

ANNUAL REPORT EXECUTIVE SUMMARY



SPACE GENERATION
ADVISORY COUNCIL

IN SUPPORT OF THE UNITED NATIONS
PROGRAMME ON SPACE APPLICATIONS

SGAC 2012

2012 | SPACE GENERATION ADVISORY COUNCIL



SPACE GENERATION ADVISORY COUNCIL

In Support of the United Nations Programme on Space Applications

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Sponsors and Partners

The Space Generation Advisory Council (SGAC) is very grateful for the continued generous support of our sponsors and partners. This year our sponsors and partners expanded both their financial and intellectual contributions. This has played an important role in the improved quantity and quality of SGAC's output in 2012.

SGAC would like to thank all sponsors and partners once again for their contribution to one of the most successful years in SGAC history.

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Museo Archeologico Virtuale



ÖWF (Austrian Space Forum)



Skyward Experimental Rocketry–
Politecnico di Milano



Space News



SpaceRef



Yuri's Night

SGC 2012 Endorsements from



Comune di Ercolano



Italian Space Agency (ASI)

Executive Council Members

Chairpersons

Catherine Doldirina (Georgia)	Chair
Chijioke Cj Nwosa (Nigeria)	Co-Chair

Executive Office

Andrea Jaime (Spain)	Executive Director
Christopher Vasko (Austria)	Treasurer
Aafaque R. Khan (India)	Executive Co-Secretary
Suresh Bhattarai (Nepal)	Executive Co-Secretary
Cynthia Chen (Australia)	Communications and Public Relations Co-Lead
Michael Kretzenbacher (Australia)	Communications and Public Relations Co-Lead
Claudia Raposo Coreia (Portugal)	Membership Manager
Emmanuelle David (France)	Project Co-Coordinator
Alanna Krolkowski (Canada)	Project Co-Coordinator

Regional Coordinators

James Chibueze (Zambia)	Africa
Minoo Rahnasabapathy (South Africa)	Africa
Joyeeta Chatterjee (India)	Asia Pacific
Yohan Ferreira (Sri Lanka)	Asia Pacific
Nunzia Paradiso (Italy)	Europe
Damian Maria Bielicki (Poland)	Europe
Mahsa Taheran (Iran)	Middle East
Hasan Aziz Kayihan (Turkey)	Middle East
Ashley Chandler (USA)	North, Central America and the Caribbean
Alan Steinberg (USA)	North, Central America and the Caribbean
Nicole Jordan (Colombia)	South America
Victoria Alonsoperez (Uruguay)	South America

*Note: Members as of December 2012. Note that some members ended their terms during the year, and they may not be named here.

Letter from the Co-Chairs

Dear colleagues and well-wishers,

The Space Generation Advisory Council has made remarkable achievements in 2012 and has focused on her one true goal: to propel the voices of students and young professionals in the space arena. We take great pride in our members' accomplishments and will continue to support them in any way we can to ensure they are inspired as they continue their journey to the peak of their careers and establish themselves as icons in the space community.

SGAC had robust strategy and detailed work plan for 2012 which has been fulfilled through the hard work of our dedicated volunteers and ever generous supporters. The ultimate proof has been the inaugural Space Generation Fusion Forum, that gathered 50 high-profile young adults to discuss key space topics, in the USA, and that has become our second annual event. Our members come from a wide range of backgrounds but will seize every opportunity to come together in order to deliberate on critical topics and package high quality outputs. This is also evident from the Space Generation Congress 2012 held in Italy and attended by 134 delegates from 44 different countries.

We would like to express our gratitude to all who have contributed in one way or another to SGAC. To our gracious members who will always contribute their time despite their busy schedules and kind sponsors who provide the financial support necessary to run our activities, we say thank you. Special thanks go to Andrea Jaime Albalat, Ariane Cornell and the Executive office for running SGAC's daily operations and leading such a great volunteer youth organisation to outstanding achievements. We appreciate our Advisory Board for all their time, continued support and guidance throughout the year.

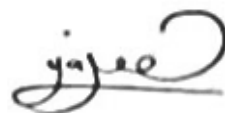
SGAC is growing stronger; the network is expanding rapidly and the organisation is better placed to harness future opportunities. We are dedicated to ensuring that SGAC remains a great organisation which everyone would like to be part of. As we look ahead to what 2013 brings, please work with us in transforming the enthusiasm and passion for space into a formidable force in the space community.

We commend this report to you.



Catherine Doldirina

SGAC Chair



Chijioke(CJ) Nwosa

SGAC Co-Chair

SGAC Output at a Glance

SCHOLARSHIPS AND AWARDS (47)

- Australian Futures Award (3)
- DLR Standout Student Scholarship (3)
- La Sapienza-SGC Scholarship (2)
- Move an Asteroid Technical Paper Competition
- OHB-SGC Space Sustainability Scholarship
- Peter Diamandis Scholarship
- \$pace is Business Paper Competition
- Space Generation Advisory Council Global Grants Programme (11)
- Space Generation Advisory Council (SGAC) Young Leader Awards (9)
- Space Solar Power Design Competition
- SSPI Satellite Futures Scholarship (3)
- United Nations / International Astronautical Federation (UN/IAF) Workshop Scholarship
- Washington Space Business Roundtable Scholarship (3)
- MVP AIAA Scholarship
- NASA SCA N Scholarship
- IES Scholarship (2)
- AYAA Australian Futures Award (3)

CONFERENCES AND WORKSHOPS SUPPORTED (3)

- Space Generation Fusion Forum (SGFF), USA
- Space Generation Congress (SGC), Italy
- *S.P.A.C.E. workshop*, by Dragos Bratanu, in cooperation with the International Astronautical Federation's (IAF) Workforce Development/Young Professional (WD/YP) and the Space Education and Outreach (SEOC) Committees

PAPERS AND PUBLICATIONS (14+)

- SGAC Annual Report
- SGAC Executive Summary of the Annual Report
- Space Safety & Sustainability Project Group,
 - 2012 SSS Educational Series:
 - Space Situational Awareness*
 - Space Weather Effects on Space Missions*
 - 16th ISU Annual Symposium "Sustainability of Space Activities: International Issues and Solutions" – February 2012
 - Maier, P., Rathnasabapathy M., Lu, Z., "Active Debris Removal: A Multinational Policy Option", 63rd International Astronautical Congress Conference Proceedings, Naples, Italy, 2012.
 - Maier, P., Rathnasabapathy M., Lu, Z., "Novel Approaches to International Cooperation and Data Sharing for SSA", 63rd International Astronautical Congress Conference Proceedings, Naples, Italy, 2012.
 - SpaceUp Stuttgart – October 2012

- Emanuelli, M., Raval, S., Nasser, S.A., Turconi, A., Nwosa, C., "Design and Evaluation of an Active Space Debris Removal Mission with Chemical and Electrodynamic Tether Propulsion Systems", 2012 Beijing Space Sustainability Conference, Conference Proceedings, Beijing, China, 2012.
- Space Technologies for Disaster Management Project Group
 - Laygo, K. *Satellite-Based Synthetic Aperture Radar (SAR) Applications to the 2011 Japan Tohoku Earthquake and Tsunami*, May 2012
- Youth for GNSS
 - Tale Sundlisater. "GNSS and SBAS System of Systems: Considerations for Applications in the Arctic". Paper presented in a poster session at IAC 2012.
- Final 2012 Space Generation Fusion Forum Report
- Space Generation Congress 2012 - Executive Summary
- Space Generation Congress 2012 Final Report
 - Including five Working Group individual reports
- In addition, 33 presentations including posters, papers and panels, were given by SGAC members at this year's IAC

CONFERENCES WITH OFFICIAL SGAC REPRESENTATION (29)

- 49th Session of the Scientific and Technical Subcommittee of UN COPUOS, Vienna, Austria
- United Nations Economic and Social Council (UN ECOSOC), New York, USA
- ISU Southern Hemisphere Summer Space Programme, Australia
- ISU 16th Space Symposium, "*Sustainability of Space Activities: International Issues and Potential Solutions*", Strasbourg, France
- IAF Spring Meetings, Paris, France
- 51st Session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Vienna, Austria
- International Space Station and Mars Conference – Europe, International Space University, Strasbourg, France
- 28th Annual National Space Symposium in Colorado Springs, Colorado, USA
- Latin American Space Conference, Mexico City, Mexico - *Youth in the Development of Space Policy*
- ISECG Stakeholders Assessment Workshop, ESPI, Vienna, Austria
- SpaceUp Stuttgart, Germany
- "Introducing the Space Generation Advisory Council" at the Technical University of Delft, The Netherlands
- Small Satellite Platform Spacecraft Data Processing and Control Course, Institute of Space Technologies (IST), Islamabad, Pakistan
- Global Exploration Conference (GLEX), Washington DC, USA
- National Space Society's International Space Development Conference (ISDC), Washington DC, USA.
- 55th Annual Meeting of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Vienna
- Aerospace Futures 2012 - Australian Youth Aerospace Association (AYAA), Sydney, Australia
- Farnborough International Airshow 2012, United Kingdom
- Space Studies Programme 2012, International Space University, Florida, USA
- UN-SPIDER Technical Advisory Mission to Cape Verde.
- AIAA SPACE 2012 Conference & Exposition, Pasadena, California, USA
- 22nd Economic Forum by the Institute for Eastern Studies (IES), Krynica-Zdroj, Poland
- 1st UK Space Education Office (ESERO-UK) Conference, York, United Kingdom
- Annual ESPI Autumn Conference; Vienna, Austria
- World Space Week in Iran
- 63rd International Astronautical Congress (IAC), Naples, Italy
- 22nd UN/IAF Workshop on *Space Technologies Applied to the Needs of Humanity: Experience from Cases in the Mediterranean Area*

- SATCON: The Satellite Communications Conference & Expo, New York, USA
- Seventh Meeting of the International Committee on Global Navigation Satellite Systems (ICG), organised by the Government of China, Beijing, China

Although they are not listed here, SGAC members have also attended and helped to organise numerous events in their home countries.

FORMALISED PARTNERSHIPS (5)

- Austrian Space Forum (ÖWF)
- International Astronautical Federation, Space Power Committee
- Washington Space Business Roundtable
- Institute for Eastern Studies
- African Regional Centre for Space Science and Technology Education in English

SGAC Activity Highlights

GENERAL HIGHLIGHTS

- Catherine Doldirina (Georgia) succeeded Michael Brett (Australia) as the new Chair of SGAC
- SGAC welcomed a new Co-Chair, Chijioke CJ Nwosa (Nigeria)
- SGAC Deputy Executive Director, Andrea Jaime Albalat (Spain) succeeded Ariane Cornell (France/USA) as the new Executive Director of SGAC at the SGAC Office in Vienna
- SGAC welcomed an intern, Cynthia Chen (Australia)
- SGAC included new members to its Advisory Board, comprised of influential members of the international space community, to provide strategic guidance.

New members include:

- Yasushi Horikawa, Chairperson of UNCOPUOS
- Norbert Frischauf, Future Studies Systems Engineer at SpaceTec
- Michael Brett, outgoing SGAC Chair
- Peter Martinez, Chairman of the South African Council for Space Affairs
- SGAC included a new member to its Honorary Board. SGAC's Honorary Board members are those who have been strong and steady supporters of SGAC and its goals:
 - JR Edwards, Manager, Human Space Flight Programs Lockheed Martin Washington Operations
- SGAC organised its fifth Move an Asteroid Competition with the support of A.C. Charania. The winner – Sung Wook Paek (Korea) – submitted a paper entitled “A Multi-functional Paintball Cloud for Asteroid Deflection”. He was invited to present his paper at the Space Generation Congress 2012 and was also featured in the LA Times.
- A total of 49 delegates from 17 countries attended the inaugural Space Generation Fusion Forum (SGFF),
- SGAC supported 13 scholarships to delegates from 13 countries to attend SGFF 2012 in Colorado, USA.
- SGAC attracted more than 300 applicants for the Space Generation Congress (SGC) 2012. The SGC 2012 reached its maximum capacity of 134 delegates travelling from 44 different countries around the globe.
- SGAC supported a record-breaking 28 scholarships to delegates from 15 countries to attend SGC 2012 in Naples.
- SGAC continued to record and publish presentations conducted during SGC. This offers members who were unable to attend the Congress the opportunity to review and recognise the ideas discussed during the event.
- SGAC announced the first NASA-SGAC video team. The team worked to produce a number of short films to support NASA in communicating the benefits of space exploration.
- The Project Group on Space Technologies for Disaster Management (STDm) was created and released a paper discussing satellite-based aperture radar (SAR) applications to the 2011 Japan Tohoku earthquake and tsunami.
- The Project Group on Small Satellites was created and had their first abstract accepted to present a poster at the 9th IAA Symposium on Small Satellites for Earth Observation Berlin, Germany.
- The Project Group on Space Law was created and presented some of their work at the IAC 2012.

- SGAC achieved remarkable participation at the IAC 2012 (Naples, Italy). SGAC members presented 33 technical papers covering vast and varying areas of interest, participated in panel discussions and organised incredibly successful outreach events, such as the Young Professional Panel, the Space Women in Emerging Countries, the SGAC Football Match, and the SGAC Booth Reception.
- SGAC expanded its social media activities by creating regional and working group Facebook pages, and renewing its old Facebook sites for the SGC and Space Generation Advisory Council Page. SGAC also started using its Twitter accounts on a more regular basis.

EXECUTIVE OFFICE HIGHLIGHTS

- SGAC Chair Michael Brett (Australia) presented SGAC's general statement, covering SGAC's developments since the last meeting of the UN COPUOS S&T Subcommittee in February 2011.
- SGAC Executive Director Andrea Jaime (Spain), presented SGAC's general statement at the 55th Session of the UN COPUOS in Vienna, in June, which explained the activities that SGAC has been engaged in during the past year.
- SGAC delivered two technical presentations at the UN COPUOS.
- SGAC Executive Director, Andrea Jaime (Spain) was on a panel on young professionals organised by the ISEB at the International Student Zone of the IAF.
- SGAC organised the panel on Space Women in Emerging Countries during the IAC, having the Executive Director Andrea Jaime as Moderator and SGAC Chair Catherine Doldirina as one of the panellists.
- SGAC Chair Catherine Doldirina (Georgia) was Master Moderator of the Day at the 28th National Space Symposium.
- SGAC former Executive Director Ariane Cornell (USA) was the moderator of the Space Generation Fusion Forum Panel at the 28th National Space Symposium.
- SGAC Executive Director, Andrea Jaime, participated in a round table on Benefits of Exploration, organised by ESPI, in Vienna.
- SGAC Executive Director, Andrea Jaime, gave a presentation on the perspectives of the young generation of the space sector in times of the financial crisis at the ESPI Autumn Conference, in Vienna.

AFRICA REGION HIGHLIGHTS

- CJ Nwosa (Nigeria) succeeded Michael Brett (Australia) as the new Co-Chair of the SGAC.
- Minoo Rathnasabapathy (South Africa) and James Chibueze (Nigeria) were elected as the new SGAC Regional Coordinators for the African region.
- Four new NPOCs: Benyam Abebe (Ethiopia), Kinyili Antony and Naftali Kagiri Kimani (Kenya) and Patsa Abram Khosto (Lesotho) were appointed, increasing SGAC representation in African countries.
- Minoo Rathnasabapathy (South Africa) and Bekele Tujuba (Ethiopia) were recipients of the Space Generation Fusion Forum Global Grants.
- Michael Afful (Ghana) and Olubunmi Emmanuel Akinwumi (Nigeria) won the 2012 OHB-SGAC Scholarship Award and Annual SGAC Satellite Futures Scholarship respectively, allowing them to participate in the SGC in Naples.
- SGAC members from the African region participated in numerous international space conferences throughout 2012 including Space Generation Fusion Forum, AIAA Space 2012, 22nd United Nations/International Astronautical Federation Workshop, 63rd International Astronautical Congress 2012 and the 2nd Annual South African Space Association Congress.
- A series of educational and outreach workshops for students were organised in many countries in the region, including presentations given at the 2nd Annual South African Space Association Congress and Kenyatta University Amateur Astronomy Club (KUAAC) launch.
- The introduction of the SGAC African Regional Facebook page was a success, connecting members across the African continent and providing a platform for discussions.



➤ ASIA PACIFIC REGION HIGHLIGHTS



- We were proud to welcome nine new National Points of Contact - Afghanistan, Pakistan, Sri Lanka, Australia (2), China (2), New Zealand, Indonesia and Philippines.
- SGAC Asia-Pacific members have attended the Space Generation Congress 2012 at Naples, Italy with unbridled enthusiasm. Out of the 133 delegates, there was an astounding 15% representation from Australia.
- Scott Fisher (Australia), SGAC's Web Editor, and Junzi Sun (NPoC, China) won the SGAC Young Leader Awards.
- Ryoko Nakamura (Japan) was the winner of the first Space Solar Power Competition.
- Elizabeth Roy (Australia) was one of the winners of the Second Annual Satellite Futures Scholarship Competition.
- Sung Wook Paek (Korea) was chosen as the winner of 2012 Move an Asteroid Competition.
- Aafaque Khan (India), SGAC's Co-Executive Secretary was selected for the prestigious Emerging Space Leaders' Grant by the International Astronautical Federation to attend the 11th Space Generation Congress, UN/IAF Workshop and the 63rd International Astronautical Congress in Naples, Italy.
- Out of the twelve winners of the SGAC Fusion Forum Global Grants Programme, there were five recipients from the Asia-Pacific region - Ahmad S. Hakimyar (former NPoC, Afghanistan), Heejin Jeong (NPoC, South Korea), Bustanul Arifin (NPoC, Indonesia), Rahul Goel (India) and Julia Leeson (Australia).
- The tireless contributions of four members were recognised by the SGAC community through the Members of the Month initiative: Aafaque Khan (India), SGAC Co-Executive Secretary - Sept 2012; Scott Fisher (Australia), SGAC Web Editor - Jun 2012; Michael Brett (former Chair, Australia) - Apr 2012; Suresh Bhattarai (NPoC, Nepal), SGAC Co-Executive Secretary - Feb 2012.
- Cynthia Chen (Australia) was selected to work as an intern for three months for SGAC in Vienna, Austria.

➤ EUROPEAN REGION HIGHLIGHTS



- SGC and the IAC took place in Naples, Italy in 2012 which was significant for the European SGAC Members and for the European space industry as a whole.
- SGAC in Europe celebrated Yuri's Night and World Space Week as part of global outreach
- Three SGAC delegates (Guzel Kamaletdinova, Stephanie Wan and Damian M. Bielicki) participated as speakers during the Economic Forum in Poland, sponsored by the Eastern Institute.
- Damian M. Bielicki (Poland) was re-elected for the second term as the Regional Coordinator for Europe. Nunzia Paradiso (Italy) has finished her last term. Guzel Kamaletdinova (Russia) was elected as the new RC for Europe.
- New NPoCs were appointed in Albania, Belgium, Ireland, Lithuania, Norway, Poland, Slovenia, Spain, Ukraine and the United Kingdom.
- To strengthen internal and external communication, the European teleconferences were launched to be held once every four months. SGAC Europe also has its own Facebook page, which was launched in Summer 2012 and remains very active.

➤ MIDDLE EAST REGIONAL HIGHLIGHTS



- Neta Palkovitz (Israel) was appointed as the NPoC of Israel.
- Ghanim-al Otaibi (Kuwait), after serving three and a half years as NPoC of Kuwait, left his duty because of increasing work commitments. Ghanim helped grow the Middle East region significantly and strengthened the connections in Kuwait for SGAC.
- S. Ali Nasseri (Iran) received the SGAC 2012 Young Leader Award.

- The Middle East region had the most attendance ever to SGC, with 9 delegates coming from Turkey, Iran, Saudi Arabia and UAE.
- To celebrate World Space Week and to introduce the Space Generation Advisory Council, the SGAC NPoCs from Iran organised and held an SGAC booth with cooperation of Night Sky Magazine in Tehran, Iran.

➤ NORTH, CENTRAL AMERICA AND THE CARIBBEAN REGIONAL HIGHLIGHTS



- Carmen Felix (Mexico), NPoC for Mexico, presented several Space Generation projects to Dr Javier Mendieta, the Director of the Mexican Space Agency.
- The first SpaceUp conference was held in Toronto on April 14, 2012 at the Centre for Social Innovations. Over 35 people attended from multi-disciplinary backgrounds, including engineers, scientists, artists, web developers, among others.
- SGAC hosted, together with the Space Foundation, the inaugural Space Generation Fusion Forum (SGFF) at the 28th National Space Symposium (NSS) in Colorado Springs, CO.
- The Astronomical Association of Jamaica, Jamaica's premier astronomy group and local SGAC liaison for space and science education and outreach, has continued to expand its network, most recently opening a chapter in the island's second city, Montego Bay.
- In collaboration with the Central American Association for Aeronautics and Space, Andres Mora (NPoC for Costa Rica) initiated two exciting projects: a national rover competition and the launch of an experiment to the ISS.

➤ SOUTH AMERICAN REGION HIGHLIGHTS



- Julio Aprea and Sergio Taleisnik (Argentina) were appointed as NPoCs for Argentina.
- Diego Jimenez (Colombia) was appointed as new NPoC for Colombia
- Bruno Sarli (Brazil) became the new NPoC for Brazil
- Miguel Gillen (Peru) started representing Peru as NPoC
- For the first time Bolivia has appointed an SGAC NPoC to represent it, Benjamin Pinaya (Bolivia)
- Pedro Molina (Ecuador), is the first NPoC to represent Ecuador.
- Former NPoC of Venezuela, Ana Alexandra (Venezuela) was selected as a scholarship winner for the Space Generation Fusion Forum, and Regional Coordinator Victoria Alonsoperez (Uruguay) received a scholarship to represent the region at the Space Generation Congress.
- SGAC representatives attended the Regional Meeting at IAC in Naples, Italy
- Chile has a new NPoC, Alejandro Lopez (Chile).

Space Generation Fusion Forum Report

Fig. 1.



Delegates of the 1st Space Generation Fusion Forum

The inaugural Space Generation Fusion Forum was held 15-16 April 2012 at the Broadmoor Hotel, Colorado Springs, USA. The event was hosted by the Space Foundation and had participatory support from the AIAA, the FAA COE CST and NASA. The Fusion Forum aimed to bring together top students and young professionals from all over the world to focus on key space topics.



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During the first day, senior space industry professionals presented their views on space policy issues and gave relevant advice to the delegates. This first day concluded with a networking reception attended by both the participants and the speakers. The audience could exchange their thoughts in a relaxed atmosphere and discuss the various topics raised by the speakers throughout the day.

On the second day, three panels were conducted on the following topics:

1. International Collaboration - From Space Situational Awareness to Exploration
2. Developing Regions and Space Applications
3. The New Role of Commercial in Spaceflight

Panellists were chosen for their relevant experience and knowledge on the different topics covered. Each panellist had to prepare answers to a list of questions relevant to their panel topic. During the ninety minute discussions, the audience voiced their opinions and asked questions for the panel and other delegates.

The Fusion Forum concluded with a vote for the Most Valuable Participant (MVP). The winner, Minoo Rathnasabapathy (South Africa), presented the Fusion Forum's report and findings at the AIAA's Space 2012 Conference held in California in September 2012. The delegates also took part in the Opening Ceremony and the Opening Reception of the National Space Symposium on April 16th.

The Fusion Forum was hosted by the Space Foundation in conjunction with the National Space Symposium. Nearly half of the Fusion Forum participants attended the Symposium, with more than 9000 international space professionals. The Fusion Forum participants were invited to the New Generation event held during the week.

speakers and moderators

Malissia Clinton	Senior Vice President, General Counsel & Secretary, The Aerospace Corporation
Chummer Farina	Vice-President, Canadian Space Agency
Lori Garver	Deputy Administrator, National Aeronautics and Space Administration
Yasushi Horikawa	Technical Counsellor, Japan Aerospace Exploration Agency
Clayton Mowry	President, Arianespace Inc.
Enrique Pacheco	Deputy Director for Space Science and Technology Affairs, Mexican Space Agency (AEM)
William Parker	Special Advisor for International Affairs, Space Foundation
Elliot Pulham	Chief Executive Officer, Space Foundation
Michael Simpson	Executive Director, Secure World Foundation
Mark Sirangelo	Corporate Vice President, Sierra Nevada Corporation & Head, Sierra Nevada Space Systems

Please see www.youtube.com/user/spacegeneration for selected presentations.

PANEL 1 – INTERNATIONAL COLLABORATION: FROM SPACE SITUATIONAL AWARENESS TO EXPLORATION

Fig. 2.



Delegates of Panel 1 with Moderator Chummer Farina (3rd from left)

Panellists discussed international collaboration, in the context of both technical and policy issues. As the number of space-faring nations increases, international collaboration was seen as essential in many areas of the space industry. Essential collaborations between established and emerging space nations should lead to mutual benefits based on equality, shared interests and technology transfer.

The panel also discussed the growing need for the regulation of space. Ideas put forward for an International Code of Conduct would require an inclusive forum taking into consideration the geopolitical and cultural interests of all nations involved. To gain international diplomacy, the panel determined that it would be important to understand the niche capabilities of each nation, taking into account issues such as cultural diversity, significant differences in agency practises, intellectual property and export control. In order to achieve a truly international perspective, importance should not be placed only on collaboration in general, but on collaboration between nations that ensures the long-term sustainability, stability and security of the space environment.

PANEL 2 – DEVELOPING REGIONS AND SPACE APPLICATIONS

Fig. 3.



Delegates of Panel 2 with Moderator Enrique Pacheco (leftmost)

Panellists achieved very interesting conclusions, that are summarised as follows. Space applications were deemed very useful for a developing nation. Such applications provide ways to connect populations, help educate groups with little to no access to educational resources, support efforts in the prevention of disasters and mitigation of their effects, support the production of food and other goods and provide access to health facilities and expertise to those in need.

The motivations of developing nations to maintain a space programme can differ from those of developed nations. Developing nations seek mainly to provide solutions for the basic needs of a population, while developed nations typically desire to maintain and improve space infrastructure in order to their economy. Some developing nations that may have interests more aligned with those of developed nations include China and India, as they have evolved from focusing on basic needs to the establishment of science and exploration initiatives.

Developing nations need to enhance their space capabilities in order to create and operate successfully large space projects. Having a group of nations that can accomplish common objectives via international collaboration, through the implementation of regional space agencies, could help achieve this by distributing the costs among the interested countries.

A discussion arose on how developing countries should enable their know-how in space, whether this could be obtained from developed nations, or whether they should build it up by themselves. The former was deemed very effective, but potentially difficult, given export control and intellectual property issues; the latter philosophy may be slower, but would allow for greater independence from foreign goods and geopolitics.

PANEL 3 – THE NEW ROLE OF COMMERCIAL IN SPACEFLIGHT

Fig. 4.



Delegates of Panel 3 with Moderator
Clayton Mowry (leftmost)

The main conclusions of this panels are stated here below:

A successful commercial human spaceflight industry that incorporates both human and government assets would require many facets to be successful. Firstly, the commercial industry would require a stable market, initially involving strong government support. Commercial initiatives also require smaller platforms with shorter design and manufacturing cycles and a well-educated public that appreciates the advantages of a human spaceflight programme.

Challenges for the commercial spaceflight industry include being able to maintain a profitable and sustainable industry, with opportunities for expansion and growth, without jeopardising the safety of their investments. The government could place itself as an anchor tenant by procuring flights to the ISS, which would initially support the development of commercial efforts. Other novel ideas, such as a “space lottery” system, could help with initial developments.

Furthermore, an ideal commercial launch site requires various components, such as a geographically strategic location, existing available infrastructure and commercial factors.

Safety is a large concern, specifically with regards to the additional stresses and medical standards required for suborbital and orbital flight. There is a need to balance profitability with the marginal returns of added safety features for commercial spaceflight participants.

fusion forum statistics

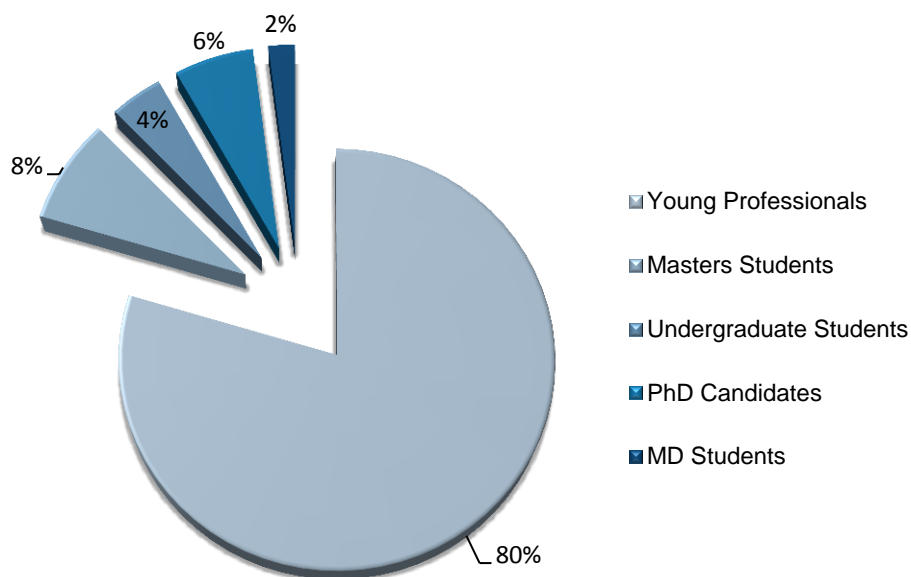
Forty-nine delegates participated in the Fusion Forum. Of these 49 delegates, 12 were part of the organising team. Speakers, moderators and industry professionals joined the discussion based on their availability.

Within the delegates, 13 participants from 13 countries were given scholarships for attendance. This helped to broaden the international network of the SGAC and allowed the delegates to interact with people from many countries and backgrounds. The age range of selected delegates was from 21 to 37. Of this, 47% were female and 53% male.

The majority (80%) of attendees were young professionals, with the remaining 20% currently studying at universities across the world. Of the student participants, 20% were undergraduates and 80% were postgraduates (Masters or PhDs). The young professional attendees came from a variety of space related fields such as aerospace medicine, space law, space policy, engineering, and science. Delegates represented commercial and non-profit organisations, space agencies, and universities.

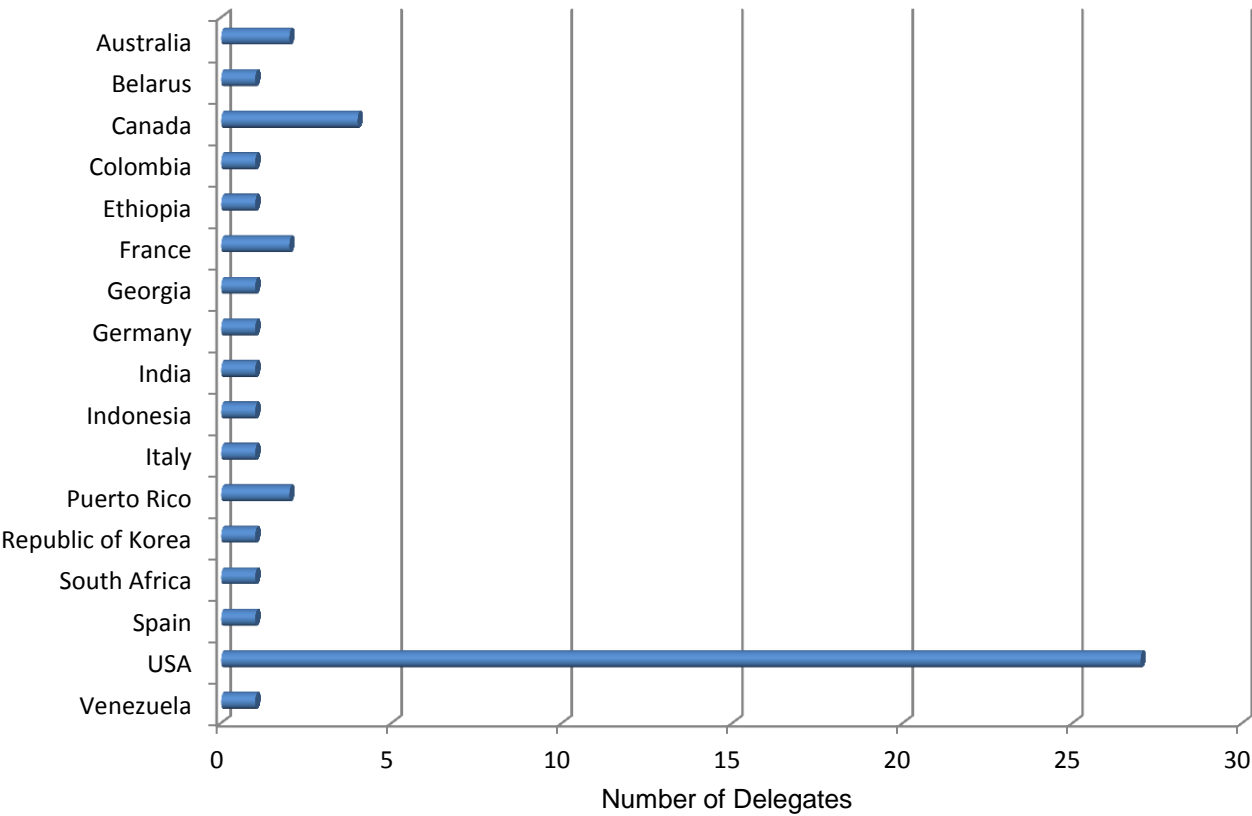
Fig. 5.

Professional Status of Fusion Forum Delegates



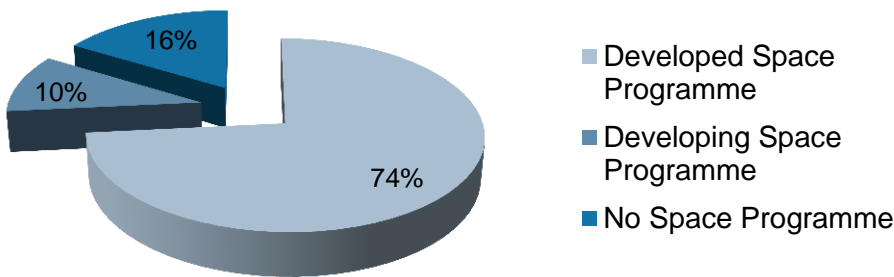
Representatives of 17 countries participated in the Fusion Forum. The highest percentage of delegates came from the USA, followed by Canada, and 74% of participants were from developed space nations.

Fig. 6. Fusion Forum Delegate Citizenship



Of the delegates, 16% were from developing countries. In addition, 10% of the delegates were from countries with a developing space programme and 16% were from countries with no space programme.

Fig. 7. Percentage of Delegates and their Countries of Citizenship's Space Programme Status⁺



⁺Hauser, M & John, M 2009, 'Solution from Space: Space Applications for International Development', Space Foundation, viewed 30 May 2012, <http://www.spacefoundation.org/docs/Space_Apps_for_Intl_Development.pdf>

Space Generation Congress Report

Fig. 8.



Delegates at the 11th Annual Space Generation Congress in Naples, Italy

The Space Generation Congress (SGC) is the annual meeting of the SGAC in Support of the United Nations Programme on Space Applications. Participants are top university students and young professionals with a passion for space. Within this Congress, SGAC aims to hone and promote the voice of the next generation of space sector leaders on the topic of international space development.



The three days of SGC 2012 brought together students and young professionals in the space sector from 44 countries for inspiring and resourceful engagement with their peers. The event, in its 11th year, was hosted in Naples, Italy from 27 to 29 September, just prior to the 63rd International Astronautical Congress (IAC). The Congress had 134 delegates. Registration attracted applicants from over 58 countries, demonstrating SGAC's ever-growing network of international members, as well as the high calibre of the organisation and its events.

Attendees heard perspectives on space issues from the world's leading space organisations, including the International Astronautical Federation (IAF), National Aeronautics and Space Administration (NASA) and the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS).

Similarly, leaders from these space organisations had the opportunity to gain insight into the innovative and bold perspectives of the upcoming space generation on the five main themes of SGC 2012: Industry, Agency, Society, Exploration and Earth Observation. SGC 2012 was supported by several sponsors and organised by a committee of volunteers from across the globe. The 2012 Space Generation Congress would not have been possible without either so SGAC would like to express its gratitude and appreciation.

speakers

Lorenzo Campo	Research Fellow at the Department of Civil and Environmental Engineering, University of Florence
Marco Ferrazzani	Legal Counsel, Head of the Legal Department, ESA
Berndt P. Feuerbacher	President of the International Astronautical Federation (IAF)
William H. Gerstenmaier	Associate Administrator, Human Exploration and Operations Directorate, NASA
Jacques Gigou	Technical Coherence Manager, ESA
David Kendall	Director General Space Science and Technology, Canadian Space Agency (CSA)
Kiyoshi Higuchi	Vice President, JAXA
Yasushi Horikawa	Chairperson of UN COPUOS and Technical Counselor at JAXA
Francisco Javier	General Director, Mexican Space Agency (AEM)
Mendieta-Jiménez	
Cosimo La Rocca	Advisor to the President, Italian Space Agency (ASI)
Asra Najam	Economics Student at the University of Michigan, 2012 SGAC \$pace is Business! Competition Winner
Ryoko Nakamura	Young Professional at JAXA, 2012 International Space Solar Power Competition Winner
Matthew A. Noyes	Mechanical Engineering Student at the University of Rochester, 2012 OHB-SGAC Competition Winner
Sung Wook Paek	PhD Candidate in the Strategic Engineering Research Group at MIT, 2012 SGAC Move an Asteroid Competition Winner
Michael K. Simpson	Executive Director, Secure World Foundation
Johann Wörner	Chairperson of the Executive Board, German Aerospace Centre (DLR)
Badri Younes	Deputy Associate Administrator, Space Communications and Navigation (SCaN) Programme Office, NASA
Confirmed but unable to attend:	
Mario Cosmo	Technical Director, Italian Space Agency (ASI)
Antonio Fabrizi	Director of Launchers, ESA

Please see www.youtube.com/user/spacegeneration for selected presentations.

At the core of SGC 2012 were the working groups, where delegates discussed their views on the development of space and prepared a set of recommendations to be published internationally by SGAC. Each working group produced a report on their discussions and recommendations, which will be shared with the United Nations as well as SGAC sponsors, members and alumni from around the world. SGAC would like to thank the key session supporters, NASA SCan, Lockheed Martin, Secure World Foundation and SGAC's anonymous donor, for making these SGC working groups possible.

Industry – Space Transportation

Supporter: N/A

Subject Matter Expert: Emmanuelle David (France)

Moderator: Remy Chalex (France/Brazil)

The Industry working group focused on space transportation and the role of the new European launch capability in the international sector. They linked it to the Congress' host nation, as the Italian industry is the main partner of the new European launcher, VEGA, whose first flight in February 2012 was a success.

The group listed countries with launch capabilities and explored how to increase the number of countries with this unique ability, what each country could offer, the differences between these countries, potential challenges and the sensitive issue of competition versus collaboration. Particular emphasis was placed on the European launch capacity and where it stands in the international context, especially in light of the recent success of the VEGA launch, the Soyuz's new launch platform at the European Spaceport and potential collaborative efforts with other regions around the world.

They devised the following recommendations and conclusions:

- Encourage established space-faring nations to strengthen their relationships with emerging space-faring nations to foster global growth and collaboration on launch efforts
- Advocate for the development of launch capacities in new space nations to encourage global competition within the launch industry
- Enable the emerging private sector to access and create markets to foster competition, innovation and efficient operation capacity
- Support international efforts to promote national policies requiring launch vehicle operators to deorbit upper stages
- Support the creation of international mechanisms to introduce more safety and sustainability into launch vehicle operations and site practices such as sharing best practices for safety at ground facilities and international research on environmentally responsible fuels and vehicles
- Explore opportunities to foster international trade and cooperation in spite of relatively stable national and international controls on space exports and technology transfers, such as using agency prerogatives and exemptions available within the existing US export control regime and creating an international expert group to study "buffer" or "interface" technologies that address transfer concerns



Launch of Vega. Credit: ESA

Fig. 9.



Delegates working during the Working Group Sessions

Agency – The International Space Station

Supporter: Lockheed Martin

Subject Matter Expert: Dr Michael Hawes (USA)

Moderator: Kat Coderre (USA)

The Agency working group discussed the potentials for future maintenance of the International Space Station (ISS). In 2010, the main partners of the ISS agreed to extend their contributions for at least another decade. Major partners such as Japan, Russia, USA and Europe have committed to extend the life of the ISS up to 2020, or possibly even 2028. However, in light of the economic crises affecting some of these partners, several cuts have been implemented in their respective budgets for space activities. The retirement of the Shuttle and the current void in its place are making it increasingly difficult to access the Low Earth Orbit station.



International Space Station. Credit: NASA

The group examined the implications and benefits of this extension at an international level, the utilisation of the ISS as an analogue platform for human exploration, as well as outreach projects to promote the ISS, such as mobile applications, websites and human spaceflight programmes.

They reached the following recommendations and conclusions:

- Transform the ISS into a commercial facility

- Use the ISS as an analogue for a Mars mission
- The ISS as the main outreach tool to promote space agencies space activities
 - Smartphone apps
 - Shuttle Carrier Aircraft Museum

Society – Space for Humanitarian Relief

Supporter: Secure World Foundation

Subject Matter Expert: Tiffany Chow (USA)

Moderator: Ross Findlay (UK)

The Society working group established how space data could help support humanitarian tasks focused on people who need assistance. Humanitarian relief during natural or man-made disasters requires rapid decision making with accurate, real-time data that only satellites can provide. They can, for example, be used to find good locations for refugee camps, support logistics and planning, and for monitoring reconstructive activities. Damage estimates and planning data are crucial for reconstruction activities. NGOs are known for using space-derived data to influence the behaviour of governments and to provide public awareness and verification of war crimes.



Pakistan Floods. Credit: GeoEye

The group recognised how space is used in humanitarian efforts in conflicted areas and how NGOs such as the World Health Organisation (WHO), Red Cross and Doctors Without Borders are currently implementing space tools.

They presented the following recommendations and conclusions:

- Create a new Centre for Responsive Information for Safety and Security (CRISIS) either alongside or within the United Nations Operational Satellite Applications Programme (UNOSAT) to act as an impartial, international coordinating body for providing space-based information in support of humanitarian relief.
- Develop an interface between users, data providers and the public by setting up technical, legal and cost standards; initiating field data requests, exchanges, processing and delivery; increasing public awareness, visibility and participation; and tailoring of the processing approach based on priority.

Fig. 10.



Members of the Society Working Group
with the Subject Expert Matter, Tiffany
Chow (Secure World Foundation)

Exploration – Communications for Exploration

Supporter: NASA SCAI

Subject Matter Expert: Stephanie Wan (USA)

Moderator: Victoria Alonsoperez (Uruguay)

The Exploration working group considered the difficulties of overcoming communications in space exploration. As space agencies focus their exploration programmes to destinations beyond the ISS and to the Moon, Near Earth Objects and Mars, space exploration is becoming an increasingly popular discussion.

The group discussed the importance of communications in exploration programmes, tele-medicine, crew support, communications challenges such as time-delay, as well as the importance of a crew's self-reliance during non-real-time communications with mission control.

They raised the following recommendations and conclusions:

- Special consideration should be given to Mars, with international cooperation identified as a key parameter. Major concerns include distance, time delays, accessibility, insufficient data rates and coverage, non-optimal utilisation of space resources, barriers concerning data sharing and the standardisation of related methodologies.
- Increased standardisation and globalisation of technologies are key, including technology transfer and development, as well as the development of an internationally integrated network of multiple small satellites.
- Standardisation and globalisation could be achieved through implementing backwards compatibility to help ease the transition into new technologies, and by incorporating communication protocols and a framework for private companies.
- To ensure the sustainability of Martian orbits, development could be made towards an internationally integrated network of multiple small satellites with standardised interfaces. This network could provide dedicated communication relays or the inclusion of relays on other spacecraft, such as fuel depots, where dedicated relays are able to use higher orbits.



Parkes Radio Telescope. Credit: NASA

Furthermore, to keep up with new technologies and needs, it is possible to use more satellites with shorter lifespans by implementing the concept of ‘mass production’.

Fig. 11.



Members of the Exploration Working Group during the Working Group Sessions

Earth Observation – Space Resources for Water Management

Supporter: SGAC's Anonymous Supporter

Subject Matter Expert: Noemie Bernede (France)

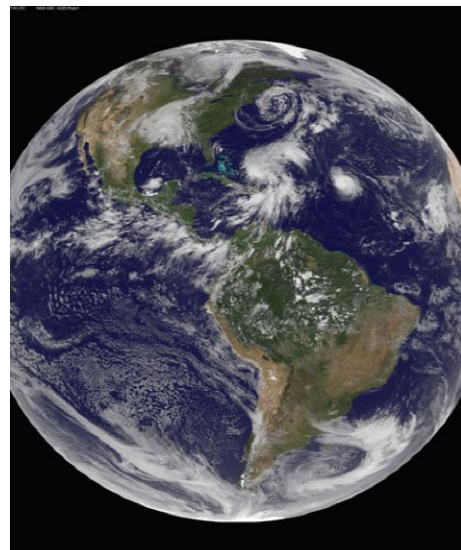
Moderator: Mariel Borowitz (USA)

The Earth Observation working group explored the ways in which space technology could contribute to the improvement of Earth's water management through various methods. Desertification, access to drinking water, and the management of water-related emergencies are some examples of problems faced by countries across the globe, particularly those in developing regions.

The group discussed previous water-related natural disasters that have occurred around the world and the national emergency strategies that followed. They discussed current space technologies that are available for the purpose of water management such as Earth Observation satellites and remote sensing. Finally, they discussed how aware developing and developed countries are of the capacity for space technology to improve water management.

They expressed the following recommendations and conclusions:

- Promoting data sharing, collection and research to ensure continuity of data collection; encouraging standardisation of data formats; increasing the availability of data by ensuring low



Earth from GEO. Credit: NOAA

costs, reduced restrictions and streamlined access to data by users; and encouraging incentives for data use by awarding scholarships, providing grants for data use and initiating competitions

- Supporting applications by continuing programmes – such as the ISS SERVIR Environmental Research and Visualization System (ISERV) – to make use of data; building on established regional initiatives, for example, ESA TIGER or Global Earth Observation System of Systems (GEOSS); prioritising local capacity-building through cooperative or exchange projects and site demonstrations
- Engaging stakeholders by raising public awareness of the benefits of Earth Observation through the utilisation of social media such as YouTube and television, as well as integrating programmes into Science, Technology, Engineering and Mathematics (STEM) education; raising awareness with decision makers at the governmental or national level by quantifying the return on investment in terms of money, knowledge acquisition and prestige, as well as presenting specific regional applications that may be of benefit to society

Fig. 12.



Members of the Agency Working Group with Subject Matter Expert, Dr. Michael Hawes (Lockheed Martin)

SGAC closed registrations for the Space Generation Congress on 24 July, with more than 250 applications from 58 different countries.

After a diligent selection process, a total of 134 delegates participated in SGC 2012. Of those 134, 28 participants from 15 countries received scholarships with assistance from SGAC and its partners to attend SGC 2012 in Naples. There was a relatively even distribution of genders amongst final delegates, with 40% women and 60% men, an achievement that is uncommon for events in the space sector. Delegates came from a vast array of backgrounds, with 29% undergraduate students, 15% masters students, 11% PhD students, 41% young professionals and the remaining 5% dedicated to other areas of industry. SGAC believes that these statistics truly demonstrate SGAC's international influence, and its continuing ability to grow. This development gives SGAC the momentum to establish a distinct and highly representative network of young space professionals and university students.

SGAC is also pleased to have welcomed a diverse representation of delegates from an array of countries and regions. SGC 2012 attendees came from more than 44 countries across six continents, setting another Space Generation Congress record. This internationalism is a major contributor to the development of a truly international voice of the space generation that SGAC strives to epitomise.

Fig. 13.

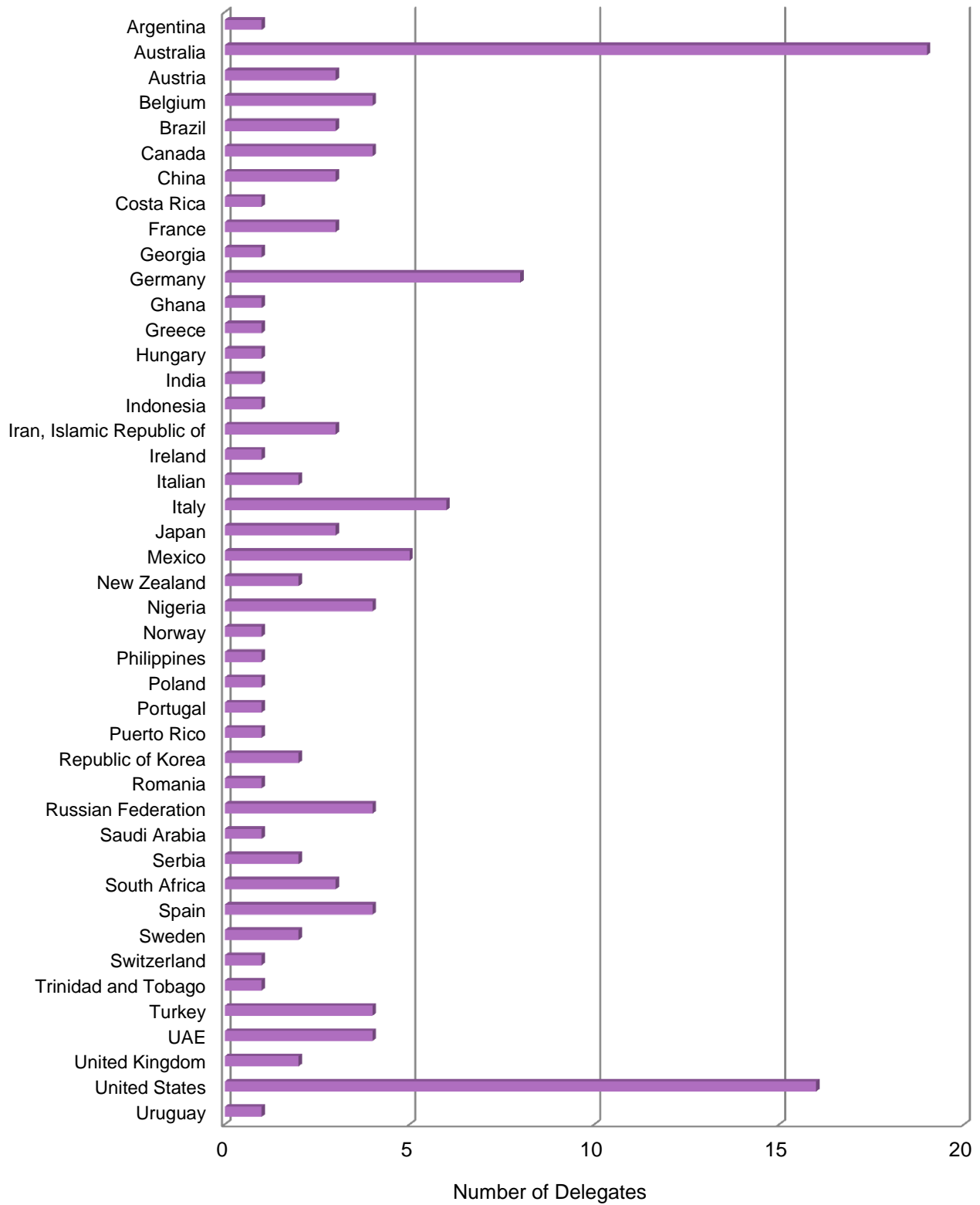


Networking opportunities during the coffee breaks

Representatives from 44 countries participated in SGC 2012. The highest percentage of delegates came from Australia, followed by the United States, Germany and Italy.

Fig. 14.

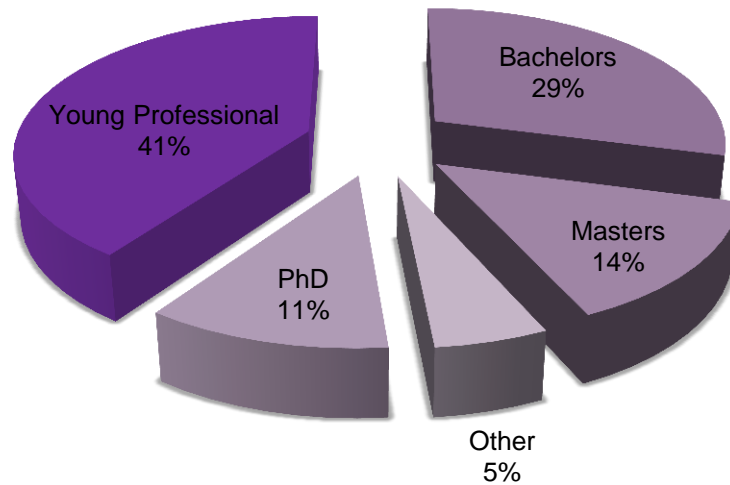
SGC Delegate Citizenship



Whilst the majority of SGC delegates were students (undergraduate, Masters and PhD), close to 45% were young professionals working within industry, in a postdoctoral position or working in space agencies.

Fig. 15.

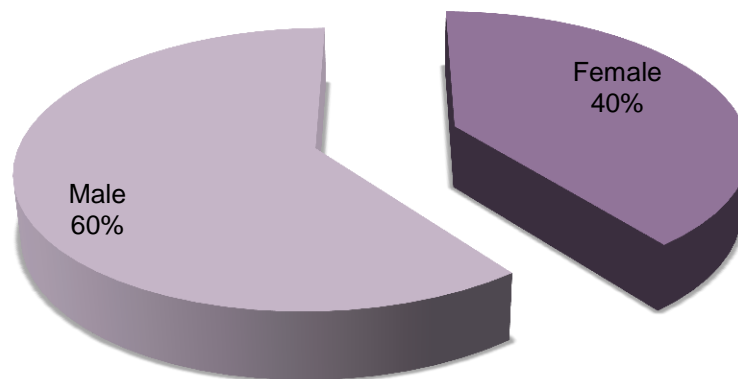
Professional Status of SGC 2012 Delegates



SGAC is proud to have had a relatively even gender distribution amongst the pool of delegates at SGC 2012, with a 40% female representation. This is a phenomenon that deviates from the norm in events in the space sector and SGAC is pleased to see such gender balance at the event.

Fig. 16.

Gender of SGC 2012 Delegates



Review: SGAC 2012 Strategic Goals

Overview

The SGAC Strategic Plan 2011, published in January, set out nine goals for the year ahead. This section of the Annual Report is the Executive Office's self-assessment of how SGAC performed against these goals. This assessment is intended to provide an additional view on the context of SGAC's activities throughout the year and inform readers about the development of the Strategic Plan for 2012.

Strategic Goal Review

1. *Continuation of efforts towards financial stabilisation*

Output: Multi-year contracts or Memoranda of Understanding with sponsors

SGAC operated a strong financial base throughout the year to return a surplus, as planned. The organisation grew both its revenue and surplus, continuing a positive trend over recent years. All accounts were paid on time and the Executive Office has been confident of its ability to operate throughout the year. The organisation successfully managed the transition between the Executive Director and the Deputy Executive Director, a process that took about 10 months.

The major goal of securing multi-year contracts with main sponsors was not accomplished. Unfortunately, many of our sponsors are constrained in their ability to enter into such contracts and are only able to support the organisation on a year-by-year basis. Financial stability will be achieved by maintaining a close and trusted relationship with our major sponsors, which so far has been more successful than ever before.

Another aspect of this objective is to save sufficient funds to maintain a balance in excess of SGAC's immediate operational needs – this objective is yet to be realised. Thankfully, there are sufficient funds to support the paid position of the Executive Director and afford two interns per year to assist the daily work.

2. *Smooth, seamless leadership transition*

Output: Complete handover of Executive Director tasks, organisational relationships, and signatory responsibilities from Ariane Cornell to Andrea Jaime.

This goal was fully accomplished in June 2012, when the new Executive Director, Andrea Jaime Albalat, took the lead of the organisation. During the second half of the year, she has proved to be a capable leader and a hard worker. The transition period of 9 months was necessary to ensure a smooth transition between the two generations, in which Ariane Cornell did a great job. The organisation of Space Generation Congress 2012 by Andrea Jaime was a vivid proof of her professional capabilities and "sealed" the success of the transition.

3. *Execution of a New SGAC-wide Event in North America*

Output: Engage the SGAC's members and stakeholders into the preparation of the Space Generation Fusion Forum, and to seek their input for this new young professional space event that shall be held in the USA from 2012 onwards, with the aim to aid SGAC's development and growth.

SGAC's Executive Office, with the help of Space Foundation and the involvement of dedicated volunteers, accomplished this ambitious goal and held the first ever Space Generation Fusion Forum in Colorado Springs (USA) in April 2012. The event was a success and gathered 49 participants from 17 countries around the world, with 11 of them receiving scholarships procured by SGAC. The event had a different format from the Space Generation Congress, and was comprised of panel discussions in which panellists were students and young professionals. The results of the Space Generation Fusion Forum were presented in a separate session of the National Space Symposium, and a comprehensive Report was produced after the event.

The success of the Space Generation Fusion Forum resulted in the decision of the Executive Council to continue its organisation also in 2013, as well as the gracious offer by Space Foundation to support and host it again prior to the National Space Symposium in 2013. The preparations for the next year's event have already started.

➤ **4. Successful execution of the 2012 Space Generation Congress**

Output: Report on a successful event, measured in terms of delegate numbers, diversity and contribution.

The SGC 2011 in Cape Town (South Africa) was an overwhelming success, and repeating this was a challenge for SGC 2012. The challenge was met, and the standard attained at SGC 2012 sets the bar for 2013 even higher. The call for applications did not need to be extended based on the high volume of applications received. SGAC managed to gather over 130 delegates from 44 countries around the world, who produced outstanding output during the working sessions. A new panel, the "SGC Fireside Chat", organised with leaders from five space agencies (Canada, Germany, Italy, Japan, Mexico) attracted a lot of attention, and allowed these leaders to outline their views on the professional future of the new space generation.

SGC's sponsors contributed greatly to the success of the event, as well as to the ability to give out 28 scholarships to attend the SGC. Representatives of SGAC sponsors attended parts of the SGC and expressed their satisfaction with it.

➤ **5. Focused development of SGAC's year-round projects**

Output: Formalised approach to the work of the SGAC projects that would provide guidelines for: the conditions for the registration of a project, as well as of its maintenance; the rewards for successful implementation; and the criteria for closing/completing a project.

Alongside the hard work of the participants of SGAC project groups, the Project Co-coordinators were successful in reshaping and re-focusing existing project groups and establishing new ones. During the SGC 2012 two groups – the Small Satellites Project Group and the Space Law Project Group – were officially inaugurated. Both project groups were created following the new guidelines and under the guidance of the Project Co-coordinators. Further development on the leadership of the project groups is being undertaken. Some of the crucial changes were introduced as amendments to SGAC Bylaws and were voted on during the General Assembly 2012.

Some of the project groups have received increasing attention from certain SGAC sponsors, in particular the Space Safety and Sustainability, and Move an Asteroid project groups. Members of these project groups have received scholarships and awards to present the results of the work done within those groups or competitions organised by them. Due to this success, SGAC sponsors expressed their willingness and interest in continuing sponsorship of various SGAC projects and competitions.

➤ **6. Deepening of relationships with partner organisations**

Output: Formalise the relationship with existing and new partner organisations through Memoranda of Understanding, which outline the long-term benefits of collaboration.

SGAC continued concluding various agreements with partner organisations. In 2012 the Memoranda of Understanding and other cooperation agreements signed included:

1. MoU with the Society of Satellite Professionals International
2. MoU with the Washington Space Business Roundtable
3. MoU with the International Astronautical Federation's Space Power Committee
4. MoU with the African Regional Centre for Space Science and Technology Education in English
5. Institutional partner contract with the Institute for Eastern Studies (Poland)

In addition, SGAC is working with several organisations on involvement of SGAC members into their projects, as for instance participation in the working groups of IAA, or possibility to benefit from special discounts for International Space University's programmes.

➤ **7. Development of a database improving alumni relations**

Output: Consolidation of the database of former members and reactivation of relationships with them, particularly in the context of SGAC events and on-going projects.

Work is underway on setting up a mailing list for SGAC alumni in order to re-establish contact with them, and to extend SGAC's presence and information about its activities to our former members. The server has been cleaned up, and the organisation has prepared a request for proposal document which will aid the successful implementation of a systematic membership (current and former) database consolidation process.

➤ **8. Recognition for SGAC through an award**

Output: A report to SGAC's Executive Council on eligibility and competitiveness for available awards

Further investigation of awards continued during 2012, although it did not bring many feasible options to consider. SGAC Advisory Board was requested to provide help and guidance on this matter, and its members expressed their willingness to alert SGAC if they receive information about an award for which the organisation would be eligible.



SPACE GENERATION
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