



**International Research Announcement for
Research in Space Life Sciences at the
International Space Station – ILSRA-2009**

ESA Specific Announcement



Letters of Intent due:

15th June 2009

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Proposal due:

14th September 2009

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1 Description of the Announcement

1.1 Introduction

Europe participates in the development of the International Space Station (ISS) via the European Space Agency, ESA.

In order to enable and enhance world wide co-operation in space life sciences, an International Space Life Sciences Working Group (ISLSWG) was established 1991. The ISLSWG includes the space agencies of the USA (NASA), Europe (ESA), Japan (JAXA), Canada (CSA) and those European national space agencies (CNES of France, ASI of Italy and DLR of Germany), which for many years have also had their own significant national space life sciences programmes in addition to being the space agencies of ESA member states.

This world-wide coordination, which started with the screening of existing space hardware and the exchange of information on the planning for development of new hardware, resulted in having a common pool of research equipment on the ISS. In addition, the regular issuing of joint space research announcements (RA) and the evaluation of the proposals by an international peer group was agreed upon.

By the end of 2010 the ISS will reach “assembly complete” and should be ready for full utilisation. Already mid-2009 the crew size will increase from three to six, which significantly increases the crew time available for scientific activities. However, the US Shuttle Transportation System will retire by the end of 2010 and this will have a marked effect on the transportation capabilities up to and down from the ISS. After shuttle retirement the crew will be transported to and from the ISS with Russian Soyuz vehicles until the new NASA crew transportation system is available, which is currently planned for 2014-15.

It is therefore important for scientists who plan to submit proposals to the current announcement to be aware that transportation of research equipment is limited in general, and the transportation from ISS back to Earth is very challenging in particular. Experiments need to be defined in a way that takes these constraints into account.

There are other means of uploading equipment *i.e.* by using Russian vehicles like the Soyuz or Progress, the ESA developed ATV (Automated Transfer Vehicle), or the Japanese H-II Transfer Vehicle (HTV). Progress, ATV, and HTV vehicles only transport cargo to the ISS, these vehicles do not transport cargo from the ISS (they burn up during re-entry). There is some download capability in Soyuz, though limited since the main purpose of this vehicle is to transport crew.

Some of the limitations regarding physiological experiments on human test subjects *i.e.* Astronauts, are stated in the Flight Experiments Information



Package (FEIP). In addition it has to be emphasized that the feasibility of a flight experiment increases if available facilities and devices, which are described in the FEIP, are used to collect and record experimental data.

Similarly the limitations for biology & exobiology experiments are described in the FEIP. It is recommended to propose experiments which use the facilities already onboard of the ISS

1.2 Announcement Objectives

The guiding principles of this international research cooperation are to:

- Promote the highest quality of scientific investigation and scientific return from space experiments.
- Optimise the utilisation of resources by avoiding unnecessary duplication of equipment and by sharing equipment and flight opportunities.
- Maximise the access to space in a period of some operational constraints.

General information on this Research Announcement is contained in the "Space Life Sciences Flight Experiments Information Package" (FEIP), which document contains the following main sections:

- Description of conditions and evaluation process
- Description of the available flight opportunities and facilities
- Generic application forms
- Instructions for proposal preparation

Experiments requiring exposure to the space environment are to be solicited. Proposals must comply with the requirements associated with the current space flight program. Investigators of flight experiments should consult the FEIP for this information.

Two types of flight experiments are currently solicited: (1) pre- and post-mission activities involving data collection prior to and on return from space, and (2) on-orbit experiments that can be implemented on the ISS. Proposals must be compatible with the operational constraints and capabilities of the International Space Station. The FEIP provides detailed information on these constraints as well as a description of the unique aspects of the evaluation and selection process for flight experiments.

1.3 Facilities available for Life Science

ESA is contributing research equipment to the common pool of life sciences facilities on the ISS with a part of the equipment being offered via national contributions.

Experiments can make use of the ESA Life Science **ISS Flight Facilities**, namely:



- [BIOLAB](#)
- [European Modular Cultivation System](#)
- [KUBIK Incubator](#)
- [EXPOSE](#)
- [European Physiology Modules](#)
- [FLYWHEEL Exercise Device](#)
- [MARES \(Muscle Atrophy Resistive Exercise Device\)](#)
- [Pulmonary Function System \(stationary and portable\)](#)
- [Percutaneous Electrical Muscle Stimulator](#)
- [Handgrip/Pinch Force Dynamometer](#)

In addition to ESA provided facilities, please consult the FEIP for the complete ISS facility inventory.

NB: All scientists to whom this Announcement is addressed can in principle have access to all facilities described in this document.

1.4 Biological Experiments

Experiments in biology concerns cell and developmental biology, plant physiology, microbiology, biotechnology & exobiology. Flight experiment constraints are described in detail in the FEIP.

There are no specific constraints on the type of biological specimens which can be proposed for use in flight experiments. However, the technical and operational constraints described in the FEIP should be taken into account in the experimental design, including use of existing facilities and the limitations with transportation to / from the ISS. Therefore, it is anticipated that biology experiments will use cell cultures, bacteria, small plants, invertebrate animals and amphibian / fish embryos. The resources and facilities to perform experiments with rodents (mice and rats) are unlikely to be available onboard ISS for the anticipated time period during which experiments proposed for this AO will be performed.

Conditioned temperature upload and download of samples is anticipated to be very limited or temporarily unavailable. Therefore, experiments should minimise upload/download mass / volume and requirements for controlled temperature during transport (ambient temperature during transport and on ISS is 18-28°C). Furthermore, experiment operations generally cannot be started until 3-5 days after launch, due to operational constraints. Limited cold stowage (refrigerated and frozen) may be available onboard the ISS. The period between upload and download of experiment samples is a minimum of 2 to 4 months, due to sequence of Soyuz vehicle rotation to / from the ISS, so experiments must be capable to operating or surviving storage for at least this period of time. Only small sample mass/volume at ambient temperature (15-30°C) can be downloaded using Soyuz and the timely availability of NASA's new Commercial Resupply System after Shuttle retirement is still to be confirmed.



To minimise the need for download of samples, experiments which employ on-orbit analysis techniques are encouraged. Potential techniques which could be used are Green Fluorescent Protein (GFP) reporter genes, ELISA and colorimetry assays.

To enhance the scientific return it is the intention to form teams of investigators with similar scientific questions and/or protocols, whenever feasible. This will be arranged during the proposal workshop (June 22nd and 23rd 2009 at ESTEC, Noordwijk, The Netherlands) and in the definition phase where selected proposals are characterised regarding the requirements and the implementation approaches and options. Experiments which combine several teams with extensive sample sharing will be favoured.

1.5 Exobiology and Radiation Dosimetry

The EXPOSE-R facility on the outside of the Russian segment of the ISS provides the possibility to subject biological and chemical samples to the space environment. Samples are accommodated in sample trays under optical windows, permitting exposure to solar UV (either unfiltered or with a quartz window simulating Martian UV conditions). The samples can be vented directly to vacuum or maintained in a controlled gas atmosphere.

Experiments using the EXPOSE-R facility should be designed to withstand transport to the space station under uncontrolled temperature conditions, external exposure of 1-2 years and stowage for up to several months before / after exposure inside the ISS. A variety of experiment tray designs exist and experiments using the existing tray designs are strongly encouraged.

Active and passive dosimetry systems have been used within the ISS by a number of different experiment teams and some external instruments (eg. EUTEF & EXPOSE) have incorporated dosimeters. For future experiments only new proposals which combine experiment protocols from different teams and have significant data sharing will be accepted. Furthermore the use of existing active dosimeters already onboard ISS is strongly encouraged.

1.6 Physiological Experiments

Experiments in Physiology concern Integrated Physiology, Bone and Muscle Physiology and Neurosciences.

In Physiological Sciences ESA is not prioritising between different sub-areas or research foci. Best science as defined in the peer review process, along with feasible protocols will be given preference for implementation.

To enhance the scientific return it is the intention to form teams of investigators with similar scientific questions and/or protocols, whenever this is feasible. This will be arranged during the Proposal Workshop (June 22nd and 23rd) and in the Definition phase where selected proposals are characterised regarding the requirements and the implementation approaches and options.



The main parts of the physiological experiments are dependent on the participation of Astronauts both as research subjects and as operators. This places an important constraint on this type of research, which is specified in some detail in FEIP section 1.4.

1.7 Ethical considerations

This section only concerns research on human subjects.

A statement from the Proposer's institution is required which states that the proposed work will meet all local requirements concerning research on human subjects. Safety assessments, including a description of possible hazardous situations for the test subjects and the foreseen countermeasures, must be provided.

In addition to this statement, a letter signed by the chairperson of the Institutional Review Board / Ethics Committee (IRB) regarding approval of the experimental protocol that includes human subjects, should be included with each copy of the proposal. In the event that this letter is not available at the time of the submission deadline, the proof of submission to the IRB should be provided with the proposal.

1.8 Data Rights

a) Data Rights

The Agency shall grant the Investigators an exclusive right of prior access to the Raw and Calibrated Data. The duration of the exclusive right (Period of Prior Access) shall be one (1) year from the provision by the Agency of the data to the Investigator in a form suitable for analysis.

The exclusive right of prior access shall be granted to the Investigators under the condition that the Investigators shall:

- undertake to furnish the Agency with an analysis of the results obtained and shall take all reasonable steps to publish such results or, alternatively, shall authorise the Agency to do so (such publication shall include a suitable acknowledgement of the services afforded by the Agency); and
- provide the Agency, free of charge, with an agreed number of copies of the publication and, notwithstanding the provisions of the paragraph above, the Agency shall have the right to reproduce and disseminate results that have already been published.

Any change to the duration of the Period of Prior Access shall take into account, inter alia:

- the extent and nature of the involvement of the Investigator in the development of the Experiment; and
- the type and complexity of the data to be received from the Experiment.

b) The Erasmus Experiment Archive (EEA)



The EEA is an ESA service to the international scientific community. Abstracts, from all European microgravity experiments performed to date are collected in this database. Experimenters sponsored by ESA have the obligation to provide these abstracts themselves. Special emphasis is placed on the completeness of the list of references of articles where the experiment results can be found.

The database includes a full-text search capability to retrieve information on experiments in a certain discipline, subject, mission, or by investigator name. The EEA covers both physical and life sciences, and can be found at the following URL:

<http://eea.spaceflight.esa.int/>

This database includes also a large number of pictures, as well as video sequences documenting experiment abstracts.

Scientists in Europe who have performed experiments, be it in orbiting or sub-orbiting facilities (drop-tube, drop-tower, parabolic flights, sounding rockets, Foton capsules, the Space Shuttle or the ISS), are urged to either provide an abstract on each of their experiments, or to provide information enabling the updating of their existing abstracts, in particular the list of articles published.

For further questions please contact the [EEA Curator](#).

1.9 Who can submit and how

At European level, this Announcement addresses academic and industry researchers of countries contributing to the ESA's programme on Life and Physical Sciences in Space (ELIPS). These are: Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Italy, Ireland, Norway, Spain, Sweden, Switzerland, and The Netherlands. The underlined countries participate also in ESA's ISS Exploitation programme which allows researchers from these countries being the team coordinators for ISS experiments. For these scientists, ESA can provide the flight opportunities, and finance the development of the specific hardware required for experimenting on the ISS. However, please note that any laboratory work, necessary for ground based research to prepare experiments will be funded by the national space organisations of the countries the scientists originate from. Similarly, support to participate in meetings for the development of instruments sponsored by ESA, and to attend launch campaigns, also has to be provided by the national space organisations.

Scientists from ESA Member States that do not contribute to the ELIPS Programme (presently Finland, Portugal, Luxemburg and the United Kingdom), and scientists from other European countries having a cooperation agreement with ESA, are encouraged to enquire with their national space organisation about the conditions for their participation in proposals to ESA.



ESA strongly advises investigators to submit their proposal to their national bodies in parallel with their application in response to this Research Announcement, in order to initiate the application for national funding as early as possible. If the proposed experiment is selected, a proof of appropriate funding is mandatory in order to commence the definition phase.

A list of national points of contact is provided with this announcement.

1.10 Endorsement of Review Results and Establishment of Research Pool

After the full scientific and feasibility aspects have been reviewed following the procedures outlined in the Flight Experiments Implementation Package (FEIP), all proposals that successfully passed the criteria are submitted to ESA's Life and Physical Sciences Advisory Groups for endorsement and subsequently to the Support Board of Delegates to ESA's relevant Programme Board for discussion and approval. Proposals thus approved enter the Pool of Research Projects (Research Pool) and will be incorporated into the ESA Research Pool Database that will be published on an annual basis as a working document.

Proposers shall be informed immediately as to the formal outcome of the Review process by a letter from ESA, giving the consensus opinion, the overall marking and any relevant comments of the Peer Board as well as the outcome of the Technical Feasibility Assessment. The results of the Review are final and shall not be open to appeal.

Once a project is included in the Research Pool, ESA will initiate steps for the implementation of that project (see section 1.11). As this inevitably involves investments both financially as well as in terms of manpower, ESA will require assurance that the project is well supported and financed.

In this context it is however recognised by ESA that National review procedures may preclude the provision for a full financial commitment for third part funding within 3 months. In such cases, ESA will accept a conditional commitment in the Project Agreement and Acceptance form, if this is accompanied by a defined date when a full commitment can be given. Based on such information, ESA will treat the proposal as being part of the Research Pool. However, the initiation of definition-, phase A or accommodation studies for the proposal, or other activities which will require more significant investments, will be delayed until a full financial commitment is available.

1.11 Project Implementation

After formal inclusion of a project in the Research Pool, the following steps will be initiated by ESA. As soon as possible, and at the latest within 1 year, a nominated ESA Project Scientist will initiate the writing up of a detailed Experiment Scientific Requirements (ESR) document together with the science team of a project that was selected and involving as well an instrument developer and an ISS operations manager. Once approved within ESA and signed by the science team, the ESR will become one of the



applicable documents to the contract that ESA will place with industry to study its development and implementation. The ESR may evolve in the course of the project realisation, keeping track of all changes agreed to it and including progressively more details of relevance to the following phase of the project (study-manufacture-testing-launch-in orbit operations-exploitation).

Although it is highly likely that successful proposers will be in contact with ESA on a regular basis as they prepare their experiments for flight, there might be occasions in the case of flight delays where such contact is not so regular. ESA shall strive to inform proposers at least on an annual basis of the status of realisation of the project.

Proposers should be aware that all projects that are in the ELIPS research pool are subject of a tri-annual review by the Life and Physical Sciences Advisory Groups.

2. Proposals: What to submit and how

2.1 Letter of Intent

To facilitate proposal processing, potential investigators are requested to confirm their plans to submit a proposal in response to this Announcement by submitting a Letter of Intent (LOI). The LOI is not binding.

Information on format and submission procedures are detailed in the Flight Experiments Information Package (FEIP)

2.2 Proposal Guidelines

The specification on how to accurately produce a proposal is described in the Flight Experiments Information Package (FEIP).

2.3 Proposal Workshop

As a means to guide proposers to submit a more complete and well written proposal, in addition to improving the possibilities of scientific team formation and networking, a Proposal Workshop will be arranged at ESA/ESTEC, Noordwijk, The Netherlands.

The workshop will take place on

June 22nd and 23rd

It is the intention that this workshop will allow for

- Answering questions related to the AO and review process, and to the various elements that should be addressed in a proposal



- Addressing technical issues related to the platforms or facilities offered
- Clarifying scientific matters
- Identifying potential partners working in the same domain with whom a joint proposal could be prepared.

In relation to the last point, ESA intends to distribute the information contained in the Letters of Intent received to the participants of the workshop in order to identify possible team members.

2.4 Submission deadlines

Letter of Intent
by
15th June, 2009

Final Proposal
by
14th September, 2009

2.5 Submission Addresses

The European Science Foundation (ESF) manages the science merit review, and proposals shall be submitted on-line as described in the Flight Experiments Information Package (FEIP).

National Funding Authority

In addition to submitting an on-line application to the ESF a paper copy of the Letter of Intent and the Proposal must be sent by the experiment proposer to the *national delegate to the ESA Programme Board of Human Spaceflight and Research* of his/her country or to the Life Sciences representative of the National Space Agency. This must be done by the same due date as the on-line application. The delegates/agency representatives are listed below.

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3 Additional Science Opportunities in upcoming Announcements

ESA also offers other types of life science opportunities.

[Sounding Rockets](#) provide excellent microgravity conditions for up to 12 min and experiments can be performed during this time. A separate AO is open in parallel to this one.

Continuously open Research Announcements:

Proposals on research activities using the platforms below, can be submitted at any time. Follow hyperlinks for further information.

[Ground-Based Facilities](#) can be used for space related science in a large variety of fields.

[Parabolic flights](#) are used to conduct short-term microgravity scientific and technological investigations, to test instrumentation prior to use in space and to validate operational and experimental procedures.

4 Points of Contact

Administrative questions regarding this Announcement of Opportunity may be directed to EsaPeerReview@esf.org

For questions related to programmatic or scientific aspects please contact:

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ESA e-mailing list

If you would like to receive information on future Research Announcements or announcements of symposia, conferences, workshops etc., you are invited to send an e-mail with your mailing details to ELIPS_AO_2009@esa.int