

The International Space Olympics

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The International Space Olympics is a competition for youth aged between 14 to 18 years, to compete in space themed academic challenges in the fields of space research, mathematics, physics, computer programming and creative space literature. The competition attracts over two hundred and fifty youth each year, in teams from countries including Russia, the USA, Germany, Greece, China, Kazakhstan, United Kingdom and Australia. The year 2007 marks the 15th International Space Olympics to be held in Korolev Russia. The International Space Olympics is a proven vehicle of space outreach and education that can serve as an effective model for inspiring students and the present generation to actively pursue space research and exploration.

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1 Introduction

There are numerous events around the world that are custom designed to challenge and stimulate young people. They come in all shapes and sizes; as local, state, national and international events; they cover all age ranges from primary years to university undergraduate levels; they encompass all subject and thread domains from spelling bees to space station design; they are integral in all areas of formal, informal and non-formal education and are initiated and supported by local, single, multiple facilitators from enthusiastic teachers, to state boards, government departments, research institutions, business and industry. They are all special in their own right and offer knowledge and skill challenges to young people. The International Space Olympics opens minds to new challenges, to the benefits of team work and international co-operation, to career opportunities in science, engineering and medicine in specialist and associated fields, in industry and research that students never dreamed existed.

1.1 The Origins of the Space Olympics

The origins of Space Olympics lie in Korolev, Moscow, Russia. They were created in 1992 by Alexander Martinov, one time Director of Mission Operations, Rocket Corporation Energia and presently head of International Relations for the City of Korolev. He was assisted by space industry giant Rocket Corporation Energia Corp in 1992, with the project being fully supported [1] by the city of Korolev, and the famous “Star City” Gagarin Cosmonaut Training Centre and Korolev schools.

The Olympics were designed to stimulate 14-18 year school-students preparing for university courses, to encourage, identify and retain the best of students into much needed disciplines. The ultimate prize of free entrance to one of Moscow’s most prestigious science and engineering universities for a Russian student is highly valued. Later, the competition was opened internationally [2] for all students to compete against each other.

1.2 The International Space Olympics

The International Space Olympics brings three hundred young people together in teams from twenty-five countries including Russia to compete for a week in Korolev, Moscow. They are from many cultural, social, academic and pedagogical backgrounds. They compete equally in several fields, including written examinations in mathematics, physics, philosophy, literature and computer programming. In addition the students are required to undertake a full research project and to present it both as a written paper and as an oral presentation in both Russian and English. Each Russian and International winning team has their research project published in a Russian or international science journal.

The judging panel numbers some 20 experts chosen [2] for their experience in education, academia, engineering, the space industry and research. They are chosen from both Russian and international bodies and all mark to the same given criteria.

The week begins with the students’ oral presentations. They are classified according to category. They include space science, planetary exploration, astrophysics, technology transfer, life sciences, human space flight and space medicine. Students offer a diverse selection of research projects. 2006 topics included “Sling shot maneuvers around black holes”, “Using cobalt in stellar spectra for star type classification”, “Orbital space tourism”, “An astronavigation system for interplanetary travel”, “Earth observation and disaster management”.

During these sessions students present their paper to the judging panel composed of a minimum of three different 'expert' judges. International students are assessed apart from Russian competitors at this stage although the judges are from both Russian and international backgrounds the presentation is appraised on academic content, balance of argument and relevance to recent research etc. The presentation is followed by a short rigorous viva that examines student's wider contextual knowledge and understanding of the topic.

Each category produces one bronze, silver and gold medalist. All gold medalists including Russian competitors re-present their research project to a full 20+ judging panel for Best All Round Research Medal. The presentations are made in front of all Olympians as well as the full compliment of Russian and international judges. The procedure is as before. Presentations are delivered in both Russian and English and are followed by a demanding question and answer session from across the judging panel. All judges mark to the same given criteria. Medals are awarded from ranked average totals. The Best All Round Research final produces three winners, bronze, silver and gold. An additional academic research prize is awarded at the discretion of the cosmonaut corps as the 'Cosmonaut's Prize' for research most relevant to present space needs.

The research projects are followed closely by the written papers. Each 4 hour specialist subject paper requires in-depth knowledge and problem solving skills.

The international level of the competition [2] was enhanced in 2006 with the first international judging panel of twenty space scientists, cosmonauts and education specialists.

1.3 Industry Support

Energia Corporation is a proactive supporter of the ISO. Senior staff including the Chief of Space Vehicle Design takes a major role in the hosting and running of the Olympics. Cosmonauts, Scientists and engineers from the Gagarin Cosmonaut Training Centre, Moscow University and Energia work with teachers from local secondary schools in the City of Korolev in the writing and moderation of examinations in the respective events. All examination papers are then moderated by an International panel of the competing countries. The process is designed to accommodate differing year level, skill and knowledge requirements of each national school curriculum. To assist national teams to evaluate the style and level of examinations past papers are available in English language from the ISO Organizing committee [1].

2 Space Research Project

Each competitor is expected to compete in the space research section of the Olympics. The project typically takes 3 months to research and is presented both in writing and orally before a panel of twenty judges. The judging panel of space scientists, engineers, and cosmonauts. The oral presentations of ten minutes in English and ten minutes in Russian. The winning team of the space wins a visit to ISS Mission Control at Energia to view actual operations. In 2006 the winning Australian team arrived just in time for a live Soyuz and ISS docking.

The Australian team research projects shown in Table 1, were innovative and original in that they were selected by the competitors after they had individually researched existing challenges and problems facing the exploration of space. Emphasis was placed on simplicity and ability to practically prove the validity of the hypothesis.



Fig. 1. The 2006 Australian Team member Sarah Connell in the four hour physics event, Korolev Russi.

Table 1. Topics presented by Team Australia in the 2006 ISO, Korolev, Russia

Discipline	Topic	Overall result
Space Medicine	The effect of pure oxygen on the clotting of blood plasma	Cosmonauts Prize, and overall Gold Medal
Space Technology	A personal Fire extinguisher for use on the ISS	Gold Medal in Discipline
Planetary Exploration	An inflatable beach ball Mars Rover for soil sampling	Bronze Medal in Discipline
Human Space Flight	An adaptive space glove for EVA	Gold Medal in Discipline
Space Medicine	Control of airborne bacteria in a microgravity environment	Bronze Medal in Discipline

3.0 Scouts and Guides

Why Scouts and Guides? Governments, Professional Associations and Corporations invest millions of dollars per annum in developing profile with local schools and education as part of their outreach programs. These schemes rarely reach more than a few thousand youth. It is recognized and observed that when a corporate entity embarks on these outreach programs they do so with good will and best intent. They tend to use local formal schools and government as vehicles for their communication program. By default they become communication rather than education. They embark on an outreach that is limited by their immediate partnerships and as a result provide erratic spot focused programs and material.

Few organizations are aware of the potential and value added outreach that lies within their grasp. This is through no fault of their own as these avenues are well disguised to the immediate observer. Few people realize that the combined family of the World Organization of the Scouting Movement (WOSM) and the World Association of Girl Guides and Girl Scouts (WAGGGS) has a combined membership of over 40 million members spread through 155 countries. Endorsed by Royalty, the United Nations and National Governments WOSM and WAGGGS are gold standard organizations providing global nonformal education and skills transfer to youth and adults.



Fig. 2. The 2006 Australian Team at St Basil's Cathedral, Red Square, Moscow.

3.1 The Teams

The team structure and management differed for each national team, Table 2, depending on whether the team was from a national body such as scouts, a state or regional area such as air cadets, or a state based school.



Fig. 3. The 2006 International judging panel with cosmonauts, space scientists and aerospace space engineers.

Table 2. An exemplar of the athlete selection diversity of some competing teams in the 14th International Space Olympics, Korolev, Russia, 2006

Country	Sponsoring Body	Selection process
Australia	Scouts Australia and Guides Australia	National competitive selection process
USA	Virginia Technical College	State competitive selection process
Russia	Moscow and Korolev State and Private schools	State competitive selection process
UK Team 1	Scouts and Guides UK, Yorkshire Region	Local community selection process
UK Team 2	<i>Air Cadets, Region based</i>	Selected by Unit
UK Team 3	<i>Private School Bristol Region UK</i>	Local community selection process
Khazakhstan	<i>National Space Agency</i>	National competitive selection
Germany	<i>Private School</i>	Regional Competitive selection
Greece	<i>National Schools</i>	National selection
Others	<i>State and Private Schools</i>	Internal selection

4 Mars Exploration

Mars was a popular topic choice by many for their research project. The projects ranged from Mars habitats for humans to robotic exploration. Australian Olympian Ho Nguyen won a bronze medal for his project, “A wind blown Mars surface rover”. The “beach ball” rover utilized the Martian wind patterns for multiple “Beach Ball” rovers

to span the Red Planet, providing geological and topographical information. Ho's contribution embodied an innovative technique for soil and ice sampling as the rover bounces and rolls over the barren surface. The "Beach Ball" rover building on work under development in the USA. Ho's contribution included a simple mechanism to orientate the ground sampling instrumentation.

Mars related topics presented included, "Mars mission 2020", in which a mission plan had been formulated using existing launch vehicles and modified Mir modules to undertake a six person mission to Mars. Another looked at the impact of corporate investment and ownership of Mars in order to facilitate a more rapid exploration of Mars. Team Ukraine investigated the concept of sending radioactive waste to Mars to create a "safe" waste dump for Earth's highly toxic and radio active waste.

Other Mars based projects included Mars sample and return mission designs, Mars water mapping, and Mars tourism. Many of the projects presented embodied the goals and vision of the Mars Society.



Fig. 2. Included in the Cosmonauts prize for the 2006 Australian Team was a visit Energia Corporation's ISS Mission Control during a Soyuz ISS linkup.

5 Conclusion

The findings [3] of the Australian Education Review 51, *Re-imagining Science Education: Engaging students in science for Australia's future*, by Australian Council for Educational Research has called for new ways and methods to inspire and transfer skills to students. The ISO offers opportunities for space interested youth to become

engaged with the international space industry, learning key skills in science and communication. The ISO also provides career role models showing pathways for career opportunities in science and mathematics. The effectiveness of this is evidenced by all of the members of the Australian team finishing in the top 26 in the overall individual grading. Each project finished in the top three in their specialist area, including winning gold in three of the research fields.

The International Space Olympics is an effective international model for skills transfer in the areas of research, enquiry, and critical thinking. The competition provides a supportive yet competitive venue for students to practice and enhance their skills and abilities.

Australia's success in the International Space Olympics (ISO) has resulted in the formation of the Space Olympics Committee of Australia [4] (SOCA) with the charter to administer and manage the Australian National Team on a similar basis to the Australian Olympic Commission for the Summer Olympics. RMIT University Australia in collaboration with the SOCA will host the 2008 Australian Space Olympics. The Australian event is open to all Australian students 14 to 18 years of age who are undertaking the Duke of Edinburgh's Award and Scouts/Guides undertaking the Queen's Scout/ Guide Award. This event will be used for competitors gaining selection for the 2008 ISO in Russia.

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Photography and video: Stuart Ross, ISO Team Australia 2006

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