DELEGATION, NATIONAL FUNDING AUTHORITY REPRESENTATIVES

AUSTRIA

Prof. J. Ortner
Austrian Space Agency
Garnisongasse 7
A-1090 Vienna

Tel: (43) 1 403 8178/0
Tx. 116 560
Fax: (43) 1 405 8228

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Fax: (45) 45 930283

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SF-90520 Oulu

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Fax: (353) 1 837 0172

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Viale Regina Margherita 202
I-00198 Roma

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THE NETHERLANDS

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Ministry of Education and Science
Postbus 25000
NL-2700 LZ Zoetermeer

Tel: (31) 79 532 265
Tx. 32636

NORWAY

Dr. Bo N. Andersen
Norwegian Space Centre
P.O. Box 85 - Smestad
N-0309 Oslo 3

Tel: (47) 22 523800
Tx. 0056 78 174 SPACE N
Fax: (47) 22 522397

SPAIN

Mr. Manuel Moreno
DCTI Facilities
Cuzco IV-PO
Castellana, 141, 12°
E-28046 Madrid

Tel: (34) 1 581 5557
Tx. 23121 CDTI E
Fax: (34) 1 581 5584

SWEDEN

Prof. Kerstin Fredga
Director General
Swedish Board for Space Activities
P.O. Box 4006
S-17104 Solna

Tel: (46) 8 627 6486
Tx. 17128 spaceco S
Fax: (46) 8 627 5014

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Office Federal de l'Education et de la Science
Wildhainweg 9
Postfach 2732
CH-3001 Bern

Tel: (41) 31 322 9967
Tx. 912 981
Fax: (41) 31 322 7854

UNITED KINGDOM

Dr. Paul Murdin
BNSC
Bridge Place
88/89 Eccleston Square
GB-London SW1V 1PT

Tel: (44) 71 215 0805
Fax: (44) 71 215 0804