

→ 2 THE ACCESS PROCESS

2.1 Overview

This chapter presents the various routes by which interested users can access any of the four low-gravity platforms and/or utilise specific ground-based facilities, including bedrest capabilities. The focus is mainly on access through the European Space Agency (ESA) (section 2.2), but in addition, complementary routes for specific facilities are briefly summarised for completeness (see section 2.3). At regular intervals ESA issues so-called Announcements of Opportunity (AOs, also known as 'Research Announcements').

These form the official access route for institutional users to utilise the various research facilities that are managed by the ESA Directorate of Human Spaceflight and Operations. In addition to this "baseline" approach there is also a "fast track" Continuously Open Research Announcement route that may be followed for specific categories of research and mission platforms.

Students can also submit proposals to perform research on three of the low-gravity platforms and ground-based facilities, through the ESA corporate student projects (see section 2.2.7).

2.2 European Space Agency access routes

2.2.1 Periodic Announcements of Opportunity

Proposals are normally solicited through the Announcements of Opportunity (AOs), issued by ESA.

- ESA issues general AOs mainly for ISS experiments and sounding rocket experiments;
- dedicated AOs are issued mainly for bedrest studies, Concordia Isolation studies and radiation studies on a 1-2 year basis.

Some ESA research announcements are internationally coordinated with other ISS partners. International Announcements of Opportunity allow for a worldwide scientific competition and cooperation, by forming the best scientific teams, as well as offering access to an instrument pool from all ISS partners.

The contact details for submittal of proposals will be indicated in each respective AO. Users should refer to the following website for information on the latest Announcements of Opportunity:

www.esa.int/Our_Activities/Human_Spaceflight/Human_Spaceflight_Research/Research_announcements

Users usually have about three to five months to submit a proposal following an announcement, while another three to six months are required for the peer review process after submittal.

2.2.1.1 Contents of a proposal

The exact structure and contents of the proposal package will vary from AO to AO and will be defined in the AO text in detail. In general they will consist of the following:

Cover page

The cover page should contain:

- the complete title of the project;
- The name, telephone number, fax number and e-mail address of the project coordinator;
- the legal name and address of the project coordinator's organisation;
- full names of collaborators and their organisations;
- AO Reference number;
- the signature of the responsible official or authorised representative of the organisation or any other person authorised to legally bind the organisation.

Proposal abstract

A brief description of the application stating the broad, long-term objectives and specific aims of the proposed work. The abstract should concisely describe the research design and methods for achieving these objectives and aims. This is meant to serve as a succinct and accurate description of the proposed work when separated from the application. The abstract should not contain more than 300 words.

Project description

The Project description should be approximately 10 to 15 pages long using regular double-spaced text. The proposal should contain sufficient detail to enable a reviewer to make informed judgements about the overall merit of the proposed research and about the probability that the investigators will be able to accomplish their stated objectives with their own/ requested resources. The description must include:

- the scientific background and a clear explanation of the relevance of the proposed microgravity research;
- the schedule envisaged for performing this research.

Biographical sketches

For each key team member, a biographical sketch containing the following information must be submitted to ESA:

- name;
- position and title;
- education/training (including institutes and location, degrees, years attended, field of study);
- a brief summary of research and professional experience.

Facilities and equipment

This section describes the facilities and major items of equipment, available from the team members' institute(s), specially adapted or suited to the proposed project, and any additional major equipment that will be required. Before requesting a major item of unique equipment, coordinators should determine if sharing or loan of equipment already within the organisation is a feasible alternative to purchase. Where such arrangements cannot be made, the proposal should state this. The requirement for items that can be typically used for research and non-research purposes should be explained.

2.2.1.2 Proposal evaluation

The evaluation of submitted proposals is performed by Peer Review Boards. The list of Peers for each Peer Review Board are drawn up from the Peer Pool by ESA in consultation with the appropriate Working Group based on the sub-

disciplines represented in the Letters of Intent (in which potential investigators are requested to confirm their plans to submit a proposal in response to the announcement) and the final proposals received. The number of peers is determined such that each peer will have to review in detail a maximum of ten proposals, with a written report submitted before the Peer Review Board meeting. Concerning optimal composition of the Peer Review Board and optimal competence of its members the peers shall have good reputations and expertise in their own disciplines and no involvement in on-going space projects related to the proposals under review.

The confidentiality of the proposals by the reviewers is covered by:

- signature of a confidentiality agreement;
- agreement that certain parts of the proposal indicated by the proposer can only be viewed and not copied;
- recognition that certain parts of the proposal may have a specific commercial interest which shall remain confidential (in particular in case of application-oriented projects);
- respect of the intellectual property of the proposer.

The Chairman of the Peer Review Board and the Executive Secretary ensure that a written report is produced on the occasion of the final deliberations of the Peer Review Board, recording the overall assessment of the Board regarding each proposal and the comments of each Primary Reviewer regarding the proposals assigned to them. This written report is held in a secure file by ESA.

2.2.1.3 Evaluation criteria

The main selection criteria and the means to assess proposals against them are:

For all proposals:

- Scientific merit – assessed by independent peer review;
- Space relevance – assessed by independent peer review;
- Technical feasibility – in-house expert assessment (ESA).

Additionally, for application-oriented proposals:

- application potential – assessed by independent peer review.

2.2.1.4 Contacts

For general information regarding scientific access to the International Space Station and the other ESA sponsored low gravity platforms, users can contact the Head of the ISS Utilisation and Astronaut Support Department at the following:

Martin Zell

Directorate of Human Spaceflight and Operations
European Space Agency
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
Tel: +31 71 565 3597
Fax: +31 71 565 3042
E-mail: martin.zell@esa.int

For specific information regarding solicited proposals please contact the following ESA scientific coordinators:

Human Research:

Jennifer Ngo-Anh

Directorate of Human Spaceflight and Operations
European Space Agency
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
Tel: +31 71 565 8609
Fax: +31 71 565 3661
E-mail: Jennifer.Ngo-Anh@esa.int

Biology and Environmental Monitoring:

Jason Hatton

Directorate of Human Spaceflight and Operations
European Space Agency
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
Tel: +31 71 565 4059
Fax: +31 71 565 3661
E-mail: jason.hatton@esa.int

Physical Sciences:

Olivier Minster

Directorate of Human Spaceflight and Operations
European Space Agency
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
Tel: +31 71 565 4764
Fax: +31 71 565 3661
E-mail: olivier.minster@esa.int

For further information on payloads and non-ISS mission platforms contact the Head of the Payload and Platforms Division:

Josef Winter

Directorate of Human Spaceflight and Operations
European Space Agency
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
Tel: +31 71 565 8243
Fax: +31 71 565 3141
E-mail: josef.winter@esa.int

2.2.2 Continuously Open Research Announcement

In July 2004, ESA released a Continuously Open Research Announcement (CORA) for access to ground-based facilities (though also now encompassing drop towers and parabolic flights), which will remain permanently open until further notice. Scientists can apply to this announcement as the need arises according to the schedule of their ongoing research. The research announcement is open to all scientific disciplines, i.e. life sciences, physical sciences, and interdisciplinary sciences.

In order to better cope with the need to access CORA-related research facilities (incl. drop tower and parabolic flights) rapidly, ESA has implemented a fast track evaluation process. Given the substantial cost for ESA of a flight/drop tower campaign, this fast track will only apply when the scientific or technical objectives can be achieved within one single campaign. This will only apply for proposals with a maximum cost for ESA of 50 000 Euros, and users must include certified supporting budgetary information in the proposal.

For the evaluation of fast-track proposals, ESA will make use of its Life and Physical Sciences Working Groups together with an in-house feasibility assessment. For interdisciplinary proposals relevant expertise from the two working groups may be sought. For this fast-track process, the proposal coordinator may expect to receive confirmation of selection/rejection of his/her proposal within a period of two months.

Any scientists from the 15 ESA Member States participating in the ELIPS programme (en.wikipedia.org/wiki/ELIPS:_European_Programme_for_Life_and_Physical_Sciences_in_Space), either from the academic or industrial sector, may apply to the announcement. Nationals from other ESA Member States may participate in proposals as team members. The latter should consult with their own national authorities regarding intentions to participate in future phases of ESA's ELIPS programmes. Nationals from other countries, and in particular ISS partners (Japan, Russia and the United States), should consult with their national space agency on their intention to support participation in a project.

For further information about ELIPS, users can read the following brochure:

esamultimedia.esa.int/multimedia/publications/BR-300/pageflip.html

The proposal form for users wishing to apply to the Continuously Open Research Announcement can be downloaded at the following website:

www.esa.int/Our_Activities/Human_Spaceflight/Research/Research_announcements

2.2.2.1 Work package breakdown and financial form

The users should summarise all activities and costs into work packages, preferably in tabular format. Each work package (WP) description should include the following:

- WP number;
- WP Title;
- name of responsible institution;
- start and end date;
- costs related to manpower, travel, equipment and consumables;
- WP task description;
- description of WP deliverables.

A detailed cost proposal for each individual team member as well as the overall budgets for the whole project covering the first three years of the project - all funded by the team members' institute(s) - must also be submitted.

2.2.2.2 Evaluation criteria

In order to facilitate both the writing of the proposal and the evaluation process, evaluation criteria have been used to organise and structure the proposal form. When necessary, notes within the body of the text are added to provide a clear and satisfactory description of the five selection criteria. These five criteria are standard in any ESA research announcement and are summarised as follows:

- addressing the general objectives of the continuously open call and justifications for experimenting in space-simulating conditions;
- scientific and technical aspects;
- qualification of the coordinator and partners related to the tasks and added scientific value from the consortium and international approach;
- management;
- mobilisation of resources.

On a scale of 1 to 5 (where 5 represents “Outstanding”), a minimal score for criteria 1, 3, 4 and 5 is set to 3/5, and for criterion 2, it is set to 4/5. Weighting is identical for all five criteria. Following confirmation of selection and readiness for support by ESA, the project coordinator should provide a Letter of Acceptance stating that all necessary resources will be made available to conduct the experiment. Failing to provide this letter within six weeks after notification by ESA will lead to automatic deselection of the proposal.

For further information regarding the five scientific and administrative aspects of this research announcement, users are requested to visit the following website for detailed information:

www.esa.int/Our_Activities/Human_Spaceflight/Research/Research_announcements

2.2.2.3 Contacts

Programmatic questions regarding the Continuously Open Research Announcement process may be addressed to:

Jennifer Ngo-Anh

Directorate of Human Spaceflight and Operations
European Space Agency
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
Tel: +31 71 565 8609
Fax: +31 71 565 3661
E-mail: Jennifer.Ngo-Anh@esa.int

For further information on parabolic flights contact the ESA Parabolic Flight Coordinator:

Vladimir Pletser

Directorate of Human Spaceflight and Operations
European Space Agency
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
Tel: +31 71 565 3316
Fax: +31 71 565 3141
E-mail: vladimir.pletser@esa.int

For further information on the ZARM drop tower contact:

Ewald Kufner

Directorate of Human Spaceflight and Operations
European Space Agency
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
Tel: +31 71 565 3786
Fax: +31 71 565 3141
E-mail: ewald.kufner@esa.int

2.2.3 Access for Media

Media wishing to attend any of the low gravity platform campaigns or to learn more can contact the ESA Communication Office:

Rosita Suenson

ESA/ESTEC Communication Office
Tel: +31 71 565 3006
Fax: +31 71 565 5728
Email: rosita.suenson@esa.int

2.2.4 Introduction to coordinated research

Europe, having long-term and consistent programme planning, has established itself in an excellent and internationally recognised position for utilising the ISS for scientific research, technological development and space-based demonstrations. The ELIPS research pool focuses on life and physical sciences but the European ISS utilisation portfolio also encompasses specific elements from some other research and technology domains. The aim of the ELIPS programme is to build on foundations and investments already made and to implement research projects that have already been selected to the maximum extent possible.

The main goals of the ELIPS programme are:

- to provide Europe with a solid basis for achieving major progress in consistent and focused fundamental research in life and physical sciences in space.

The research lies within the following six main research disciplines as established in earlier programme periods and supported by several studies:

- fundamental physics;
 - materials sciences;
 - fluid physics and combustion;
 - astrobiology;
 - biology;
 - human physiology and performance.
- to facilitate applied research and industrial R&D, addressing societal needs in, for example:
 - supporting the understanding of biological mechanisms and organ functions as well as the development of diagnostics and novel treatments for age-related human diseases;
 - supporting the development of new, advanced materials for a variety of industrial applications including new energy sources and reducing energy needs;
 - supporting the implementation of industry-driven R&D and technology demonstrations, allowing end- user industries to benefit from research exploiting the specific features of the Columbus environment and other platforms.
 - to enable research and technological development for human exploration in the areas:
 - radiation biology and physiology;
 - health care and human performance under extreme conditions;
 - on-orbit analysis technologies;
 - food production in space;
 - fluids processing in space;
 - materials exposure and advanced materials
 - space technology testing;
 - educational activities, exploiting the ISS and using the European astronauts as ambassadors of science and technology towards the younger generations.

The above research goals of ELIPS are being achieved through continuing optimal use of the European Columbus laboratory and the European resources and capabilities available on the International Space Station, complemented by a suite of autonomous European mission capabilities for performing microgravity- or

radiation-related research. A range of free-fall times is offered from seconds in a drop tower and parabolic flights, to minutes in sounding rockets, and unlimited on the ISS. Results from space-borne research are significantly amplified with various ground-based facilities, notably in the area of human research with bedrest studies in France and Germany and isolation studies at the Concordia station in Antarctica.

2.2.5 Topical Teams

An important ingredient of the ESA strategy towards research is the concept of Topical Teams of European scientists that perform preparatory activities during an “incubation phase” in anticipation of an Announcement of Opportunity.

Topical Teams:

- anticipate on the long-term development of research in their topic and seek synergies between similar single experiment proposals and science teams;
- assess the relevance of the space environment as a tool for investigations and determine the specifications of the instruments required for such investigations;
- identify industries that could benefit from the envisaged research and associate them with the definition of the objectives and the strategy of a space relevant project;
- assess the relevance of the project to the Framework Programmes of the European Commission and ultimately submit high level research programme proposals in association with their industry partners to ESA in response to regular Announcements of Opportunity and, in parallel, to the European Commission as appropriate.

More than 30 different Topical Teams are currently active in both life and physical sciences and one of the objectives of AOs is to enable them to formulate and submit high-level joint research programme proposals that result from the incubation phase. It should be noted that Topical Teams are open structures so that interested scientists can contact their coordinators at any time and seek to join any of the active teams.

For more information regarding Topical Teams, users can consult the following web site:

www.esa.int/Our_Activities/Human_Spaceflight/Research

2.2.6 Fundamental and applied research projects

With Announcements of Opportunity (AOs), ESA solicits research programme proposals. These have a space experimentation element aiming at critical advancements of knowledge in various scientific disciplines. Projects in space use the unique environment to perform critical experiments that are either very difficult to realise on the ground, or not achievable to a sufficient level of accuracy. The scientific approach developed by the projects should be such that no ambiguity remains as to which parameter has influenced the difference in measurements.

This calls for a detailed analysis of the environment that prevails in space in comparison with that on the ground, and its effect on the process or phenomenon under investigation. The end results should enable scientists to challenge or validate current theories and stimulate further development towards a better understanding of fundamental principles.

There is an overall strategic objective of the Microgravity Applications Projects (MAP) within ELIPS. It should involve industry, encouraging application-oriented research on the ISS and other mission platforms, for application-oriented research and, if applicable, for industrial R&D.

The objective is to develop projects in order to, among other things:

- optimise applied ground-based processes;
- generate benchmark data and materials samples and physical processes relevant to industrial R&D;
- investigate biological or physiological changes associated to long-duration spaceflight, which are of interest for clinical applications on Earth;
- investigate the basic role of gravity in cell differentiation and organisation, and the application potentials in biomedicine.

The development of MAP projects takes into account the following key elements:

- support is provided during the full cycle of definition and development of dedicated flight experiment hardware, flight and operation, results analysis and exploitation;
- the period leading up to the actual generation of relevant results on the ISS to be already productive and of benefit to industrial participants. (Ground-based research is supported and preparatory or precursor flight experiments are adequately planned);
- full and fair Intellectual Property Rights protection to be assured for all partners, be they from academia or industry.

Beyond the nominal support as previously described, ESA's MAP programme financially supports more than 30 projects in physical sciences, life sciences, and interdisciplinary sciences. These projects involve industry in the definition of their objectives.

All running projects have demonstrated to industry how ground-based research complemented with well-focused space-borne experiments and measurements can generate unique results of significant interest to their own R&D. A number of features of the running MAP projects are being extended to fundamental research projects - striving towards excellence in research in space.

All proposing MAP teams should identify the most effective way of achieving the goal of the project. This encompasses a final phase during which the outline of the experimental programme (including the detailed definition of the instrument and the selection of the best-suited carrier) is consolidated on the basis of extensive ground-based testing and modelling. It also includes an implementation phase during which the space experiment is developed by space industry, launched and operated in space. Finally it includes an exploitation phase for the complete analysis of all results and their synthesis. Each member of a team is expected to define in detail their unique contribution to the project and at which particular stage during the project.

2.2.7 Commercial access

2.2.7.1 The Open Call for Commercial Proposals

The mechanism set up by ESA for soliciting commercial projects related to the ISS is called “Open Call for Commercial Proposals”. The Open Call is a permanent and non-prescriptive call, which allows potential commercial users to submit business ideas which aim at the commercial utilisation of the ISS.

There is a very broad range of commercial ideas. Particular characteristics of the projects concerned are considered on a case-by-case basis. Specific technical aspects, compliance with ISS rules, ESA public image or financial aspects need to be taken into account as well.

2.2.7.2 The Commercial Proposal – structure and content

The accepted response to the Open Call is the submission of a written Commercial Proposal. These must contain the following information:

- background information on the utilisation/commercial objectives;
- type and quantity of required ISS services and resources;
- desired conditions for procurement of such services (e.g. schedule, exclusivity rights, etc.);
- proof of finance for the project;
- information on company and project management;
- risk assessment.

The Commercial Proposal should always clearly describe the project, its objectives, its on-ground and on-board plan of activities and the project’s organisational structure.

2.2.7.3 Evaluation procedure

The proposals will be evaluated by independent internationally recognised experts, known as ‘peers’, on scientific, applications or technological merit, in addition to its space relevance. The technical feasibility assessment includes an analysis of accommodation possibilities on board the ISS as well as a verification of the availability of required resources and flight opportunities. Peers are appointed by ESA, delegated entities and/or by the other ISS partners in the

case of international AOs. As a result of the peer review, all proposals are marked to an absolute scale with a selection threshold (recommended or not recommended). The peers remain anonymous, and are bound to confidentiality and have to declare non-interest in the proposals. The final selection and approval for implementation of the submitted proposals is taken by the ESA Programme Board for Human Spaceflight taking the result from the peer review into account.

2.2.7.4 Contract negotiation – Intellectual Property Rights (IPR) and marketing rights

Each contract must be tailored to address the specific contents, terms and conditions associated with each project. Among the various elements that the contract will address are the Intellectual Property Rights and Marketing Rights that the commercial user will acquire.

Intellectual Property Rights (IPR)

The data resulting from activities undertaken on board the ISS are one of the key deliveries of commercial projects, especially in the case of industrial R&D projects. Different from the institutional access, the commercial route ensures the ownership to the commercial user of the Intellectual Property Rights that may be generated under the project. This prevents the dispersion of the intellectual properties and related economic benefit to different parties.

The intellectual property regime will depend fundamentally on the financial balance of the project:

- if the commercial user does not pay the 100 % of the utilisation costs and has been granted ESA support, the commercial user will have the ownership of the information, data and IPR resulting from the project, but ESA will retain access to and use of this information, data, and IPR. The rights of access and use of ESA will be subject to negotiation to secure the payment to ESA of either:
 - royalties on the exploitation of such information, data and IPR; or
 - fees in relation to the in-cash or in-kind support granted by ESA.

Marketing rights

Marketing rights include those rights that are related to the act or process of promoting and selling products or services. Commercially-oriented projects often exploit image association and use the association for commercial purposes - therefore marketing rights become crucial. If a contract excludes the marketing rights, the commercial user may still have the right to use pictures or video footage taken onboard the ISS for their own internal use for scientific purposes. However, by negotiating the marketing rights, the commercial user may also obtain the right to use pictures or video footage for commercial publication and advertising. This must always be done in full consultation with ESA.

Most of the time, the subject of such pictures and video footage are ESA astronauts, which as ESA staff members are subject to ESA rules and regulations. In addition, ESA astronauts are bound by the European Astronaut Policy that contains specific provisions related to commercial activities and by ISS partnership rules. If certain conditions of acceptability are met, commercial users can benefit from the commercial exploitation at corporate as well as at product level of the personal image of ESA astronauts (name, voice and physical appearance). Terms and conditions are carefully set out in the contract and ultimately require the informed consent of the astronaut concerned. In addition, the commercial user could also acquire the right to use the ESA official emblem or one of the trademarks owned by ESA to promote the selling of its products or services.



Image 2-1: The Large Diameter Centrifuge at ESA-ESTEC

In all cases, the activities foreseen have to be compliant with ISS and image rules. The ISS image represents the value of ISS as perceived by the public at large, users, governments and other institutions. Among others, ESA will never be associated with activities that promote any of the following: alcohol, tobacco, religion, politics, intolerance, obscenity, violence or gambling, nor violate laws or morals.

For further information on commercial access to the International Space Station contact the Head of the ISS Utilisation and Astronaut Support Department:

 **Martin Zell**
Head of ISS Utilisation and Astronaut Support
Department
Directorate of Human Spaceflight and Operations
European Space Agency
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
Tel: +31 71 565 3597
Fax: +31 71 565 3042
E-mail: martin.zell@esa.int

2.2.8 Student access

2.2.8.1 Centrifuge

The 'Spin Your Thesis!' programme gives university students the opportunity to perform a scientific or technology experiment, which is linked to their syllabus, by participating in a centrifuge campaign that provides hypergravity conditions.

Up to four student experiments are carried out each year during two weeks in the Large Diameter Centrifuge facility at ESA's European Space Research

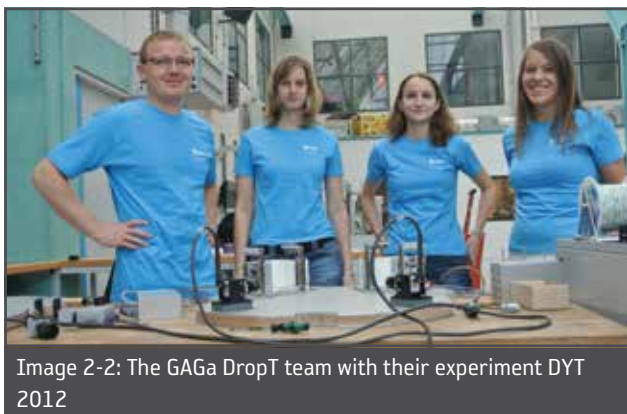


Image 2-2: The GAGa DropT team with their experiment DYT 2012

and Technology Centre (ESTEC) in Noordwijk, the Netherlands. The diameter of the centrifuge is eight metres. It has four arms, each of which can support two gondolas with a maximum payload of 80 kg per gondola. This facility allows the acquisition of measurement points in the range from 1 to 20 g (where g is the gravitational acceleration at the surface of Earth).

For the current status and further information please visit ESA's Education website at the following address: www.esa.int/Education/Spin_Your_Thesis!_programme

or contact ESA's Education office at spinyourthesis@esa.int

2.2.8.2 Drop tower

The 'Drop Your Thesis!' programme gives university students the opportunity to perform their own scientific experiment in microgravity conditions, as part of their Bachelor's, Master's or PhD thesis or research programme, by participating in an ESA-sponsored campaign at the 146 metres high drop tower facility of the ZARM Centre of Applied Space Technology and Microgravity and operated by the ZARM Drop Tower Operation and Service Company in Bremen, Germany.

Each year one student team performs five 'flights' in simple dropping mode or in catapulting mode, offering respectively 4.74 seconds and 9.3 seconds of microgravity.

For the current status and further information please visit ESA's Education website at the following address: www.esa.int/Education/About_Drop_Your_Thesis

or contact ESA's Education office at dropyourthesis@esa.int

To familiarise potential student users with the drop tower concept (see chapter 4) and providing a tool for demonstrating a weightless environment to school pupils, the Erasmus Centre provides a drop tower demonstrator, erected in its High Bay area. The tower is a 13 metres woven metal structure, providing 1.5 seconds of microgravity. Drop tests can be carried

out in the inner payload bay of the cylindrical capsule surrounded by an aerodynamic protective outer shield. At the base of the tower, a 1.75 metre deep pit filled with PVC lentil-shaped objects breaks the fall of the experiment capsule.

For more information about the drop tower demonstrator please have a look at paragraph 3.2.20 (drop tower demonstrator) in chapter 3 (Ground-based facilities).

For more information about experiment opportunities on the drop tower demonstrator please contact the Corporate Education Office via nigel.savage@esa.int

2.2.8.3 Sounding Rocket and Stratospheric Balloons

Each year, the REXUS and BEXUS (Rocket & Balloon EXperiments for University Students) programmes offer opportunities for university student experiments to be flown on two sounding rockets and two stratospheric balloons. Each flight carries a payload consisting solely of two to five student experiments.

The REXUS/BEXUS programme is realised under a bilateral Agency Agreement between the German Aerospace Center (DLR) and the Swedish National Space Board (SNSB). The Swedish share of the payload has been made available to students from other European countries through collaboration with ESA.

EuroLaunch, a cooperation between the Esrange Space Centre of the Swedish Space Corporation (SSC) and the Mobile Rocket Base (MORABA) of DLR, is responsible for the campaign management and operations of the launch vehicles. Experts from ESA, SSC and DLR provide technical support to the student teams throughout the project.



Image 2-3: REXUS 13 teams

The BEXUS balloon has a volume of 12,000 m³ and a diameter of 14 m when filled. The total mass available for the experiments is between 40 and 100 kg. The maximum altitude is 35 km and the flight duration is 2-5 hours.

For more information about sounding rockets, please take a look at chapter 6 of this guide.

For the current status and further information please visit the REXUS/BEXUS website at the following address:

www.esa.int/Education/Rocket_Balloon_Experiments_for_University_Students

or contact ESA's Education office at rexus-bexus@esa.int



Image 2-4: Dutch ESA astronaut André Kuipers and the SPHERES robots

2.2.8.4 International Space Station

European ISS robotics

SPHERES - short for Synchronised Position Hold, Engage, Reorient, Experimental Satellites – are internal volleyball-sized satellites that have their own power, propulsion and navigation systems that come to life on the International Space Station, following commands from students on the ground. European students are invited to create programmes to make the mini-satellites revolve, spin, move and hover. Volunteer mentors will help the youngsters to control the droids on the ISS.

For the current status and further information please visit the ESA Education website at the following address:

www.esa.int/Education

or contact the Corporate Education Office via nigel.savage@esa.int

European Astronaut Corps

The members of the European Astronaut Corps are ambassadors for the benefits of spaceflight. The astronauts participate in countless public relations activities, conferences, scientific lectures and educational activities sharing their unique experiences with the audience and thus shaping the overall attitude towards science in general and spaceflight in particular.

2.3 Complementary access routes

2.3.1 Drop towers

2.3.1.1 Funding via national agencies

Researchers can also get access and obtain funding from their national agencies. This can either be a full funding covering the use of the drop tower, the experiment hardware development, the related lab activities, the travel costs and accommodation, or it can be a partial funding together with ESA. In the latter case, ESA will provide users with access to the drop tower for utilisation, while the national agency (or user's institute) has to cover the costs related to hardware development, testing and other lab activities. For this type of access researchers should contact their respective national agencies.

2.3.1.2 ZARM funding

The ZARM Drop Tower Operation and Service Company GmbH (ZARM-FAB) offers up to 10 drop tower experiments per year free of charge to researchers from universities and industry.

Conditions

To request funding directly from ZARM, all of the following conditions must be satisfied:

- no funding for drop tower use from other sources;
- the experiment requires no more than 9.4 seconds of reduced gravity ($<10^{-5}$ g);
- the experiment can be performed in agreement with the guidelines laid out in this document;
- the experimental hardware core already exists or will be provided by the experimenter;

- the applicant must cover travel and accommodation expenses.

Support and services

If the experiment proposal is accepted, ZARM-FAB will provide the following support and services:

- engineering support for design and adaptation of experimental hardware;
- technical support concerning functionality and safety;
- one drop capsule - standard platform;
- integration of the experiment into the drop capsule;
- access to standard equipment (e.g. video cameras, video recorders, capsule computer system CCS, etc.);
- access to laboratory;
- up to ten drops;
- supporting the publication of results.

Applications

The application package must include:

- a) A description of the experiment, with the emphasis on:
 - a clear explanation of the objectives;
 - the scientific relevance;
 - the microgravity relevance;
 - the probability of collecting quantitative results;
 - the qualification and experience of the applicant;
 - the compatibility of the relevant time constants with the conditions offered by the drop tower.
- b) A sketch or technical drawing of the set-up

2.3.1.3 Co-funding through DLR

The main user of ZARM-FAB GmbH is the German Aerospace Center (DLR), which is also the German national space agency. For this reason, cooperative projects with German research institutes and/or scientific groups could lead to co-funding via DLR. For more information users should contact ZARM (see drop tower chapter for contact coordinates or www.zarm.uni-bremen.de).

2.3.2 Parabolic flights

2.3.2.1 Funding via national agencies

In addition to the ESA ELIPS programme, national agencies can sponsor parabolic flight campaigns on their own and researchers can therefore access parabolic flights via these campaigns. The German (DLR) and French (CNES) national space agencies perform their own parabolic flight campaigns at a European level.

The European Space Agency performs about two parabolic flight campaigns per year within ELIPS. When access is obtained via the European Space Agency, ESA will only provide the user with a “flight ticket” for a parabolic flight campaign. All other costs related to hardware development, testing, lab activities, travel, subsistence etc., must be covered by the user’s national agency or their affiliations/institutes. Users are advised to contact their respective national agencies for further details.

2.3.3 Sounding rockets

2.3.3.1 Funding via national agencies

In addition to ESA's ELIPS programme, the German and Swedish space agencies have in the past been the only national agencies in Europe that have funded their own sounding rocket campaigns or their own payloads. Therefore, researchers of German or Swedish nationality can apply to gain access to sounding rocket missions for their experiments via their national agencies.

