Feeling Free, Feeling 0-g!

- The Fifth ESA Parabolic Flight Campaign for Students

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Introduction

Following the great success of the Student Parabolic Flight Campaigns that it organised in 1994 and 1995, ESA decided to make them an annual event for students from the Agency's Member States. An initiative of ESA's Education Office, the campaigns give talented students a unique opportunity to experience weightlessness whilst performing their own scientific experiments, and hopefully encourage them to consider pursuing a career in space.

The fifth Student Parabolic Flight Campaign (SPFC) took place from Bordeaux-Mérignac Airport in southwest France in the first weeks of September 2002, with more than 120 students participating. Their thirty-two experiments had been selected in a Europe-wide competition and covered a wide variety of disciplines. The great enthusiasm shown by the students and the wide coverage that the campaign received in the media demonstrated the growing interest in space education and the promotional value of the campaign.

The Selection Procedure

The selection procedure for the 5th SPFC took place in three phases. In Phase-1, launched in October 2001, students were invited to apply individually. Phase-2, launched in January 2002, solicited applications from teams of four students (aged 18 to 27 years), who were asked to provide an outline of their experiment and the name of their academic professor endorsing it. Phase-3 was launched in February 2002, when the teams were requested to describe their experiments in detail, as well as the major parameters of the equipment to be used. They were also asked at that stage for information about the journalist which each team had to nominate to accompany them.

ESA and Novespace (the operator/ manager of the A300 Zero-G aircraft to be used) then assessed the experiment descriptions submitted by the student teams. Thirty-two experiments were selected for the campaign based on their originality, technical complexity and the degree of outreach that would be achieved by the team. They were divided over two weeks of parabolic flying, with 16 groups taking part each week.

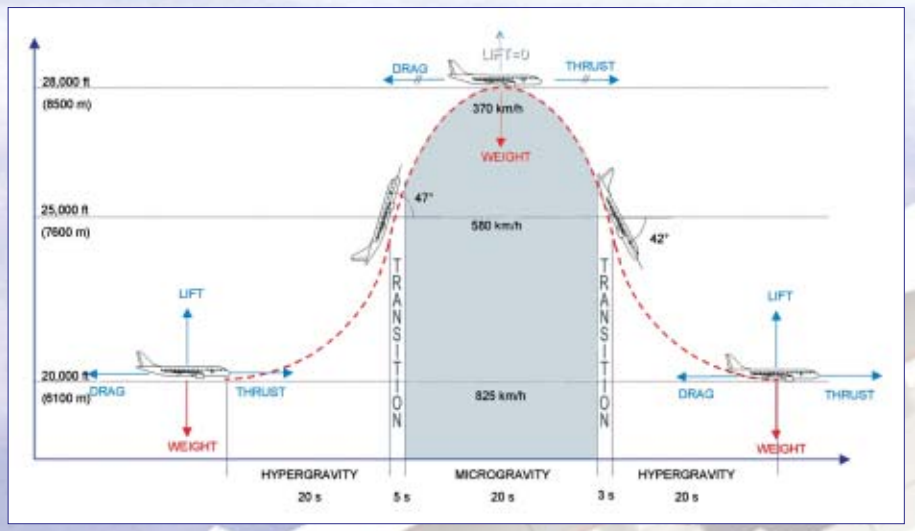
Table 1. Geographical distribution of the SPFC 2002 experiments

Germany	9
The Netherlands	1
United Kingdom	3
Spain	3
Finland	1
Switzerland	2
Belgium	1
Sweden	1
France	5
Italy	3
Poland	1
Portugal	1
Denmark	1

Preparing the Campaign

Since aircraft parabolic flights are officially classed as 'test flights', specific precautions must be taken to ensure that all flight operations are performed safely and that the 'passengers' are adequately prepared for the quickly repeating cycles of high and low gravity that they will experience.

Prior to the campaign, Novespace and the French Test Flight Centre (Centre d'Essais en Vol, CEV) provided support in the design of the test equipment and related safety aspects. Several months before the campaign began, experts reviewed all of the experiments to be conducted and all of the equipment to be installed aboard the aircraft, from the structural, mechanical, electrical, safety and operational points of view. Technical visits were made to the students' institutes to check on the progress/status of each experiment, to give advice where needed, and where necessary to suggest modifications or additions to each experimental set-up. A safety review was held one month before the flight campaign began to assess the overall status of each experiment.



The mechanics of the parabolic-flight procedure

In the week before flight, the experiments were made ready and checked out in the workshop supplied by Novespace, before being installed in the A300 aircraft. During this preparatory process, the students in the different teams had ample opportunity to exchange ideas about the various experiments that they were going to conduct.

Before the first flight, the Airbus aircraft also received a full safety check to verify that all of the equipment that had been installed complied with the appropriate safety standards. All of the students whom ESA selects to participate in its parabolic flights have to pass a special medical examination tailored for such flights. All such certifications are checked prior to the first flight of the campaign. For experiments to be conducted on human test subjects, the ESA Medical Board reviews the medical protocols to ensure that the proposed research will be conducted in accordance with the ethical rules and the safety rules applicable for space flights.

The Flight Weeks

Since the 32 experiments were divided over two weeks of flying with two flights each week, each experiment was flown twice, with two students working on the experiment on each flight. During a pre-flight safety briefing, the procedures for a parabolic flight, the emergency procedures, and all of the experiments to be conducted were explained by CEV personnel to all of those taking part - students, journalists and ESA staff.

During the flights, specialised CEV personnel supervised and supported the experiment operations. In addition, there was a flight surgeon on board to monitor the medical aspects of the in-flight operations and to assist any students suffering from motion sickness due to the rapid gravitational changes. In an attempt to counteract this problem, a 'familiarisation flight' has been introduced during which the students are given a short five-parabola flight whilst staying in their seats with their seatbelts loosely fastened. The most sensitive students are then recommended to fly during the second rather than the first parabolic-flight day. Whereas previously some 30% of the students would be sick, since the introduction of the familiarisation flight this number has fallen to less than 10%. Anti-motion-sickness medication is also made available to the students before their flights.

A standard flight lasted about three hours, allowing 31 parabolas to be flown. The outcome of each flight was reviewed in a formal debriefing during which the aircrew gave their assessment of the flight and the student teams reported on their experiments.

Outreach

Each student team had to provide outreach material (web page, presentation, media) concerning their experiment. In addition, approximately 20 journalists participated in the campaign, representing television, radio, newspapers and scientific magazines. Hence the students' experiments are not only often fundamentally new and exciting, but can also become front-page news!

Table 2. Affiliations of participating journalists

Kupla Media	Finland
Polish Television	Poland
BBC Tomorrow's World	UK
Terra-Lycos Networks	Spain
Welt der Wunder	Germany
Libération	France
Portugal National TV	Portugal
Le MatinE - 24 Heures	Switzerland
VRT	Belgium
The Irish Democrat/ The Independent	Ireland
Süddeutsche Zeitung	Germany
Journal l'Alsace	France
Natuur & Techniek/Ingenieur	The Netherlands
Raumfahrt Concret	Germany
Star Observer	Germany

Conclusion

The 5th ESA Student Parabolic Flight Campaign was a great success, with the participating students experiencing the thrill of weightlessness for the first time. It also gave them the chance to work and exchange ideas with their contemporaries from other European countries, resulting in the creation of a network of contacts and plans for a 'Parabolic Flight Participants Club'.

At the end of the Campaign, all of the students received a special certificate attesting to their participation. For the two best student experiments, there will be the opportunity to participate in ESA's Professional Parabolic Flight Campaign in March/April 2003. In addition, the ESA Education Office, in co-operation with the ESA's Directorate of Human Spaceflight and Microgravity (D/MSM), is offering microgravity-related student experiments a chance to fly on the Russian Foton recoverable capsule. In the future, selected student experiments will also be eligible for flight on the International Space Station.

By learning from each other's experiments and through their unique personal experience of weightlessness, the students who participated in this Campaign have become ambassadors for microgravity research and its applications, with a strong interest in space. These young people will be a part of the next generation to make use of future microgravity research opportunities and to implement many of today's far-reaching plans in space.

Further information can be found at: www.estec.esa.nl/outreach or www.esa.int/education

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