



SPACE GENERATION
ADVISORY COUNCIL

ANNUAL REPORT EXECUTIVE SUMMARY



SPACE GENERATION ADVISORY COUNCIL 2015

In Support of the United Nations Programme on Space Applications



In Support of the United Nations Programme
on Space Applications

c/o European Space Policy Institute (ESPI)
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SPONSORS & PARTNERS

The Space Generation Advisory Council (SGAC) is very grateful for the continued generous support of sponsors and partners. This year SGAC's 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 2015.

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

Platinum Sponsors

Lockheed Martin



Secure World Foundation



Space Foundation



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Airbus DS



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United Launch Alliance



SSPI



INDIVIDUAL SPONSORS

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International Astronautical Federation (IAF)



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OHB System



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World Space Week Association



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Aerospace Association



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Czech Space Office



Council of Young Ukrainian
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and Space Strategic Studies



Foundation Institute for
Eastern Studies



Future Space Leaders
Foundation



G.A.U.S.S.



Gisat



The Heinlein Prize Trust



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Society (MANT)



The International Association
for the Advancement of
Space Safety



International Development
Alliance - EU-wide Informal
Network

International Space University



Lunar Mission One



McGill Institute of Air
and Space Law



Mona Geoinformatics Institute



De Nederlandse Vereniging
voor Ruimtevaart (NVR)



Österreichisches Weltraum
Forum



QB50



Kosmomol

Radio Amateur Corporation



Sapienza Aerospace
Student Association



Satellite 2015



SEDS USA



SERENUM



Skoltech



SkyNight Magazine (Iran)



Skyward Experimental Rocketry



SPACENEWS



SpaceRef Canada Interactive



SpaceTec

Space Safety Magazine



Students in Aerospace



Students in Aerospace

StyleCom



Swiss Space Systems



Telespazio VEGA Deutschland



Toronto Students for the
Advancement of Aerospace
(TSAA)



UKSEDS



UNAVCO



University of Colorado Boulder



University of Toronto
Aerospace Team (UTAT)



Washington Space Business
Roundtable



Women in Aerospace Europe



The World Aerospace Forum



YOUNG ESA



Yuri's Night



National Agencies

Agenzia Spaziale Italiana



Canadian Space Agency



Centre National d'Études
Spatiales



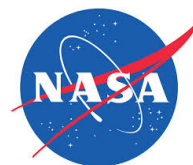
Deutsches Zentrum für Luft-
und Raumfahrt e.V.



JAXA



National Aeronautics and
Space Administration



EXECUTIVE COUNCIL MEMBERS

Chairpersons

Victoria Alonsoperez (*Uruguay*)
Stephanie Wan (*USA*)

Chair
Co-Chair

Executive Office

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Jacob Hacker (*Australia*)
Ali Nasser (*Iran/Canada*)
Jack Yeh (*New Zealand*)
Reinhard Tlustos (*Austria*)
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Ana Raposo (*Portugal*)
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Operations Manager & Outgoing Secretary
Executive Co-Secretary
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Communications and PR Coordinator
Project Coordinator
Project Coordinator
Competition Coordinator
Competition Coordinator
Web Coordinator
Strategic Partnerships Coordinator
Fusion Forum Manager
Space Generation Congress Manager

Regional Coordinators

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Beza Tesfaye (*Ethiopia*)
Suresh Battharai (*Nepal*)
Yusuke Muraki (*Japan*)
Zihua Zhu (*China*)
Guzel Kamaletdinova (*Russia*)
Matteo Emanuelli (*Italy*)
Behnoosh Meskoob (*Iran*)
Hamed Gamal (*Egypt*)
Ashley Chandler (*USA*)
Alan Steinberg (*USA*)
Bruno Sarli (*Brazil*)
Marco Cabero (*Bolivia*)

Africa
Africa
Asia Pacific
Asia Pacific (outgoing)
Asia Pacific
Europe
Europe
Middle East
Middle East
North, Central America & Caribbean
North, Central America & Caribbean
South America
South America

**Note: Members as of December 2015. Note that some members ended their terms during the year, and they may not be named here. On the same note, Volunteers that are team members are not listed here, but represented by their leads or coordinators in the Executive Office.*

LETTER FROM THE CO-CHAIRS

Dear members, colleagues, and supporters,

The Space Generation Advisory Council is now in its 16th year since the 1999 inception at UNISPACE III in Vienna, and its success has continued over the past year. The number of volunteer teams and positions has grown to accommodate the increasing number of national and regional activities. We, as well as our sponsors, continue to be impressed with the passion and enthusiasm of our members, who dedicate several hours each and every week to ensure quality output.

2015 was a busy and rewarding year for growth. We organised several young professional workshops and continued the success of the Asia Pacific Space Generation regional workshop (SGW) with a second SGW held in the South America region. Inspired by such regional activities, Colombia launched the first event in the SGx series, a new line of nationally focused events. We could not have done all this without the support of all our partners, sponsors, and ultimately the energy and leadership of the SGAC members.

Our major event in the first half of 2015 was the fourth Space Generation Fusion Forum (SGFF), a setting in which to discuss disruptive developments in the space sector with professionals and key players. Its continued success makes us excited to celebrate the fifth edition in 2016 and the strong support of our partner, the Space Foundation, helps make SGFF even better than ever.

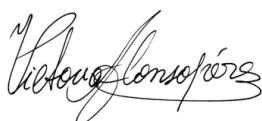
In June, SGAC hosted its first United Nations Committee on the Peaceful Uses of Outer Space reception to highlight our deep connections with the Office of Outer Space Affairs. The rest of the summer holidays remained busy for the Space Generation Congress (SGC) in Jerusalem. A mix of new faces and old SGAC friends filled seats at the sold-out event. During the SGC Closing Dinner, we were honoured to have Lockheed Martin's Wanda Sigur, ESA Director General Jan Woerner, and NASA Administrator Charles Bolden as speakers. Our additional distinguished guests included heads of space agencies from the German Aerospace Center (DLR) and the Centre National d'Études Spatiales (CNES).

As these events continue to grow in number and magnitude, we are ever more thankful to the event managers and their teams for planning all details necessary to make the event memorable. Furthermore, national and regional work, as well as project groups, would not have been possible without the leadership of each team.

The enthusiasm and energy from SGC has fuelled our work in the remaining months of the year, as we finish the year with the General Assembly and planning activities for 2016.

As you read through our annual report, remember that this work would not have been possible without the impressive inspiration and volunteer hours from our members, the ongoing support of our sponsors, and the collective passion to guide the next generation of space leaders.

Victoria Alonsoperez
Chair
(Uruguay)



Stephanie Wan
Co-Chair
(USA)



LETTER FROM THE EXECUTIVE DIRECTOR

Dear SGAC members, partners, supporters, and friends,

It's been an eventful year for the Space Generation Advisory Council as we continue to grow the SGAC network, increase the number of opportunities for the next generation, and extend our presence within the global space industry. From opening new SGAC volunteer positions and upgrading our online presence to working with our partners to offer more scholarships and awards than ever before. Our commitment to representing and promoting the next generation of space leaders has never been stronger.

I am glad to share the progress we have achieved in 2015. Once again, SGAC has exceeded its targets in donation revenue, number of scholarships, partnerships with other organisations, SGAC events, and contributions to the international space community. In 2015, SGAC worked with our sponsors and partners to give 114 scholarships and awards to upcoming leaders in the industry, allowing them to participate in international conferences, meet space sector leaders, and increase their professional development. Additionally, SGAC has organised 16 congresses, workshops, and events around the world. This year, SGAC hosted the 14th Space Generation Congress, the fourth Space Generation Fusion Forum, and a series of regional and national workshops. With 4,000 members from over 110 countries, the successes of 2015 have cemented SGAC as one of the largest international networks of students and young professionals in the space sector.

SGAC has also expanded its network with key agencies, industry, and academic partners, building on established collaborations and initiating several new cooperations. It is thanks to sponsors and supporters that SGAC is able to continue our steady growth, and year after year prioritise opportunities and scholarships for SGAC members. In the coming year, SGAC aims to continue its engagement with partners who seek to increase the visibility of the next generation of space leaders within the space community.

Over the course of the year, SGAC has continued supporting the United Nations by actively participating at UNCOPUOS meetings and other events by the United Nations Office for Outer Space Affairs (UNOOSA), bringing energy, ambition, and fresh ideas from the SGAC members and Project Groups. The eight SGAC Project Groups continued to publish educational and technical material on different space topics throughout the year, with a total of 21 presentations and publications in 2015. The impact of these reports has brought numerous opportunities for SGAC members to present their work through attending conferences and events around the world.

The SGAC team is very proud of our achievements in 2015. These successes would not be possible without the continued hard work and dedication of our volunteer members. On behalf of the Executive Council I would like to recognise all of the members who made 2015 a remarkable year for SGAC!

Best Regards,

Minoo Rathnasabapathy
SGAC Executive Director





OUTPUT AT A GLANCE

SCHOLARSHIPS AND AWARDS (114)

- Space is Business! Paper Competition (1)
- Australian Youth Aerospace Association (AYAA) Australian Futures Award (2)
- Space Solar Power Design Competition (1)
- OHB Innovative Earth Observation Missions Competition (1)
- Move an Asteroid Technical Paper Competition (1)
- Bob Richards Space for Peace Scholarship (1)
- Czech Space Competition (1)
- Embry Riddle Technical Paper Competition (1)
- Italian Space Agency (ASI) Grant (5)
- German Aerospace Center (DLR) Standout Student Scholarship (2)
- Society of Satellite Professionals International (SSPI) Satellite Futures Scholarship (2)
- NASA Space Communications and Navigation (SCaN) Scholarship (1)
- NASA Advanced Exploration Systems (AES) Scholarship (1)
- Space Generation Advisory Council Young Space Leaders Scholarship (5)
- Space Generation Congress Host Nation Scholarship (1)
- International Lunar Exploration Working Group (ILEWG) Moon Plenary Competition (1)
- ILEWG Young Lunar Explorers Prize (1)
- SGAC-IAASS Space Safety Competition (3)
- International Committee on GNSS (ICG) Logo Design Competition (1)
- Space Generation Advisory Council Global Grants Programme (4)
- SATELLITE 2015 Essay Competition (30)

In addition to the previous list, SGAC worked with our partners to offer free registration to the Space Generation Congress as part of the following awards programme:

- Future Space Leaders Grant Programme (5)
- International Astronautical Federation (IAF) Emerging Space Leaders Grant Programme (14)
- Israeli Aerospace Industries (IAI) Young Professionals (9)
- Space Symposium Complimentary Registrations (20)

CONFERENCES AND WORKSHOPS ORGANISED (16)

- SATELLITE 2015 Speed Mentoring Event, USA
- Space Generation Fusion Forum (SGFF), USA
- South American Space Generation Workshop 2015 (SA-SGW), Argentina
- SGAC/WSW COPUOS Reception, Austria
- Hungarian Space Academy, Hungary
- SGC Workshop for Moderators and Rapporteurs, Israel

- Space Generation Congress (SGC), Israel
- SGxColombia, Colombia
- SGAC/World Space Week TweetUp, Israel
- SGAC-Bob Richards Space for Peace Outreach Event, Israel
- SGAC SpaceOps Workshop, Israel
- SGAC/IAF Global Networking Forum: How to Launch a Career in Space, Israel
- SGAC/ISU/IAF WD-YPP Networking Event, Israel
- ReInventing Space Careers Night, UK
- YGNSS Workshop on Interoperability and International Cooperation, USA
- Asia Pacific Space Generation Workshop 2015 (AP-SGW), Indonesia
- SGAC European Student Workshop, Italy

FORMALISED PARTNERSHIPS (8)

- MonaGIS
- DLR Standout Student Scholarship Agreement
- Lunar Mission One
- Space Ops
- SkolTech
- Space Safety Magazine
- Agenzia Spaziale Italiana (ASI)
- Centre National d'Etudes Spatiales (CNES)

PAPERS, PRESENTATIONS, AND PUBLICATIONS (21)

PROJECT GROUPS

Space Law and Policy Project Group:

- T Cheney (*UK*), L Napier (*USA*). Policy Analysis: Air versus Space. Where Do Sub-orbital Flights Fit in for International Regulation? Journal of Science Policy and Governance, Vol. 3 Issue 1.
- SGAC Response to Questions on Suborbital Flights for Scientific Missions and/or for Human Transportation. 54th Session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Austria.
- L Napier (*USA*). SGAC Statement in Response to 2015 UNCOPUOS LSC Working Group on the Definition and Delimitation of Outer Space. 54th Session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Austria.
- T Cheney (*UK*). SGAC Technical Presentation on the Space Law and Policy Project Group. 54th Session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Austria.
- Space Technology for Disaster Management Project Group:

- S O'Sullivan (UK), M Kinyua (Kenya). Space Technology and its Uses for Disaster Management. Oral Presentation. Queen's University of Belfast, Ireland.
- S O'Sullivan (UK), M Kinyua (Kenya). Space Technology and Disaster Management: the Paradigm Shift. Oral Presentation. Harvard Business School, USA.
- S O'Sullivan (UK), M Kinyua (Kenya). NDVI Variable to Indicate Varying Vegetation Cover over Kenya. Oral Presentation.
- S O'Sullivan (UK), M Kinyua (Kenya). Young Professionals and Students Involvement in Disaster Risk Reduction Using Space Technology Approaches. 66th International Astronautical Congress. Jerusalem, Israel.

Youth for the GNSS Project Group:

- E Offiong (Nigeria). SGAC and YGNSS's Role in Education Outreach. Oral Presentation. USSTI 2015 course, Washington DC, USA
- J Duran (Spain/France). Introduction of Youth for GNSS (YGNSS) and the Results from the Space Generation Congress (SGC). Positioning, Navigation, and Timing Advisory Board Meeting. Boulder, Colorado, USA.
- S Wan (USA). Perspectives from the Next Generation of GNSS Users: GNSS Today and Preparing the Future. 10th meeting of the International Committee of GNSS. Boulder, Colorado, USA.

Space Safety and Sustainability Project Group:

- N Prasad Nagendra (India), K Kumar (The Netherlands), L Bettiol (Italy), G Federico (Italy), A Alizadeh (Iran), O Ogunmodimu (Nigeria), S Shojaee (Iran/Italy), M Emanuelli (Italy), A Nasser (Iran/Canada). An Analysis of the Applicability of Space Debris Mitigation Guidelines to the Commercial Small-Satellite Industry. Interactive presentation and paper. 66th International Astronautical Congress. Jerusalem, Israel.
- A Rivolta (Italy), L Ferrario (Italy), C Borriello (Italy), J Ramon Medel (Spain), L Ghasemzadeh (Iran), J Chan-Hao Wang (Canada), A Nasser (Iran/Canada), M Emanuelli (Italy). International spacecraft design policies for orbital servicing. Oral presentation and paper. 66th International Astronautical Congress. Jerusalem, Israel.
- D Emanuele Chiuri (Italy), A Turconi (Italy), A Hussein (UK), N Nader (Egypt), S Raval (India), M Emanuelli (Italy), A Nasser (Iran/Canada). Active Debris Removal: Overview and Figures of Merit of Debris Grabbing Strategies. Interactive presentation. 66th International Astronautical Congress. Jerusalem, Israel.
- J Lousada (Portugal), R Rajput (India), H Gamal (Egypt), C Kiang (USA), G Kamaludinova (Russia), J Loughman (USA), P Bertrand (France), A Nasser (Iran/Canada), M Emanuelli (Italy). Technical Safety Analysis of a One-Way Human to Mars Mission. Oral Presentation and paper. 66th International Astronautical Congress. Jerusalem, Israel.
- A Nasser (Iran/Canada), M Emanuelli (Italy). SGAC Space Safety and Sustainability Project Group - Reflecting the Views of the Next Generation for Five Years. Oral presentation and paper. 7th International Conference on Recent Advances in Space Technologies (RAST). Istanbul, Turkey.
- J Lousada (Portugal), A Malcolm (UK), H Gamal (Egypt), R Rajput (India), M Emanuelli (Italy), A Nasser (Iran/Canada). Report on National Research on Space Debris, Safety of Space Objects with Nuclear Power Sources on Board and Problems of their Collision with Space Debris. 52nd Session of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Austria.

SGAC Near Earth Object Project Group:

- A Karl (Germany). The 2013 SGAC Name An Asteroid Campaign - Overview, Results, Lessons Learned - A Strategy for IAWN to Educate the General Public. Paper, Poster and Presentation. 2015 Planetary Defense Conference, Frascati, Italy.

Space Exploration Project Group:

- H Ghassabian (Iran), A Calzada (Spain), S Hettrich (Germany), M Wojciechowska (Poland), I Wojciechowski (Poland), S Karmakar (India), PN Vyshnav (India), R Rajput (India), M Takla (Egypt), A Antonello (Italy), A Garcia (USA), G Oborin (Russia), S Saini (USA), I Zhukov (Russia). Proposal for Mission Architecture - Team Alcides. Report for ESA Moon Challenge.
- S Hettrich (Germany), B Akinsanmi (Nigeria), A Alizade (Iran), L Ghasemzadeh (Iran), H Ghassabian (Iran), S Karmakar (India), M Lawniczak-Wanslaw (Poland), E Salt-eri (Greece), M Takla (Egypt), M Wojciechowska (Poland), I Wojciechowski (Poland). Analog Planetary Research as an Effective Tool for Space Education. Poster presentation and paper. 1st Symposium for Space Educational Activities. Padova, Italy.
- S Hettrich (Germany), J Frankowski (Poland). The Poland 2016 Mission - First Mission Outline. Oral presentation at the Site Inspection Mars Analog Simulation, Rzepiennik Biskupi, Poland.
- A Calzada (Spain). Space Generation Advisory Council - Exploration Projects in SGAC SEPG. Moon Village Workshop, ESA ESTEC, Netherlands.

OTHER (56)

- M Rathnasabapathy (Australia/South Africa). Education in Orbit. Panelist. SATEL-LITE 2015, USA
- L Groswald (USA). Motivating the next generation. Panelist. International Civil Aviation Organization (ICAO) / United Nations Office of Outer Space Affairs (UNOOSA) AeroSPACE Symposium, Montréal, Canada.
- S Bandla (USA), M Rathnasabapathy (Australia/South Africa). Report on the Outcomes of the 4th Space Generation Fusion Forum. 31st Space Symposium, Colorado Springs, USA.
- M Rathnasabapathy (Australia/South Africa). Space Education from Preschoolers to Seniors. Panelist. Space and Satellite Technology Forum, Poland.
- K Howells (Canada). The Space Generation Advisory Council: Students and Young Professionals Shaping the Future of Space. Canadian Space Summit, Canada.
- P Maier (Germany), J Svoboda (Czech Republic), M Rathnasabapathy (Australia/South Africa). SGAC and SGC 2015. SpaceUp Cologne, Germany.
- S Wan (USA). SGAC Intro to SpaceOps. Oral Presentation. Space Ops Committee Meeting. South Korea
- D Milankovich (Hungary), L Bacsardi (Hungary). The Voice of Youth. Hungarian Space Camp. Sopron, Hungary.
- M Rathnasabapathy (Australia/South Africa). Next Generation's Role in Research and Innovation for National Economic Development. Panelist. 5th Global Space & Satellite Forum (GSSF 2015), Abu Dhabi, United Arab Emirates (UAE).
- S Wan (USA). Geospatial Capacity Building Forum. Panelist. GeoBuiz. USA.
- M Rathnasabapathy (Australia/South Africa). SGAC - The Network. Metaplaneta Ideathon. Singapore.
- M Rathnasabapathy (Australia/South Africa). Reverse Teaching - What Can Kids Teach Teachers. International Space Education Board (ISEB) Educator's Workshop, Israel.
- M Rathnasabapathy (Australia/South Africa). Q&A with Jacob Cohen. IAC Global Networking Forum (GNF), Israel.
- A Bartolini (Canada), A Nasser (Canada/Iran), A Persad (Canada). The Space Generation Advisory Council: Students and Young Professionals Shaping the Future of Space. International Space Development Conference 2015, Canada.
- R Tlustos (Austria). The Space Generation Advisory Council (SGAC). ISU Space Studies Program 2015, Athens, Ohio, USA.
- C Kiang (USA). SGAC: Beyond the Network. SpaceVision SEDS USA. USA
- A Gibson (USA). SGAC - How to get Involved. CUSEDS Students for the Exploration and Development of Space Meeting, USA.
- K Halauko (Belarus). International Space Law: Actual Issues and New Challenges.

- es. Festival of Science Blogs at Cosmonautics Museum, Russia.
- JD Burke (USA), K Howells (Canada), C Rumpf (Germany), M Thangavelu (India). International NEO Education and Public Outreach. Planetary Defense Conference 2015. Italy.
- A Vigneron (Canada). Three Things You Need to Know about the Space Generation Advisory Council. WSW Ottawa: Space Net Night, USA.
- B Sarli (Brazil), J Silva-Martinez (USA/Peru), K Toole (USA), A Demeubayeva (Kazakhstan), J Chibueze (Nigeria), Space Generation: Engaging the Next Generation in the Asia-Pacific and South American Regions. 66th International Astronautical Congress. Jerusalem, Israel.
- B Sarli (Brazil), M Cabero (Bolivia), A Lopez (Chile), J Cardoso dos Santos (Brazil), B Dnapoli Reis de Mesquita (Brazil), D Jiménez (Colombia), A Roman-Gonzalez (Peru), G Villena de la Cruz (Peru), N Vargas (Bolivia), F Perazzo (Argentina). South American Space Era. 66th International Astronautical Congress. Jerusalem, Israel.
- B Yaglioglu (Turkey), A Kayihan (Turkey), A Flores (Costa Rica), H Gamal (Egypt), E Dagdeviren (Turkey). Effective and Sustainable Outreach of Space Science and Technology: Middle East and Central America Cases. 66th International Astronautical Congress. Jerusalem, Israel.
- D Milankovich (Hungary), L Bacsardi (Hungary). Space Generation – Opportunities for Building International Relationships for Youth Interested in Space Research. The Day of Space Research. Budapest, Hungary
- A Raposo (Portugal), M Rathnasabapathy (Australia/South Africa). Space Generation Advisory Council's Project Groups: Education Activities in an International Network. 1st Symposium on Space Education Activities. Padova, Italy.
- M Losekamm (Germany), J Hacker (Australia), N Sardesai (Australia), A Nakarada Pecujlic (Serbia), A Vigneron (Canada). Legal and Political Implications of Future On-Orbit Servicing Missions. 66th International Astronautical Congress. Jerusalem, Israel.
- A Vigneron (Canada), J Hacker (Australia), M Losekamm (Germany), N Sardesai (Australia), C Johnson (USA), R Bell (USA), D Rey (Canada). Encouraging Legal Awareness in STEM Graduates: Lessons Learned from SGC 2014. 66th International Astronautical Congress. Jerusalem, Israel.
- N Zhou (China). Possible Next Step Cooperation between APRSAF and SGAC - Based on Success of the 2nd Asia-Pacific Space Generation Workshop (AP-SGW2). 22nd Asia Pacific Regional Space Agency Forum (APRSAF). Bali, Indonesia.
- D Milankovich (Hungary), L Bacsardi (Hungary). The Voice of Youth. Hungarian Space Academy. Godollo, Hungary.
- D Milankovich (Hungary), L Bacsardi (Hungary). The Next Generation of Space Research Space Generation – Opportunities for Building International Relationships for Youth Interested in Space Research in Jerusalem. News article. Úrvilag Newsportal, Hungary.
- C Kiang (USA). Evaluating the Potential for Commercial Space Industry Growth: An Entrepreneurial Environment Analysis of Japan. 66th International Astronautical Congress. Jerusalem, Israel.
- P Milova (Russia), J Svoboda (Czech Republic). Evaluation of the Potential for Commercial Space Industry Growth: An Entrepreneurial Environment Analysis of Russia. 66th International Astronautical Congress. Jerusalem, Israel.
- A Roman-Gonzalez (Peru), N Vargas (Bolivia). Aerospace Technology in Peru. 66th International Astronautical Congress. Jerusalem, Israel.
- A Calzada (Spain). Introduction to SGAC and the Space Exploration Project Group. ESA Moon Village Workshop, Netherlands.
- O Kara (Turkey), B Yaglioglu (Turkey), M Brunner (USA), D Schor (Canada), R Birke-land (Norway), T Smith (USA), A Hornig (Germany). Communication Architecture and International Policy Recommendations Enabling the Development of Global CubeSat Space Networks. IAC Virtual Forums. 66th International Astronautical Congress. Jerusalem, Israel.
- Y Henry (Jamaica). Introduction into SGAC. UWI Research Days Conference. Jamaica.

- L Bettiol (*Italy*). Astro Space Team, ELGRA + SELGRA & SGAC. Department of Industrial Engineering, University of Padova. Italy.
- E Jayashantha (*Sri Lanka*). Introduction into SGAC. Annual Night Camp and Astronomical Workshop. Sri Lanka.
- P Batenburg (*The Netherlands*). The Moon - A Continent and a Gateway for our Future. Panelist IAC 2016 Plenary. 66th International Astronautical Congress. Jerusalem, Israel.
- A Nasser (*Iran/Canada*). Motivations for Space Exploration: A Survey within the Space Community, Journal of the British Interplanetary Society, vol. 68, no.5-6, pp. 135-141, October 2015.
- SGAC Exchange of Views Statement at the Scientific and Technical Subcommittee of UNCOPUOS.
- SGAC Exchange of Views Statement at the Legal Subcommittee of UNCOPUOS.
- SGAC Exchange of Views Statement at the General Assembly of UNCOPUOS.
- SGAC Technical Presentation at the Scientific and Technical Subcommittee of UNCOPUOS.
- SGAC Technical Presentation at the Legal Subcommittee of UNCOPUOS.
- SGAC Technical Presentation at the General Assembly of UNCOPUOS.
- SGAC Annual Report 2015.
- SGAC Executive Summary of the Annual Report 2015.
- Space Generation Fusion Forum 2015 Final Report.
- Space Generation Congress 2015 Final Report.
- Asia-Pacific Space Generation Workshop 2014 (AP-SGW) Report.
- South American Space Generation Workshop 2015 (SA-SGW) Report.
- SGAC's UN Involvement Video.
- SGC 2015 Promotional Video.
- Space Generation Fusion Forum 2015 Summary Video.
- Space Generation Congress 2015 Highlights Video.

CONFERENCES/EVENTS WITH OFFICIAL SGAC REPRESENTATION (50)

- 10th Illan Ramon Conference, Israel
- 52nd Session of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Austria
- American Astronautical Society (AAS) Goddard Space Symposium, USA
- National Space Club Goddard Memorial Dinner, USA
- SATELLITE 2015, USA
- SSPI Better Satellite World Awards Dinner, USA
- SpaceUp Cologne, Germany
- Planetary Defense Conference 2015, Italy
- IAF Spring Meeting, France
- The Day of Space Research, Hungary
- ICAO/UNOOSA AeroSPACE Symposium, Canada
- 31st Space Symposium, USA
- 54th Session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Austria
- 8th Argentine Congress of Space Technology, Argentina
- Global Space and Satellite Forum, UAE
- International Space Development Conference (ISDC) 2015, Canada
- 10th Planning Meeting of the International Committee on Global Navigation Satellite Systems (ICG), Austria
- Ceremony on the occasion of signing agreement on accession to ESA Convention, Hungary
- 58th Annual General Assembly of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Austria
- 6th Space and Satellite Technology Forum, Poland
- Hungarian Space Camp, Hungary
- Global Space Innovation Conference (GLIC) 2015, Germany

- SpaceUp GLIC, Germany
- Hungarian Space Research Forum, Hungary
- GeoBuiz 2015, USA
- Metaplaneta Ideathon, Singapore
- IAA Heads of Agencies/ Climate Change and Disaster Management Conference, Mexico
- ESPI Autumn Conference, Austria
- Space Studies Programme 2015, International Space University, USA
- International Space Education Board (ISEB) Educator' Workshop, Israel
- World Space Week Celebrations around the world
- Yuri's Night Celebrations around the world
- 66th International Astronautical Congress (IAC), Israel
- IAC Young ESA Reception, Israel
- IAC Global Networking Forum (GNF), Israel
- SpaceUp Rome, Italy
- American Institute of Aeronautics and Astronautics (AIAA) SPACE 2015, USA
- 10th Meeting of the International Committee on Global Navigation Satellite Systems (ICG), USA
- 10th Annual SSPI Future Space Leaders Dinner, USA
- 13th Reinventing Space Conference, UK
- SATCON Conference, USA
- SpaceVision 2015, USA
- Space Tech Expo Europe, Germany
- Canadian Space Summit, Canada
- High Level Fora: Space as a Driver for Socioeconomic Sustainable Development, Austria
- 22nd Session of the Asia-Pacific Regional Space Agency Forum (APRSAF-20), Indonesia
- ESA Moon Village Workshop, Netherlands
- 1st Symposium on Space Education Activities, Italy
- African Leadership Conference, USA
- UN ECOSOC Multilateral Negotiations on an International Code of Conduct for Outer Space Activities, New York, USA

Although they are not all listed here, SGAC members have also attended and helped organise numerous events in their home countries, especially for World Space Week and Yuri's Night.

ACTIVITY HIGHLIGHTS

GENERAL HIGHLIGHTS

SGAC ACTIVITY HIGHLIGHTS

Victoria Alonsoperez (*Uruguay*) succeeded Christopher Vasko (*Austria/Hungary*) as new Chair of SGAC.

SGAC welcomed a new Co-Chair, Stephanie Wan (*USA*).

SGAC welcomed a new Executive Director, Minoo Rathnasabapathy (*Australia/South Africa*).

SGAC appointed Ali Nasser (*Iran/Canada*) as the SGAC Operations Manager.

SGAC welcomed two interns, Jacob Hacker (*Australia*) and Chantelle Dubois (*Canada*).

SGAC signed eight new MoUs including with Agenzia Spaziale Italiana (ASI) and Centre National d'Etudes Spatiales (CNES).

In 2015, SGAC worked with partners and sponsors to award 94 scholarships and awards to SGAC members to attend international conferences, in addition to complimentary registration for numerous conferences.

SGAC awarded four Global Grant awards to Martin Losekamm (*Germany*), Etim Offiong (*Nigeria*), Jan Svoboda (*Czech Republic*), and Anja Nakarada Pecujlic (*Serbia*).

SGAC awarded five Young Leaders awards to Kyle Acierno (*Canada*), Sirisha Bandla (*USA*), Henry Ibitolu (*Nigeria*), and Giampietro Tonoli (*Italy*).

SGAC organised 16 conferences, workshops, and events around the world.

SGAC members attended 50 conferences with official SGAC representation.

The eight SGAC Project Groups produced 17 papers and publications during 2015.

SGAC increased its ties with the UNOOSA and hosted its Inaugural UNCOPUOS Reception, partnering with World Space Week Association (WSWA).

SGAC organised the fourth Space Generation Fusion Forum in conjunction with the 32nd Space Symposium.

SGAC held the first South American Space Generation Workshop (SA-SGW) and second Asia Pacific Space Generation Workshop (AP-SGW) as part of its regional workshop series.

SGAC hosted the 14th Space Generation Congress in Jerusalem, Israel, held in conjunction with the 66th International Astronautical Congress.

The annual SGC Closing Gala Dinner hosted 210 guests with keynote speeches from Administrator Charlie Bolden (NASA), Director General Jan Woerner (ESA) and Ms. Wanda Sigur (Lockheed Martin Space Systems Company).

SGAC achieved remarkable participation at the IAC 2015 in Jerusalem, Israel. SGAC organised several events during the IAC including the SGAC Space Ops Workshop, Space for Peace Outreach Event, Next Gen Reception (together with ISU and Workforce Development/Young Professionals Programme Committee), and the Global Networking Forum Panel How to Launch Your Career in Space. Members also participated in events such as the IAC Plenary, and several IAF Committees.

EXECUTIVE OFFICE HIGHLIGHTS

SGAC opened new positions in the Executive Office including SGC Manager, SGAC Operations Manager, SGAC Grants Lead, SGAC Legal Counsel, and SGAC Deputy Treasurer.

Three new Regional Coordinators were elected:

- South America: Marco Cabero (*Bolivia*)
- Middle East: Hamed Gamal (*Egypt*)
- Asia Pacific: Zihua Zhu (*China*)

Sirisha Bandla (*USA*) was appointed as the fourth Space Generation Fusion Forum Manager.

Jan Svoboda (*Czech Republic*) was appointed as the Space Generation Congress 2015 Manager.

SGAC delivered Statement of Views at UNCOPUOS including three technical presentations at the 52nd Session of the Scientific and Technical Subcommittee, 54th Session of the Legal Subcommittee and 58th Annual General Assembly of UNCOPUOS.

SGAC Chair Victoria Alonsoperez (*Uruguay*) was the Master Moderator for one day of the 31th Space Symposium.

SGAC Co-Chair Stephanie Wan (*USA*) was invited to present at the following:

- SGAC Intro to SpaceOps. Oral Presentation. Space Ops Committee Meeting. South Korea.
- Perspectives from the Next Generation of GNSS Users: GNSS Today and Preparing the Future. Oral Presentation. 10th meeting of the International Committee of GNSS. Boulder, Colorado, USA.

- Geospatial Capacity Building Forum. Panelist. GeoBuiz. Washington DC, USA.

SGAC Deputy Executive Director Minoo Rathnasabapathy (*Australia/South Africa*) was invited to participate in the following conferences/panels:

- Education in Orbit. Panelist. SATELLITE 2015. Washington DC, USA.
- Space Education from Preschoolers to Seniors. Panelist. Space and Satellite Technology Forum. Rzeszow, Poland.
- Next Generation's Role in Research and Innovation for National Economic Development. Panelist. Fifth Global Space & Satellite Forum (GSSF 2015), Abu Dhabi, United Arab Emirates (UAE).
- Metaplaneta Ideathon. Speaker. Singapore.
- Reverse Teaching - What can kids teach teachers? Speaker. International Space Education Board (ISEB) Educator's Workshop. Jerusalem, Israel.

SGAC Executive Director Minoo Rathnasabapathy (*Australia/South Africa*) and SGFF Manager Sirisha Bandla (*USA*) presented the conclusions of the fourth Space Generation Fusion Forum Panel at the 31st Space Symposium.

AFRICA: REGIONAL HIGHLIGHTS



- Beza Tesfaye (*Ethiopia*) and Kingsley Ukgaegbu (*Nigeria*) won the ESL Grant to attend SGC and IAC 2015.
- Four NPOCs were elected in 2015. Attia Salah (*Libya*), Tom Mutabazi and Oywoth Abedigamba (*Uganda*), and Rania Toukebri (*Tunisia*).
- NPOC terms completed: Ifriky Tadadjou (*Cameroon*), Lumka Msibi (*South Africa*), Bezaye Hailu Getu (*Ethiopia*), and Nicholas Muinde (*Kenya*).
- NPOCs terms renewed: Conrade Muyanbo (*Zimbabwe*) and Erinfoami Funmi (*Nigeria*).
- Yuri's Night and WSW events were held in Libya, Ethiopia, and Nigeria.
- Potential collaboration between SGAC Africa and ALC-YF (African Leadership Conference Youth Forum) was initiated and commenced.
- SGAC space awareness events to university students and student societies held in Libya and Tunisia by the NPOCs.

ASIA PACIFIC: REGIONAL HIGHLIGHTS



- Zihua Zhu (*China*) was welcomed as the new Regional coordinator.
- Ten NPOCs were appointed in the region: Araz Jabbarli (*Azerbaijan*), Aghasif Alakbarov (*Azerbaijan*), Jahangir Hossain (*Bangladesh*), Wenqian Wang (*China*), Yangzi Tao (*China*), Shripad Jagdale (*India*), Happy Rumiris Simanungkalit (*Indonesia*), Hagarly Hutasuhut (*Indonesia*), Nazifa Baktybayeva (*Kazakhstan*), and Yasith Lakmal (*Sri Lanka*).
- The second Asia Pacific Space Generation Workshop in partnership with Indonesian National Institute of Aeronautics and Space (LAPAN) was held November 28-29th in Bali, Indonesia as an official side event of the 22nd Asia Pacific Regional Space Agency Forum (APRSF-22), December 1-4th in Bali, Indonesia.
- SGAC members from India, Sri Lanka, Philippines and Thailand named four of the six asteroids identified during the Find an Asteroid 2015 Campaign run by the SGAC Near Earth Object Project Group.
- SGAC members celebrated Yuri's Night and World Space Week across the region with programmes to engage students and young professionals.
- The second Australian SpaceUp was held in the lead up to the ASSC, July 25, 2015.
- Official contacts were established with Asia-Pacific Space Cooperation Organization (APSCO), Korea Aerospace Research Institute (KARI), and National Space Agency of Malaysia (ANGKASA).

EUROPE HIGHLIGHTS:



- SGAC Europe is proud to welcome 11 new NPOCs: Bora Aliaj (Albania), Maximilian Trautinger (Austria), Kamen Kozarev and Stanimir Gantchev (Bulgaria), Marketa Palenska (Czech Republic), Laura Bettiol (Italy), Joao Lousada (Portugal), Anastasia Ilina (Russia), Tomas Hrozensky (Slovakia), Tobias Bandi (Switzerland), Kateryna Aheieva (Ukraine).
- SGAC has signed Memoranda of Understanding with the Italian Space Agency (ASI), the French Space Agency (CNES), Skoltech, and renewed the agreement already in place with the German Space Agency (DLR).
- Many European students and YPs attended SGC 2015 in Jerusalem thanks to the efforts of European NPOCs who helped setting up different national scholarships.
- SGAC Participated in several European space conferences and meetings including the European Aerospace Student Meeting 2015, the European Space Policy Conference, the Global Space Innovation Conference (GLIC), Space Tech Expo Bremen, and the Paris Air Show.
- NPOCs and SGAC members organised different local events. These included:
 - SpaceUp events such as SpaceUp Rome, SpaceUp NL, SpaceUp GLIC Munich.
 - Space Startup Weekend Bremen.
 - World Space Week (WSW) events such as "Mars Analog Mission Hangouts #askFRL" in France.
 - Networking events such as "Discover Your Space" in the Netherlands, "Explorare, Quo Vadis? – Art, Philosophy, and Space Exploration" in Belgium, "Munich Space Dinner" in Germany, "SGAC Greece goes to the European Space Expo in Athens" in Greece.
 - Local events for students and summer schools such as Hungarian Space Camp and Hungarian Space Academy, Czech Space Day, Summer Space School in Russia, Moscow Region.
- The SGAC European Student Workshop, a one-day regional workshop for university students was successfully held in Padua on December 12. The workshop was followed by the traditional SGAC European Christmas dinner.
- SGAC Europe is organising the first European Space Generation Workshop, organized in conjunction with the 2nd International Conference on Research, Technology and Education of Space, in Budapest, Hungary on 26-27 February, 2016.

MIDDLE EAST: REGIONAL HIGHLIGHTS



- Behnnosh Meskoob (*Iran*) finished her first term as a regional Coordinator of the Middle East region.
- Six new NPOCs were appointed including Mohammed Sallam (*Egypt*), Yevgeny Tsodikovich (*Israel*), Montaser Sallam (*Jordan*), Zainab Al Salhi (*Oman*), Waad Al-jaradt (*Palestine*), and Shamma Alqassim (*UAE*).
- Israel hosted the 66th International Astronautical Congress and the 14th Space Generation Congress, and 21 members from the Middle East participated at the SGC.
- Israel has also won the privilege to host the International Space University's (ISU) Space Studies Program (SSP) in summer of 2016 in the Technion, Haifa.
- Host Nation scholarship for local or international participants that have roots in the hosting nation of the SGC funded an Israeli member participation in SGC15.
- Middle Eastern NPOCs did several outreach events during this year, including Yuri's Night in several countries.
- Teams from Egypt, Iran, Israel, and Turkey participated in the SGAC Find an Asteroid Search Campaign.
- The United Arab Emirates (UAE) held an opening ceremony for the UAE space agency and announced a Mars mission.

- Zainab Al Salhi (*Oman*) participated in the UAE space agency opening ceremony.
- Zainab Al Salhi (*Oman*) participated in the United Nations International Conference on Space-Based Technologies for Disaster Management - A consolidating role in the implementation of the Sendai Framework on Disaster Risk Reduction.
- Zainab Al Salhi (*Oman*) had a radio interview and newspaper report about the SGAC.
- Burak Yağlıoğlu (*Turkey*) participated in RAST, Ankara International Aerospace Conference (AIAC), Eskişehir Osmangazi University Hezarfen Aeropsace Days, Turkish Aeronautical Association University Aeronautical, and Space Days in addition to Yuri's Night.
- Mohammadreza Rezaei (*Iran*) gave an interview with Isfahan Astronomy Club about Iranian manned space programme and presented a lecture on the New Horizons spacecraft and its explorations near Pluto and Kuiper belt.
- Iranian NPoCs wrote four articles about World Space Week in scientific magazines.
- A team of Aerospace Engineering students from Cairo University (*Egypt*) won the most Innovative Idea prize in an interstellar mission feasibility study held by the Initiative for Interstellar Studies.
- A team of Aerospace Engineering students from Cairo University (*Egypt*) launched the first Egyptian sounding rocket ever launched in Green River, Utah, USA, and won the team spirit award.
- Mohammed Sallam (*Egypt*), Omar Samra (*Egypt*), and Hamed Gamal (*Egypt*) started a campaign to introduce space activities and technologies to 100 elementary and high schools in Egypt.
- Mohammed Sallam (*Egypt*) presented the One-Way Mars Mission at the Astronautical Society of Mustafa Mahmoud's mosque.
- Palestine members held various astronomy events such as watching the blood supermoon and a solar eclipse in North Bethlehem, Palestine.



NORTH CENTRAL AMERICA AND THE CARIBBEAN:

REGIONAL HIGHLIGHTS

- The region welcomed four new NPoCs: Alexander Gibson (*USA*), Adrian Quesada Rodriguez (*Costa Rica*), Juan Esteban Gramajo Gonzalez (*Guatemala*), and Antonio Gutierrez (*Mexico*).
- The Space Generation Fusion Forum was held in Colorado Springs, USA in conjunction with the Space Foundation's Space Symposium, and managed by Sirisha Bandla (*USA*).
- SSGAC hosted a SATELLITE Mentoring Event in conjunction with SATELLITE 2015, in Washington DC in March to connect SGAC members with senior industry and agency mentors.
- Yuri's Night celebrations were held all over the region, including Los Angeles, USA, Colorado Springs, USA, and Winnipeg, Canada.
- SGAC members attended the International Space University Space Studies Program in Athens, Ohio.
- SGAC recently signed a MoU with MonaGIS initiated by Yitzhak Henry (NPoC Jamaica).
- Canadian Space Summit was a huge success, and with around 80 students and 20 professionals in attendance, it was evident that Ottawa's space actors embraced the chance to grow the local community.



SOUTH AMERICA:

REGIONAL HIGHLIGHTS

- The first South American Space Generation Regional Workshop was organized. It was a two-day regional workshop for university students and young professionals in South America in conjunction with the eighth Argentine Congress of Space Technology (CATE) held in Buenos Aires, Argentina on May 6-8th 2015. Federico Perazzo (*Argentina*), Bruno Sarli (*Brasil*), Natalia Vargas (*Bolivia*), Gian Carlo Villena (*Peru*), Pablo de Leon (*Argentina*), Lynn Van Brook (*USA*), Kendra Toole (*USA*), Ignacio Curto (*Argentina*), Ana Perez (*Colombia*), Jackelyne Silva Martinez (*Peru*), Avid Roman Gonzales (*Peru*), and Marco Antonio Cabero (*Bolivia*) were in charge of several aspects of the organization.
- SGxColombia was held during World Space Week with outcomes serving as the model for other countries and regions to prepare, organise, and host the SGx series. Oscar Ojeda (*Colombia*) and Camilo Reyes Mantilla (*Colombia*) were Colombia's ground team responsible for the success of the event.
- At the International Astronautical Congress, regional NPoCs presented the first Regional South American Paper, which is the contribution of all the NPoCs in the region and depicted the history of the space activities in its countries.
- Marco Antonio Cabero from Bolivia was nominated as Regional Co-Coordinator.
- Natalia Vargas was nominated as new NPoC in Bolivia.
- SGAC members, Josue Cardozo (*Brasil*), Avid Roman Gonzales (*Peru*), Natalia Vargas (*Bolivia*), Bruno Sarli (*Brasil*), and Marco Antonio Cabero (*Bolivia*) presented papers at the IAC 2015.

SPACE GENERATION FUSION FORUM PANEL REPORT

PANEL 1

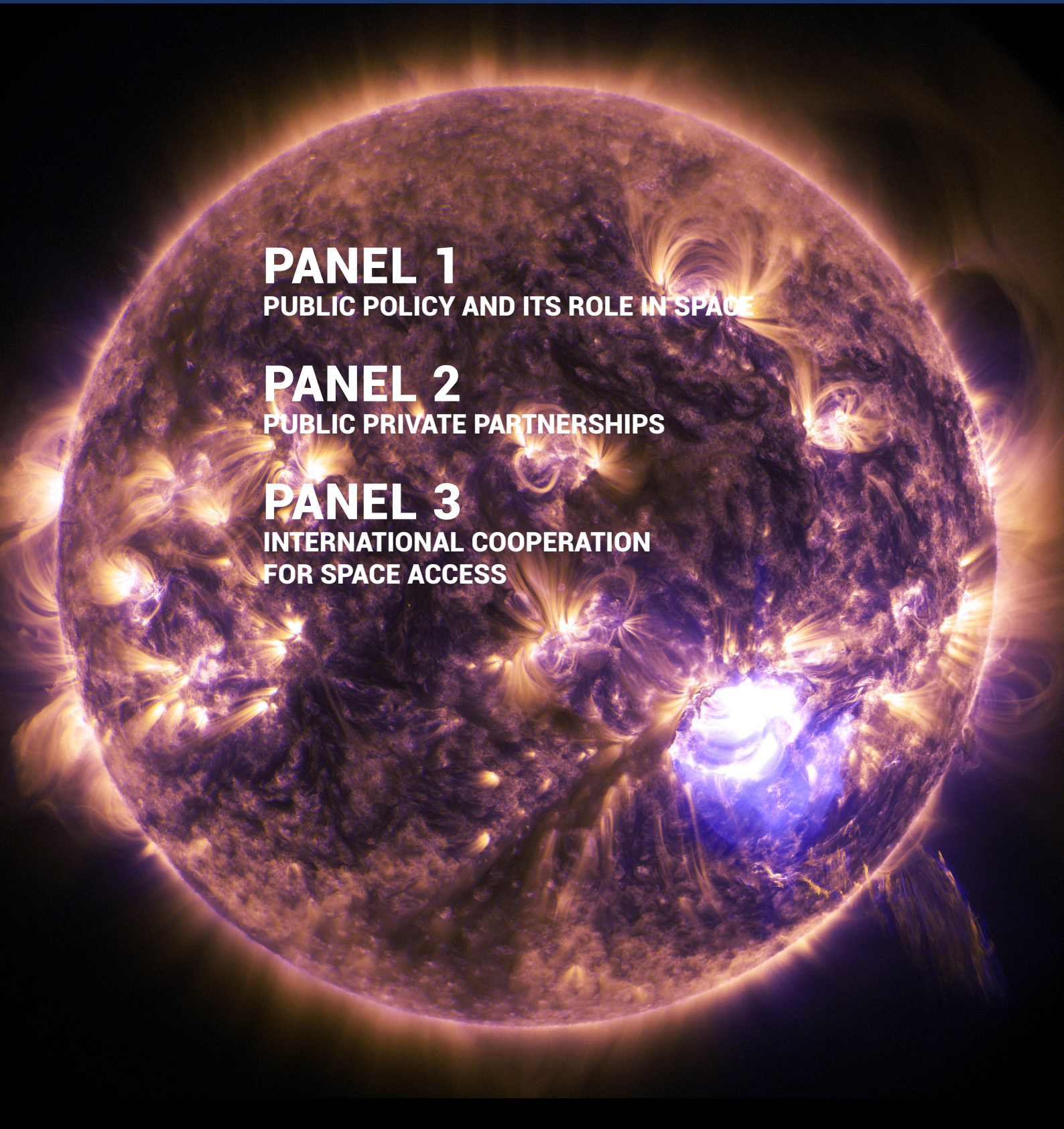
PUBLIC POLICY AND ITS ROLE IN SPACE

PANEL 2

PUBLIC PRIVATE PARTNERSHIPS

PANEL 3

**INTERNATIONAL COOPERATION
FOR SPACE ACCESS**



SPEAKERS & MODERATORS

Jeffrey S. Ashby	Keynote Speaker
Salvatore T. "Tory" Bruno	Keynote Speaker
Johann-Dietrich Woerner	Capstone Address
Clayton Mowry	Keynote Speaker
Carissa Christensen	Keynote Speaker
Amir Blachman	Moderator - Industry Focus Session Panel
Eric Stallmer	Moderator - Policy and it's role in Space Panel
Michael Gazarik	Moderator - Public-Private Partnership Panel
Russell Boyce	Moderator - International Cooperation for Access to Space Panel

PANEL 1 - PUBLIC POLICY AND ITS ROLE IN SPACE

Delegates and Moderator

Name*	Country	Affiliation
Eric Stallmer (Moderator)	USA	Commercial Spaceflight Federation
Trevor Kilpatrick	USA	United Launch Alliance
Etim Offiong	Nigeria	African Union Commission
Chantelle Dubois	Canada	University of Manitoba
Lauren Smith	USA	NASA Glenn Research Center

A. Introduction

New innovations and applications from space have brought increased investment in the space community, however, there are many factors that drive investment. There must be certainty: certainty that the technology can perform in a timely manner, certainty that a market exists, and especially certainty that a supportive regulatory and policy environment exists. This panel focused on driving investment and innovation in space through public policy, and explored public policy strategy and its influence in space business. The panellists discussed the current status of space programmes, policymakers effect on those programmes and the challenges facing the policy environment in a global arena.

Left: Eric Stallmer (USA), Trevor Kilpatrick (USA), Etim Offiong (Nigeria), Chantelle Dubois (Canada), Lauren Smith (USA)



B. Discussion

The discussion began with opening remarks by moderator Eric Stallmer, President of the Commercial Spaceflight Federation. Stallmer facilitated panel discussions in three major areas: challenges facing governments and space agencies, possible initiatives to overcome these challenges, and status of prospective space programmes.

I. Challenges Faced by Governments and Space Agencies

As the driving forces behind space programmes shift, managing the transition phase from government-run to a mix of government and private sector is critical to ensuring continued success. Previous investments in workforce and facilities mean that the current challenge is how to use existing facilities to develop new technology. The government needs to develop policies that ensure a functional relationship between national space agencies and private companies. Whether engaging the private sector through contracts or non-reimbursable agreements, benefits will arise when using the expertise and infrastructure of the government and mating them with the fast-paced business savvy and innovation of the private sector.

Competition should drive down the cost of doing business in space, but it is unclear whether there is currently enough business to sustain competition. The government still plays a large role in space as an early vehicle for driving business and the major customer for many private companies. In addition, government must protect industry from monopolies, which are common in industries with a high barrier to entry. Policies should be encouraging start-ups to grow in the aerospace sector to increase competition and drive prices lower.

Another challenge is the public aversion to investment in space. The public drives demand, but the public's willingness to invest in space depends on their appreciation for the benefits of the industry. Governments and space agencies need to invest in public outreach to educate them on the numerous applications of space. Policy makers themselves may not be fully vested in space, especially if the people they represent are not directly affected. It is imperative that space agencies and professionals in the space sector reach out to policy makers to advocate for the benefits of people in the region.

The last challenge discussed is the rise of inconsistent government policies, likely linked to democratic environments with change in

leadership and in policy directions. It is difficult to predict the policy direction of future governments and the panel agreed that it is important to find a way to set long-term goals and commitments. This requires a major change in the way the government sets goals and includes a factor of public buy-in to the possibility of long-term commitments set by policymakers. Most importantly, the government must follow through with commitments by providing adequate and consistent funding to completion.

II. Status of Prospective Space Programmes

On the international scene, there is no common ground on the next step(s) in space exploration. The current attention is on the ISS, with questions about operation length and the benefits of ISS for commercial applications and research. Russia has indicated its desire to pull out of the partnership after 2024 and build its own space station. The departure of one partner begs discussion on whether another partner should be welcomed.

The United States has utilised the commercial space sector for transportation to ISS. Its Commercial Orbital Transportation Services (COTS) has proven successful in using the private sector for ferrying supplies to and from ISS, and the Commercial Crew Program is making steady progress in developing a commercial system to ferry astronauts. The Commercial Crew Program has the potential to increase the utilization of ISS for not only government missions, but commercial research and development (R&D) as well.

Companies that may not be considered "traditional" space companies are set to drive programmes in the space sector and could use ISS as a stepping stone. Others have focused on steps after the ISS such as alternative in-orbit habitats and

Lauren Smith addressing questions based on her experience at NASA's Glenn Research Center



satellite servicing. A new wave of small satellite applications will flood the sphere in the next few years, and Oneweb, Facebook, and Google have all indicated they intend to launch constellations of satellites to make Internet available to developing countries.

III. Possible Initiatives to Overcome these Challenges

The panel discussed at length whether industry is currently maximising the ISS, and whether government is setting policies to create attractive access to the international lab for all commercial and scientific sectors. The current sectors utilising the ISS must initiate new ways of publicizing their work so others think about what can be developed, researched, and discovered in this environment. This marketing and public relations campaign should extend to the younger generation poised to take the reigns for the next era of R&D and innovation. ISS is a powerful tool in attracting talent to the sector. Furthermore, with the advent of the commercial space sector, "traditional" career paths in space are being replaced with more adventurous for the next-generation such as orbital and suborbital platforms to film, boost tourism and create new commercial applications.

Considering the current threats to the life of the ISS, partners should consider expanding ISS access to international use by opening participation to interested countries. Such access, however, must be balanced with the demands of these new relationships on current partners. If the benefits of ISS have been exhausted, then the government should consider its next steps in LEO and how to develop policies that make endeavours in this space more attractive.

Finally, with the projected geometric increase in satellite constellation, launching companies need to be ready market. New business models, including rideshare and multiple satellite launches,

allow new entrants into the market as the launch price decreases and the availability increases. Outside of the new entrants, the international community also needs to develop a framework to ensure everyone has access to space, especially developing countries.

C. Conclusion

The panel discussed government-commercial partnerships that must be continued to advance the space sector as a whole, and attested the critical role that policy making plays in our path to the stars. With space applications and the LEO marketplace continuing to grow, there are many opportunities for policy to shape the future of the industry: from the regulatory process in licensing spectrum for the small satellites aiming to do everything, or in the launch side. The strategies and policies can deal with these and more complex issues beyond LEO travel and the Outer Space Treaty to help advance the race to the stars.

Trevor Kilpatrick contributes an industry perspective



Etim Offiong on Public Policy and its Role in Space



PANEL 2 - PUBLIC-PRIVATE PARTNERSHIPS

Delegates and Moderator

Name*	Country	Affiliation
Dr. Michael Gazarik (<i>Moderator</i>)	USA	Ball Aerospace
Kellie Gerardi	USA	Masten Space Systems
Brooke Mosley	USA	United Launch Alliance
Martin Losekamm	Germany	Technische Universität München
Jan Svoboda	Czech Republic	EUMETSAT

A. Introduction

Virtually every country depends on space-based technologies, and public-private partnerships are the foundation of many of the world's space programs. The panellist's combination of unique work experiences, including industry, agency, and academic, provided insight into many of today's public-private partnerships. This panel addressed the merits, challenges, and future opportunities of these partnerships, and presented their visions of the future of the space sector.

Left: Jan Svoboda (Czech Republic), Martin Losekamm (Germany), Chris Nie (USA), Jordan Sotudeh (USA), Kellie Gerardi (USA), Brooke Mosley (USA), and Dr. Michael Gazarik (USA)



B. Panel Discussion

I. The International Space Station – A Prime Public-Private Partnership Example

Discussion on public-private partnerships revolved around those relating to the ISS, the flagship microgravity and space research station for many of the world's largest space agencies. The space station has been a great example of international cooperation throughout the years with public-private partnerships making ISS useful to both science and industry. For US companies and academic institutions, the ISS has provided consistent opportunities to conduct research in microgravity. The BioServe Space Technologies Center at University of Colorado Boulder has been conducting biological research in space since the 1980s, first on the SkyLab program, and now on the ISS while partnering with pharmaceutical companies. For European players, however, it is much more difficult to conduct experiments on the space station as limited crew time hinders even the installation of fully automated setups. The European Space Agency therefore imposes stricter criteria for the selection of experiments and often favouring larger, more expensive projects. The criteria also often stand in contrast to what industry and mainly academia need and would prefer to conduct. The ISS was and is seen as a great example of the stabilising effect of international cooperation.

II. The Importance of Public-Private Partnerships

Recognition and understanding of each entity's goals are important aspects of cooperation between government and industry. While the ultimate objective of the sector is to build new capacities, varying individual goals may lead to different approaches in achieving the goal. Building common framework to understand differing needs and visions can bring some stability for all actors. For example, strong public-private cooperation, and particularly compliance with International Traffic in Arms Regulations (ITAR) allows aerospace and defence-related companies to operate in the United States, and the government to regulate exported or foreign exposure to potentially sensitive technologies. Inability to cooperate strongly hinders industry growth, particularly into the international market.

The relationship between government, academia and industry is crucial for sustainable development of space activities. Governments tend to focus on building new capacities and undertaking projects too risky for industry, while industry

values human capital to ensure long-term growth. The interdependence of these relationships highlights the need for cooperation between individual stakeholders as well as the importance of understanding the driving forces behind each player. Panellists also noted that partnerships, especially in the space sector, are about maintaining and developing capacities as well as supporting spinoff applications. The government's ability to maintain the industrial base can strongly support the future expansion of the sector, if it is managed on a well-defined partnership basis and with reasonable motivation and foresight. For example, it is not logical to stop manufacture of a crucial launcher element solely because it will not be needed in the present economic cycle, however, funding programs already considered obsolete for the sake of employee retention can significantly hinder long-term growth potential. The importance of technology transfer and supporting spinoffs is emphasised by countless examples of space technology benefiting society.

III. The Changing Landscape of Public-Private Partnerships

Government procurement is seen as particularly influential to commercial industry, as it provides stable capital flow and similar risk reductions between international partners. Prime examples include NASA's Commercial Crew and Commercial Cargo Programs, where the ultimate long-term goal is to establish independent commercial service providers. Government-funded exploration missions conducted by academic institutions and research centres complement these industry projects.

In contrast to the US and its emphasis on commercializing scientific research, most space missions in Europe are conducted by industry consortia procured directly for ESA, EUMETSAT, European Commission or individual national space agencies by governments. High-risk exploration should primarily be led by governments, allowing industry to play a greater role in the day-to-day business of space research and moderate its risks.

Importantly, the change from a contractor-based system to service providers also brings up new challenges. Companies that used to develop systems as a contractor for agencies or the military are increasingly faced with the challenge to provide cheaper products. On the other hand, crew and mission security remain major design drivers, and so in many cases, smaller but more innovative companies must work alongside government agencies that operate under the assumption that slower is better and safer.

IV. Barriers for Public-Private Partnerships

While addressing the barriers for public-private partnerships, panellists returned to the theme of culture. New partnerships usually require change in some form, but in many organisations, especially governments, the inertia associated with years of working under a specific approach can be strongly resistant to attempts at changing direction. From small procedural adjustments to complete overhauls of organisational philosophies, effective organisational change takes time and support of leadership level. Panellists agreed there is a slow but steady trend towards more flexible models. They clarified that many barriers still exist, but unique opportunities are opening, at least in the US, for small and nimble companies to enter areas that used to be open only for large systems integrators. New players can bring more commercially responsive approaches compared to a bureaucratic mind-set that may exist within established space players, and the decades of experience of established industry and government partners helps newcomers avoid common problems.

Panellists noted that public visibility and political involvement could be a significant barrier for complex research and technology development projects. Agencies and industry understand the cost, but politicians and the general public oftentimes do not. This increases the difficulty of budgeting large-scale endeavours and often leads to delayed or underfunded projects. On the other hand, manageable reductions of funding can have the same effect as competition, since scarcity spurs innovation and creativity to solve problems and challenges in new ways. Partnerships in this complex environment seek to satisfy each party's interests, but this is not an easy task.

V. What Can Individual Partners from Government, Industry and Academia Learn from Each Other?

Differences in objectives and operating strategies can be beneficial to all parties, especially in the space sector. In academia, for instance, there is more exposure to failure than in industry or federal agencies. Learning how to deal with failure is a valuable skill for engineers, but one which employees may not acquire working in the risk-averse environment, such as NASA during the last 20 years or the current state in Europe. NASA, however, does an excellent job at engaging the public. Its results have spurred private industry, such as SpaceX, to similarly commit to outreach activities. Cooperation in outreach towards a shared vision for space will make the message

more effective for both stakeholders and the public at large. Even the most experienced players can learn from new entrants, and it is increasingly important that actors learn from each other.

VI. The Potential for Future Public-Private Partnerships

There still are areas of space activity without direct governmental interests or requirements such as asteroid mining. As the importance of these early-stage activities increases, governments will become more involved, providing more opportunities to develop new and mutually beneficial partnerships. Continued cooperation will require solidifying trust, which is generally lacking between branches of government as well as between government and industry. As government is usually the least adaptive, it requires the greatest amount of time and effort to initiate change.

C. Conclusion

The panel addressed multiple aspects of public-private partnerships from the international and cross-sector perspectives of the panellists, focusing on ISS as a prime example. The panellists agreed on the importance of public-private partnerships for success of technically sophisticated space endeavours and emphasised the need for continued support as these partnerships have a stabilising effect on the international community at large. Key motivators to establish strong partnerships are needed to build new capacities, preserve the industrial base, and share knowledge or experience. Despite challenges in organisational cooperation, the panel expects a trend of increased openness and cooperation.

PANEL 3 - INTERNATIONAL COOPERATION FOR SPACE ACCESS

Delegates and Moderator

Name*	Country	Affiliation
Prof. Russell Boyce (<i>Moderator</i>)	Australia	University of New South Wales Canberra
Victoria Davis	USA	Orbital ATK
Paul Eccleston	UK	RAL Space
Anja Nakarada Pecujlic	Serbia	European Space Policy Institute
Rebeca Rodriguez	USA	Xplore Box

A. Introduction

With the incredible influx of new players, countries, commercial operations, and universities, current activities can be described at Space 2.0. This panel focused on international cooperation of these new partners. The panellists brought industry, legal, and economic experience to help address these issues.

Left: Prof. Russell Boyce (Australia), Victoria Davis (USA), Rebeca Rodriguez (USA), Anja Nakarada Pecujlic (Serbia), Paul Eccleston (UK), and Alexander Gibson (USA)



B. Panel Discussion

Moderator Russell Boyce, Chair for Space Engineering at the University of New South Wales in Australia, led International Cooperation panel. The four guiding questions for the panel were whether the various players are working in the same direction, Asia-Pacific as a space hot spot, issues surrounding dual-use and weaponisation of space, and how to balance increasing space activities with space debris.

I. Relationship between Research, Government and Industry Sectors

The panelists opened this discussion by noting that individual states are responsible for space activities, no matter who conducts the mission. From an industry perspective, government leadership helps open new markets, and without such assistance it would be difficult for companies to establish themselves. IntelSat, for example, started as an intergovernmental organisation and was then privatised. Transport to ISS was similarly entirely government-run and is now a commercial operation. The science and research side of the ISS, however, will likely remain within the government. In Australia, the opposite trend emerges, where the government seeks industry and research entities to lead the space sector while the government provides funding. Practical experience shows that it is easier to establish cooperation in academic and research sectors, as many researchers are internationally mobile, whereas in the commercial sector trade regulations and other international influences can delay or cause the cancellation of contracts. International trade agreements and laws allow companies to act across borders.

II. Space Debris

Low Earth Orbit can be considered a valuable resource, but is threatened by space debris with approximately 10,000 objects tracked by the United States Air Force. One solution to deal with space debris would be launch providers splitting costs with payload owners to facilitate removal back to the country of origin, with the state having ownership of the satellite. Another solution is the introduction of a cap and trade system for space debris, similar to the carbon emissions, to limit the amount of debris per launch by providing financial incentives. A major problem to debris emission regulations is enforcement, since there are currently only non-binding debris mitigation guidelines. These guidelines have influenced national laws in western countries, but others

including Russia, Brazil, and India do not want to be involved. Other international space domains have managed to arrange assets, such as geospatial and radiofrequency allocations, and the organisation can serve as a model for space debris.

III. Asia-Pacific: a Hot-Spot for Space Activities

With the recent military shift in the region, space is becoming a very important and highly protected asset. The European Space Agency is working to engage with China ideally as equal partners on science and missions. Partnerships amongst Asian states are based on the ESA model but with looser legal framework. Cooperation with the Asian partners has not reached full potential; partnerships are mired with security concerns that dominate foreign relations.

IV. Dual-Use Issues with Space Access

From a legal perspective, dual-use technologies pose conflicts to security and competition, and have greatly interfered with international cooperation in the past.

The panel addressed the challenges of dual-use space products to international cooperation. Recent changes to the International Traffic in Arms Regulations have been implemented in response to the realisation that these regulations hinder development and cooperation. Under the changes, purely scientific items can be identified and removed from the restricted list.

C. Conclusion

The panel concluded that in order to foster international cooperation to drive access to space, the following points should be considered:

- States should focus on project-based missions to provide protection for contractors. International trade agreements and laws allow companies to act across borders for increased cooperation.
- To protect the LEO natural resource, states should enact enforceable regulations similar to the carbon trading to tackle the space debris problem.
- Restrictive nature of dual-use regulations must be addressed to prevent hindering advancement. Modification of ITAR is a promising example to permit international training and exchange of expertise.

FUSION FORUM STATISTICS

Fifty-three students and young professionals from eighteen different countries participated in the third Fusion Forum, along with speakers, moderators and industry professionals who formed the discussion panels. Sixteen of these young delegates were members of the organising team. Four participants from four different countries were given scholarships to attend the Fusion Forum, helping broaden the international network of the SGAC and allowing delegates to interact with people from a variety of backgrounds. Of the delegates, 43% were female and 57% male.

The majority of the attendees were Bachelors (32%) or Masters level (59%), while 9% of the participants were PhD level. The young professional attendees came from a variety of space-related fields including aerospace medicine, space law, space policy, engineering and science. Delegates represented commercial and non-profit organisations, space agencies and universities.

Of the eighteen countries represented at the Fusion Forum, the highest percentage of delegates came from the USA, followed by Spain. Participants represented nations with both developed and developing space programmes:

USA	33
Spain	3
Australia	2
Canada	2
Germany	2
Mexico	2
Austria	1
Austria/Hungary	1
Costa Rica	1
Ethiopia	1
Ghana	1
India	1
Iran	1
New Zealand	1
Pakistan	1
Vietnam	1



59%
Master or
equivalent



32%
Bachelor or
equivalent



9%
PhD



SPACE GENERATION CONGRESS REPORT

The Space Generation Congress (SGC) is an annual conference bringing together the next generation of space leaders from around the world to discuss key space topics. This global conference gives university students and young professionals the opportunity to network and to examine critical questions that are facing the space and international communities at large.

Aims of SGC

SGC first aims to strengthen SGAC's international network. Delegates have a chance to interact and engage with the incoming generation of space professionals from all over the world. From SGAC's perspective, it allows us to consolidate our international links in order to best represent and facilitate the voice of the next space generation.

Second, SGC aims to harness the voice of the next generation by providing input on key questions facing the space sector, and the international community, as well as international stakeholders.

Third, SGC aims to support the next generation of space leaders by giving them networking opportunities with today's space leaders and high-level speakers.

14th SGC, Jerusalem, Israel

Through SGC, SGAC aims to offer delegates a range of activities and initiatives to engage in conversations and consider key questions that are facing the space and international community. The discussions and recommendations over the three days at SGC will be presented at the UNCOPUOS sub-committee meeting in February 2016.

Held prior to the 66th IAC, SGC sold out with 126 delegates in attendance from 44 countries. Leaders from space organisations joined delegates to discuss and debate the five main themes of SGC 2015, gaining fresh, innovative, and bold perspectives from the incoming space generation.

SGAC would like to express its sincere gratitude and appreciation for its sponsors, partners, and committee of volunteers who supported activities at SGC 2015.

SPEAKERS

Charles Bolden	Administrator, National Aeronautics and Space Administration
Johann-Dietrich Wörner	Director General, European Space Agency
Wanda A. Sigur	Vice President and General Manager, Civil Space, Lockheed Martin Space Systems Company
Jason Crusan	Director, Advanced Exploration Systems Division at NASA
Yitzhak Ben-Israel	Chairman, Israeli Space Agency
William H. Gerstenmaier	Associate Administrator, Human Exploration and Operations, NASA
James H. Crocker	Vice President & General Manager, Space Systems Company International, Lockheed Martin Space Systems Company
Kiyoshi Higuchi	IAF President and Technical Counsellor, Japan Aerospace Exploration Agency
Enrique Pacheco	Director for Space Science and Technology Affairs at Mexican Space Agency (AEM)
Barbara Adde	Policy & Strategic Communications (PSC) Director, SCaN Program, NASA
Joerg Kreisel	Space Business Consultant & Venture Investor, JKIC
Agnieszka Lukaszczyk	Policy Officer, Space Data, European Commission
Tal Inbar	Head, Space Research Center, The Fisher Institute for Air & Space Strategic Studies

SPACE GENERATION CONGRESS WORKING GROUPS

Exploration Working Group – Pioneering Space

The Exploration Working Group was one of the largest and most diverse at the Space Generation Congress, with over 30 young professionals from 17 countries. The diversity in culture, gender, education and professional experiences not only ensured global perspective, but also the inclusion of a variety of views and opinions. Over three days, the group deliberated and discussed exploration with a focus on Pioneering Space: the idea of permanently expanding human presence into the solar system in a sustainable and self-sufficient way. The ultimate goal of exploration programmes is to transition human spaceflight activities out of the current Earth Reliant phase of operations in Low Earth Orbit (LEO) into the Proving Ground of cislunar space, and ultimately becoming Earth-independent. Framing human exploration in the context of Pioneering Space provides a sustainable way of building exploration capabilities. This framework not only encourages, but necessitates international and public-private partnerships to be successful. As a result of the Working Group sessions, delegates defined the tagline Pioneering Space Together as a “global collaboration to build and maintain shared infrastructure and knowledge in space, working together throughout the process”.

The process required to Pioneer Space Together was discussed under the pretence that first humanity must become Earth-independent. In this context, the goal of future international pioneering expeditions should be to establish a sustainable human presence at strategic destinations in the solar system, while fostering economic activity on and off the Earth. This can be achieved by incrementally building self-sufficient human and technological capabilities in space and transitioning from being Earth-reliant to Earth-independent.

The transition from reliant to independent invariably includes a Proving Ground. The Proving Ground was defined not necessarily as a location, but as a crucial phase to help safely advance human spaceflight capabilities in a relevant environment to provide a foundation for pioneering expeditions. The Proving Ground can be used as a pathway to sustainable pioneering, with future expeditions yielding a variety of economic, technological, scientific, social, and educational benefits in Earth and space. This was seen as an essential step to inspire new generations to understand the motivations behind pioneering efforts, but also to contribute to the advancement of humanity as an interplanetary species.

The main challenge posed by future pioneering expeditions is the development of advanced technologies and capabilities both of which demand healthy and coordinated international partnerships and collaborations between well-established and emerging space agencies. Infrastructure needs must also be addressed, as well as diverse motivations and broad economic development. The group felt that it was important to stay away from terminology associated with colonisation or military connotations.

The discussions of this working group during the Space Generation Congress in October 2015 were only one portion of a longer conversation, and there were a number of issues that were underscored for further discussion. These include identifying differing roles of commercial and government entities, defining a Proving Ground strategy to address affordability issues, and including non-space faring nations.

Commercial Working Group – How to support Entrepreneurial

Activities in the Space Sector Entrepreneurship plays an important role in the overall economy because of its potential to generate economic growth and to create new jobs. Entrepreneurial activities are efficient in promoting innovations that are essential for sustainable society development since they are more inclined to accept risks, they can be more productive by reducing transaction costs and other efficiency-seeking activities, and they are typically more agile compared to established Entrepreneurship in the space industry is starting to play an increasingly important role, both supporting and influencing established organisations. The number of start-ups is still very low compared to other business sectors. It is therefore important for industry development and growth to identify additional channels that will stimulate space-oriented entrepreneurship activities and support innovation.

The commercial working group, comprising 35 members from 17 nationalities, discussed strategies to support entrepreneurial activities in space. We looked at the following three areas that influence entrepreneurship:

- Interplay between government, academia, and private sector
- Regulatory changes needed to encourage space start-ups with focus on effects of the International Traffic in Arms Regulations (ITAR)
- Financing and raising money for start-ups

RECOMMENDATIONS

- **Interplay between government, academia, and industry:**
The group developed recommendations specific to several launching states based on an evaluation of each country's government, academia, and industry. The countries surveyed were Australia, Canada, European countries, Israel, Russia, Kazakhstan, Japan, USA, and India. Detailed recommendations for each country can be found in the report.

- **Regulatory Concerns:**
The group proposed a revision of ITAR rules, more specifically to remove space applications from defence and place it under a separate body that is suited for space entrepreneurial activities. The group also recommended a new UN-mandated Space Law that allows small satellites to be launched with minimal liability concerns for launching states, as this would specifically help entrepreneurial activities and start-up companies.
- **Financing:**
The group identified five areas to help improve start-up financing: culture and attitude to risk, available funding sources, presentations to investors, business partnerships, and experience sharing.

Policy Working Group – Policy challenges related to nanosatellites

The emergence of nanosatellites, brought on by the miniaturisation of systems and the considerable decrease in construction and launch costs, has allowed new actors to launch their own small craft into space. Along with start-ups, universities, NGO, and even amateurs supported by crowdfunding campaigns, miniaturisation has created a breeding ground for new companies –such as Nanoracks, Tyvak, ISIS BV, ClydeSpace, and other competitive businesses– to enter the space sector. The increased popularity of these spacecraft is made evident by launch projections that estimate the launch of thousands of new nanosatellites over the coming years.

In October 2015, young professionals and students from around the world met in Jerusalem, Israel, for the annual SGC. The group was composed of 18 people from 13 different countries. The Policy Working Group at SGC, supported by Secure World Foundation, focused on nanosatellites policy challenges. During the three days of the Congress, members of the group discussed and debated the implications of the current regulations and guidelines related to the growth of the nanosatellite market. The driving factors considered in the 3-day forum were:

- Forward projection and the relationship between the traditional space industries and emerging space companies in the nanosatellite sector
- Regulatory issues, access to space, and mission lifetime for nanosatellites
- Long-term sustainability issues raised by proposed constellations and mega-constellations of nanosatellites

RECOMMENDATIONS

Following up the debate, recommendations were made based on three guiding principles:

- 1 **SUSTAINABILITY:** Space and radio spectrums are global resources that must be managed responsibly. Any practice, even if legal, ought to address its impact on the current and future state of access to space.
- 2 **RESPECT:** The community of existing satellite operators has developed policies and norms that any new satellite stakeholders should attempt to respect.
- 3 **IMPORTANT BENEFITS:** Nanosatellites offer many clear benefits to the global community. They represent a significant mean to encourage innovation, education, science, and economic growth.

Three main recommendations also considered stakeholders to promote a path for a sustainable and cooperative use of space between existing satellite operators and new nanosatellite operators. First, the group recommended that an international

organisation coordinate the stakeholders to develop guidelines and best practices for nanosatellite operators and launch organisations. Second, the group recommended that the stakeholders establish an open orbital region for nanosatellites. The specified region would be below 400 km, where short-lived satellites would have an orbit lifetime. Doing so would help mitigate long-term, unsustainable debris issues. Satellites seeking to be deployed outside of this region would need to demonstrate certain technical and operational capabilities and mission justification. The requisite capabilities might include manoeuvring and deorbiting capability, radiation hardening, and redundancy. Finally, the group recommended governments and related organisations promote the small satellite launcher market for dedicated orbital insertion, which would facilitate the aforementioned dedicated orbital region.

Communication Working Group – Space Internet Opportunities & Risks

In the last decade, the Internet has become an integral part of daily life in the developed world. It connects people, aids in navigation and orientation, allows access to updated information about various subjects, and serves as an efficient way to receive services from businesses and the government. Many people in first world countries refer to the Internet as a basic commodity, comparable to electricity or running water, with its status mirrored in popular culture. The remaining population, as four billion people, are left without access to the Internet.

In the past year, several companies including Google, Facebook, SpaceX, and OneWeb eyed the opportunity to offer sky-fi, or Internet access from the sky or space. Such companies offer potential technological ideas to supply worldwide access to the Internet. The communications working group used a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis to investigate widespread use of satellites, drones, and high altitude balloons. The team performed a simulation of several companies presenting a government with different sky-fi technologies to identify main challenges and opportunities that each technology would emerge.

The strengths of various systems include global coverage of satellites, high bandwidth of drones, and greater coverage area of balloons. Weaknesses are the lower bandwidth of satellites and the low coverage zones of drones. A combination of these systems could be considered the balance of strengths and weaknesses, with balloons, drones and satellites working in tandem to ensure a more robust system. As the costs of such a system would be far too expensive to develop, the communications working group proposes a staged approach. Government is a big part of the discussion and needs to be considered when developing any system involving air and space infrastructure, with issues such as regulatory filings, airport usage, and property damage concerns topping the list.

RECOMMENDATIONS

The main recommendations were stated as:

- **CONDUCT MARKET STUDIES TO UNDERSTAND DEMAND.** In some remote areas, there are more pressing issues such as lack of clean water, unreliable electricity, and malnutrition.
- **INSTITUTE A PHASED APPROACH.** Instead of building a full system, the group recommended to scale up and take into account speedy technology development.
- **LET GOVERNMENTS SERVE AS ANCHOR TENANTS** and expedite regulatory processes. This will help ensure resolution of any legal hurdles.
- **PROVIDE FUTURE CONNECTIVITY** to Internet Service Providers to ensure commercial sustainability.

Earth Observation Working Group – The Role of Earth Observation in Climate Change Monitoring and Management

The impacts of climate change are globally visible. Earth temperatures have risen considerably, altering the rainfall pattern and food production, and affecting coastal and terrestrial ecosystems. There have been potentially dangerous changes in local weather conditions that have affected our daily lives such as problems with water supplies, power, and transportation systems. Even though it is possible to monitor the changes from the ground, an additional validation is available from space.

Remote sensing from space has enabled us to understand the climate changes by observing the Earth in its entirety, providing a unified point of view, and having macro and micro ground coverage capabilities. It has helped to study the spatio-temporal states of the atmosphere, land, and oceans. Satellites in different orbits, altitudes, and inclinations monitor different characteristics, giving more diversified data. It is possible to extract different types of information from space-derived data.

As part of the Space Generation Congress 2015, the Earth Observation Working Group (EOWG) has underlined the role of satellite imagery in monitoring the Earth's changing climate and the challenges in the comprehensive use of this data. Currently, there are very few algorithms and applications that can convert the data into useful information for immediate use. The ones that do exist are not accessible to the general public outside the scientific and academic community. The different formats of space-borne data make it difficult for most people to comprehend the actual information. These challenges have significantly hindered the utilization of such data to its fullest potential. The major problem addressed by the EOWG is how to bridge the gap between the space-based data and the end users.

RECOMMENDATIONS

The solution presented is a processing platform for such data that can meet the needs of every user. Climate Online User Data (CLOUD) is a single platform that provides space-based information in a consistent format, enabling easy access for the general public as well as the scientific community.

The three main features of CLOUD are:

- 1 A data and information archive to store all freely available open-source space-based raw data collected by various remote sensing institutions.
- 2 A core system that will consist of elaborated or partially processed data derived from the query results of the user.
- 3 A user-friendly interface to enable the users to search and generate information specific to their interests.

The platform would standardise the various archive data by rectification and calibration processes. The final product of the platform would be the customised information through suggestions and crowd-sourcing from the general public –assuming it would be more relevant for the benefits of general public for practical use.

The organisational structure of CLOUD consists mainly of its stakeholders: scientists, decision makers, and the general public. Educational institutions and policy makers would play a decisive role in the development of the platform. Being a non-governmental organisation, it would rely heavily on crowd-funding and donations as primary financial sources.

The outreach strategy for CLOUD would be targeted to involve all the stakeholders in both the development and use of the platform. Different media would be used to spread awareness among students, developers, decision makers, and the prime end users.

CONGRESS STATISTICS

SGAC was pleased to welcome a diverse representation of delegates from an array of countries and regions. 126 delegates were invited to participate at SGC 2015, together with 13 speakers and 12 Subject Matter Experts. SGC 2015 attendees came from more than 44 countries across six continents. This diversity is a major contributor to the development of a truly international voice of the space generation that SGAC strives to represent.

This year, SGAC increased the number of scholarships awarded to its members! A total of 56 scholarships, which included technical paper competitions and SGAC Young Leaders Awards, allowed SGAC members from all over the world to attend the SGC 2015 and the IAC 2015.

These figures clearly demonstrate SGAC's international influence, and that the organisation's continued development gives SGAC the momentum to establish a distinct network highly representative of young space professionals and university students.

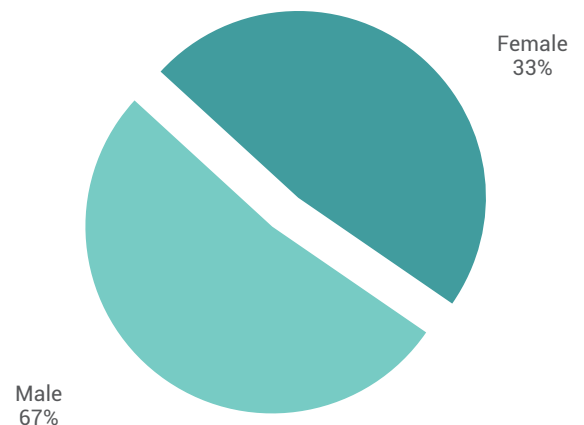
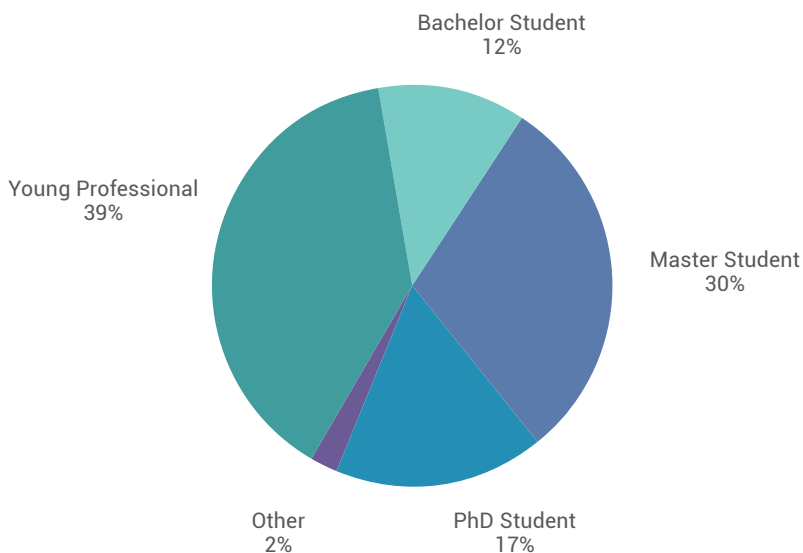
**126
DELEGATES**

**44
COUNTRIES
REPRESENTED**

**56
SCHOLARSHIPS**

**13
SPEAKERS**

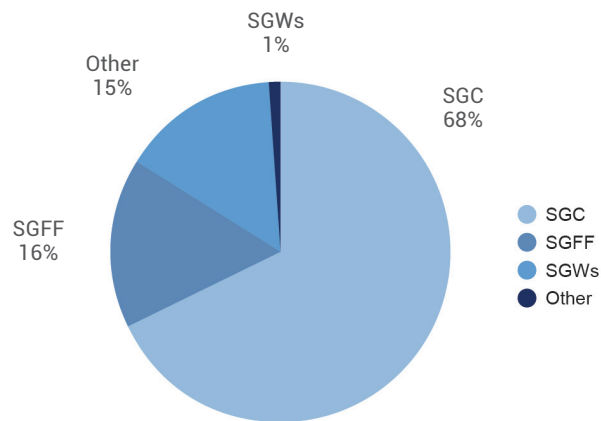
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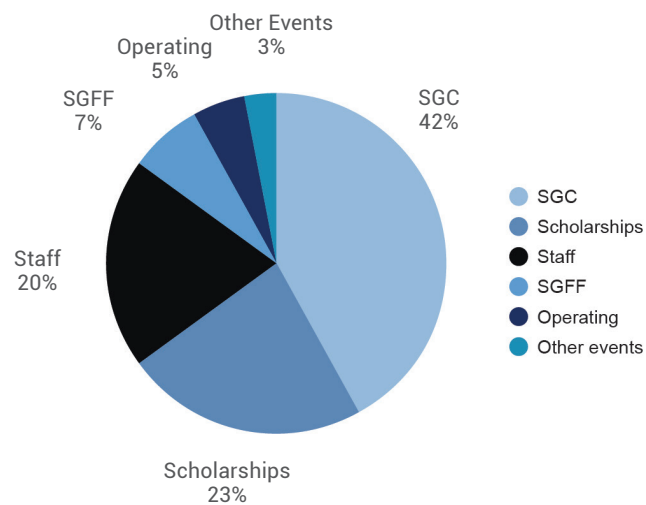
SGAC FINANCIAL SUMMARY

The financial summary was prepared by the SGAC Treasurer in accordance with required accounting principles and applicable legal requirements, to ensure transparency of the organisation at all times. They present a true and fair view of the organisation's income and expenditures.

Income



Expenses



GOAL ACHIEVEMENT REVIEW

The SGAC Strategic Plan 2014 outlined nine goals for the year ahead. This section of the Annual Report is the Executive Office's self-assessment of how SGAC met these goals. It is further intended to provide an additional view of the aims of SGAC's activities throughout the year and serves to inform readers about the development of the SGAC Strategic Plan for 2015.

STRATEGIC GOAL REVIEW

1 - Financial Stability

Desired Outcome: SGAC will improve financial stability by continuing to foster strong relationships with sponsors and seek out additional funding resources. SGAC will develop concise individual budgets for Project Groups and Competitions, and attract sponsors from new areas of the space sector, such as satellite telecommunication companies and aerospace organisations.

SGAC's financial health in 2015 has been steadily improving as the Strategic Partnerships Team has focused on increasing sponsorships for SGAC events. The results are exemplified in the increased number of competitions and scholarships SGAC offered for SGC 2015. Many previous sponsors from 2014 –if not all– provided support to the organisation in 2015. SGAC has also worked carefully this year to develop a detailed budget that highlights the expenses and revenues, and has invested in tools for different project groups and teams to improve SGAC's image and efficiency.

2 - Success of 2015 Space Generation Fusion Forum

Desired Outcome: SGAC will report on the execution of SGFF 2015, whose success was measured by funds raised for the event, number of scholarships awarded, and demographics of the attendees. The quality of both panel discussions and invited speakers, and the engagement of SGFF delegates during the 31st Space Symposium will also be evaluated. SGAC will engage members to prepare and participate in SGFF. The organisation will establish new partnerships to continue to develop this event within the general framework of SGAC's growth.

The fourth annual SGFF was held on April 12-13th, 2015, and gathered 61 students and young professionals from 15 countries to discuss the year's theme of "Inspiring Investment in Space", and pushed new ideas and applications in the space sector. This year, SGAC offered four Global Grant scholarships and organised several panels with invited experts addressing the attendees to provide a unique point of view.

Speakers included: Jeffrey Ashby (former NASA astronaut and Chief of Mission Assurance at Blue Origin), Amir Blachman (Space Angels Network), Tory Bruno (President and CEO of United Launch Alliance), Richard Dalbello (Virgin Galactic), Jeff Feige (Orbital Outfitters), Stephanie Bednarek (SpaceX), Karen Yasumura (DigitalGlobe), Myland Pride (Intelsat General), and Dr. Johann-Dietrich Woerner (Former Chair of the Executive Board of DLR and current Director General of ESA).

3 - Success of 2015 Space Generation Congress

Desired Outcome: SGAC will report on the SGC event, whose success was measured by the number of the delegates, diversity in delegate background and country of origin, number of scholarships, and quality of the output mainly in the final SGC presentations and SGC Final Report.

This year SGC welcomed 126 delegates, 14 speakers, and seven subject matter experts from 41 countries to Jerusalem. The number and calibre of applicants continues to grow, where 47% of delegates are Masters or PhD students, and 39% of the delegates are young professionals. Additionally, SGAC worked with sponsors and partners to proudly offer 56 scholarships to students and YPs to attend the SGC and the International Astronautical Congress (IAC). Compared to the 39 from last year, it is an increment of 44%. We hope to continue cultivating these partnerships to provide more opportunities in the future.

4 - Relationships with External Organisations

Desired Outcome: Formalise relationships with existing and new partner organisations through Memoranda of Understanding. SGAC aims to outline long-term benefits of collaboration and provide SGAC with better visibility in the space sector, especially in those areas where SGAC is not yet a reference such as the telecommunications sector.

SGAC relationships have grown significantly in 2015. The organisation continued to strengthen partnerships with space agencies, industry, academia, and space organisations around the world including CNES, OHB, Students for the Exploration and Development of Space (SEDS), and Skoltech. With the increasing number of SGAC events and the level of professionalism in various space panels, SGAC continues to gain interest from many organisations. In 2016 we hope to continue discussions that will lead to more opportunities and scholarships for SGAC members in the future.

5 - Continuation of SGAC membership database

Desired Outcome: SGAC will obtain statistics from our membership database to better understand the needs of the members.

SGAC completed a thorough review of current membership database over the course of the year. Based upon the review, the organisation is preparing a strategic plan not only to provide a comprehensive website update in 2016, but also to develop tools to best utilise various statistics extracted from the membership database and events to better learn about SGAC's members. While the goal is not to re-invent available analytical tools, it has taken a long time to understand various platforms and select a long-term option for the organisation.

6 - SGAC Alumni Strategy and Database

Desired Outcome: SGAC will develop a strategy to retain information on SGAC alumni knowledge and expertise areas in the organisation. Part of this strategy is a database of former members including their activities and their involvement with SGAC. SGAC will attempt to reignite relationships with those that have been out of contact, particularly for SGAC events or ongoing projects.

As SGAC members age into "dinosaurs" (over 35 years of age), it is necessary to keep them involved and offer engagements with current members. This year, SGAC appointed an Alumni Coordinator to develop a membership database of the former members. Using the database, SGAC hosted its first SGAC Alumni Breakfast to meet with alums with the hope of re-establishing connections for future activities.

7 - Strengthen Relations with UNOOSA

Desired Outcome: SGAC will initiate periodic meetings at the UNOOSA facilities outside of annual UNCOPUOS meetings to establish a closer relationship. SGAC will also keep the SGAC UN Involvement Webpage on the SGAC website better maintained and up to date.

There were several SGAC interactions with UNOOSA this year. SGAC hosted its first reception at the UNCOPUOS in June 2015, a traditional event normally hosted by member states. SGAC was also represented at the ICAO UNOOSA 2015 Aerospace Symposium, speaking on the panel "Motivating the Next Generation" of aerospace professionals.

Normally, SGAC also supports member applications to be considered for UNOOSA conference scholarships, including applications to attend the UN/IAF workshop. Workshops were extremely limited this year due to political considerations; nonetheless the organisation looks forward to continue toward this goal in 2016.

8 - PR & Communication Branding Strategy

Desired Outcome: SGAC's PR and Communications Team will develop a yearlong communications campaign strategy to provide better outreach to students and young professionals outside of our current membership base.

The PR and Communications team developed a communications strategy over the summer. A newly formed group reviewed different aspects of communications and branding, laying out areas for improvement and tools to facilitate the work. Despite the excellent work, many team members have moved on due to personal time commitments. The plan is far from finished, but social media tools have been obtained and implemented.

The PR and Communications Team operates differently from other SGAC teams due to their necessary involvement in both internal and external aspects of the organisation. As a result, new team members will be accepted on a rolling basis to allow more skilled design and communication applicants to apply throughout the year. Since scholarships and competitions are targeted to engineering or policy backgrounds, SGAC plans to offer more rewards and incentives, such as waivers to SGAC or partner events, to showcase and thank the team members for their ongoing hard work.



In Support of the United Nations Programme
on Space Applications

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