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ADVISORY COUNCIL

SPACE GENERATION ADVISORY COUNCIL 2017

In support of the United Nations Programme on Space Applications

SPACE GENERATION
ADVISORY COUNCIL

In support of the United Nations Programme on Space Applications

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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 2016. SGAC would like to thank all sponsors and partners once again for their contribution to one of the most successful years in SGAC history.

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LETTER FROM THE EXECUTIVE DIRECTOR

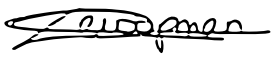
Dear SGAC members, partners, supporters, and colleagues,

The Space Generation Advisory Council has completed another successful year 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. We are proud of the achievements of the organisation and its members. SGAC has now more than 13,000 members and alumni from more than 110 countries within the six SGAC regions. In 2017, SGAC worked with sponsors and partners to offer more than 120 scholarships and awards to the next generation of space professionals. These numbers reflect the upward trajectory of SGAC's growth and its commitment to talented next generation leaders by facilitating their participation in international conferences, meet space sector leaders, and increase their professional development.

Additionally, SGAC has organised (or co-organised) 37 congresses, workshops, and events around the world (a 76% increase since 2016), including the second SGx event, the 16th Space Generation Congress, the sixth Space Generation Fusion Forum, the first Poland Mars Analogue Simulation, and the Space Generation Workshops series. SGAC continued its effort to grow its local and regional presence. This year, SGAC organised its first African Space Generation Workshop in Akure, Nigeria. Moreover, the eight SGAC Project Groups continued to publish educational and technical material on different space topics throughout the year, with a total of 15 presentations and publications in 2017. Over the course of the year, SGAC has continued to support the United Nations (UN) by actively participating at the Committee on the Peaceful Uses of Outer Space (UNCOPUOS) meetings, the Economic and Social Council (UN ECOSOC), and other events by the United Nations Office for Outer Space Affairs (UNOOSA). SGAC is now actively preparing for UNISPACE+50. Born out of UNISPACE III, SGAC is expected to play an important role in nurturing the dialogue pertaining to UNOOSA and to represent the voice of the young generation of students and young space professionals. We would like to express our gratitude to the sponsors and supporters that allow SGAC to continue growing steadily and help increase the visibility of the next generation of space leaders within the space community. We also appreciate the support and guidance of our Advisory Board.

The groundwork laid in previous years has allowed SGAC to continue to be the largest international network of students and young professionals in the space sector, propelling the voice of the next generation of space leaders. The successes of this year would not be possible without the continued hard work and dedication of our volunteer members. We are grateful for their time, effort, and dedication towards making SGAC grow.

Best regards,
Clémentine Decoopman
SGAC Executive Director



OUTPUT AT A GLANCE

Scholarships and awards (130)

Scholarship/Award/Competition	Event supported	Number of Awardees
Global Grants	Space Generation Fusion Forum	4
ISS Crew Fund	European Space Generation Workshop	5
GSA	Space Generation Fusion Forum	1
SGAC-IAASS	IAASS	3
STE USA	Space Tech Expo USA	2
SGLA	Space Generation Congress	5
Space is Business Competition	Space Generation Congress	1
Move an Asteroid	Space Generation Congress	1
ASGIA	Space Generation Congress	3
DLR	Space Generation Congress	2
ILEWG	Space Generation Congress	2
SGC Logo	Space Generation Congress	1
STE Europe	Space Tech Expo Europe	3
Young ESA	Space Generation Congress	1
ASI Grant	Space Generation Congress	7
AYAA Scholarship	Space Generation Congress	8
OHB	Space Generation Congress	2
NASA AES Scholarship	Space Generation Congress	1
NASA SCAN Scholarship	Space Generation Congress	2
Embry-Riddle Scholarship	Space Generation Congress	1
University of Adelaide Scholarship	Space Generation Congress	5
Russian Scholarship	Space Generation Congress	1
ISEB NASA	Space Generation Congress	2
ISEB KARI	Space Generation Congress	5
ISEB CSA	Space Generation Congress	7
SGAC/ESPI/DLR	Space Generation Congress	9

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

Scholarship/Award/Competition	Event supported	Number of Awardees
Future Space Leaders Award	Space Generation Congress	7
Emerging Space Leaders Awards	Space Generation Congress	15
Space Symposium Complimentary Registrations	Space Generation Fusion Forum	24

Conferences, Workshops, and Events Organised or Co-Organised (37)

Global (3)
- SGx in conjunction with Satellite 2017
- Space Generation Fusion Forum (Colorado Springs, USA)
- 16th Space Generation Congress (Adelaide, Australia)

Regional (4)
- E-SGW (Paris, France)
- AF-SGW (Akure, Nigeria)
- AP-SGW (Bengaluru, India)
- SA-SGW (Sao Paulo, Brazil)

Local (11)
- SG[Israel]
- SG[Greece] (Athens, Greece)
- SG[Iran]
- Stargazing, Ethiopia
- Space Meetup, Kenya
- Why Space, Nigeria
- Yuri's Night, South Africa
- Yuri's Night in Bolivia
- SGAC Meetups in New York City and Washington DC
- World Space Week Event, Kenya
- Hispanic Heritage Month (Houston, USA)

Thematic (19)
- ESA-SGAC Event at the Paris Air Show (Paris, France)
- Next Generation Programme on the Future of Space Exploration (Turin, Italy)
- SGAC/AAS Next Generation Event: Innovation Beyond Boundaries (Washington DC, USA)
- Poland Mars Analogue Simulation (Torun, Poland)
- Moon Village Event (Bremen, Germany)
- Moon Village Event (Munich, Germany)
- Space Cooperation and Diplomacy Event (Washington DC, USA)

- Reinventing Space Career Event (Glascow, UK)
- Youth Space Forum in conjunction with the Global Space Congress (Abu Dhabi, UAE)
- SpaceUp BIT (Beijing, China)
- SpaceUp Cote d'Azur (Nice, France)
- SpaceUp Stuttgart (Stuttgart, Germany)
- SpaceUp London (London, UK)
- SpaceUp Skoltech (Moscow, Russia)
- SpaceUp ISU (Strasbourg, France)
- SpaceUp Norway (Trondheim, Norway)
- SpaceUp Lisbon (Lisbon, Portugal)
- SpaceUp Colombia (Bogotá, Colombia)
- SGAC European Christmas Dinner (Dublin, Ireland)

Formalised Partnerships (7)

- SEDS Canada
- Mars Society Hellas
- Australian Youth Aerospace Association
- University of Adelaide
- Singapore Space and Technology Association
- OHB
- Asociación Centroamericana de Aeronáutica y del Espacio

Papers, Presentations, And Publications (15)

Project Groups

Space Exploration Project Group

- Sourav Karmar. Thorium reactors on Mars, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017
- Sebastian Hettrich. Why space colonies will not solve terrestrial problems, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017
- Sebastian Hettrich. Thermodynamic challenges of cooking food on Mars, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017
- Samuel Hargrove. Preliminary results of the Poland Mars Analogue Simulation, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017
- Efstratia Salteri. Planning and scheduling for the Poland Mars Analogue Simulation, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017
- Hady Ghassabian. Study of isokinetic structures and applications for expandable and adaptive habitats using in-situ lunar resources for future Moon surface missions, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Small Satellite Project Group

- M. Deiml. WAVE-E: The WAter Vapour European-Explorer Mission, 11th IAA Symposium
- Shreya Santra. Why and how small satellites can be relevant for scientific research, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017
- Shreya Santra. Feasibility study of rockoon concept as a novel launcher system for small satellites, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017
- Shreya Santra. Long term views on use of Cubesats for commercial applications, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Space Law and Policy Project Group

- Lauren Napier. Enabling private sector - SGAC perspective, Room Journal
- Kathryn Robison. Funding science, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Space Safety and Sustainability Project Group

- Guzel Kamaletdinova. Mars space suit safety analysis, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017
- Nikita Chiu. On-orbit servicing, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017
- Nikola Schmidt. Space colonies governance, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Others (82)

Oniosun Temidayo Isaiah, Henry Ibitolu. Prospects for leveraging on 3D-printing technology and local materials for space education development in Africa: a case of IrawoScope, Africa's first 3D-printed affordable telescope. UNOOSA, UN Italy Workshop, Open Universe Initiative, Nov 2017

Rayan Imam. Space technology for sustainable development in Sudan - Initiative at University of Khartoum United Nations/United Arab Emirates - High Level Forum: Space as a Driver for Socio-Economic Sustainable Development. Dubai, United Arab Emirates, 6 - 9 November 2017

Rayan Imam. Availability of space science and technology infrastructure in Africa UN/Austria Symposium on Access to Space: Holistic Capacity-Building for the 21st Century. Graz, Austria 3 - 7 September 2017

Rayan Imam. Onboard mission scheduling for the camera subsystem of uoksat-3, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Zihua Zhu. Space Generation Advisory Council on Promoting Future Space Collaboration among the Next Generation in Asia-Pacific, GLEX 2017

David Ho. IAC 2017, Space amongst the giants: a new course for Asia-Pacific space cooperation, 68th

International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Matthew Richardson. Economic benefits of reusable launch vehicles for space debris removal, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Yashwanth Amara. Drag enhancement for spacecraft using numerous ultra-thin wires arranged into drag-wire webs of various configurations, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Jara Kaye Villanueva. Site suitability analysis for philippine Earth observation ground station, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Saqib Nisar. An integrated space technology and Global Navigation Satellite Systems application for agriculture monitoring, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Yusuke Muraki. Concept of Asian small precipitation radar constellation, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Leila Ghasemzadeh and Behnoosh Meskoob. Preliminary results of the Poland Mars Analogue Simulation, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Leila Ghasemzadeh, Preliminary design-concept of multi regional satellite for increasing accuracy in GNSS (precise point positioning). 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Mina Takla. Integrated international strategy for mitigating effects of minor asteroid impacts through a collaborative and effective early warning and disaster, Planetary Defense Conference 2017

Natalia Indira Vargas Cuentas. Epidemiology study of the chagas disease in Bolivia using remote sensing data, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Natalia Indira Vargas Cuentas. The space technology to solving societal issues in Bolivia: an overview, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Natalia Indira Vargas Cuentas. Use of satellite images for droughts studying: the Bolivian case, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Natalia Indira Vargas Cuentas. Facial image processing for sleepiness estimation, 2nd International Conference on Bio-Engineering for Smart Technologies - BioSMART, Paris, France

Natalia Indira Vargas Cuentas. The ‘Salar de Uyuni’ as a simulated Mars base habitat in South America. Global Space Exploration Conference - GLEX, Pekin, China

Avid Roman-Gonzalez. Analysis of landslide in Chosica using satellite images, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Avid Roman-Gonzalez. Nanosatellite vibration test equipment, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Anamol Mittal, Dr. K. Kishore Kumar. Investigating the radiant sources of meteors, International Journal of Scientific and Engineering Research, 2017

Laszlo Bacsardi, Roger Birkeland, Andreas Hornig, Mansoor Shar, Brandon Morrison, and Yevgeny Tsodikovich. Present and the future of space internet: the Space Generation perspective, 33rd Space Symposium, 67th IAC, NewSpace Journal

Andrew Ross Wilson, Prof. Massimiliano Vasile. Integrating life cycle assessment of space systems into the concurrent design process, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Andrew Ross Wilson, Prof. Massimiliano Vasile. Ecodesign: Towards Life Cycle Sustainability of Space Systems, European Space Agency Clean Space Industrial Days, Noordwijk, Netherlands, 2017

Sourav Karmakar, Suranjana Trivedy, Sebastian Hettrich, Shreyas Mirji, Damian M Bielicki. Thorium based nuclear technology for the development of Martian civilization, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Sebastian Hettrich, Nicola de Quattro, Danielle LeMieux, Rainer Diaz de Cerio Goenaga, Brenda Patricia Hernandez Perez, Tajana Lucic, Kiran Tikare, Hady Ghassabian Gilan. Why space colonies will not solve terrestrial problems, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Sebastian Hettrich, Adhithiyan Neduncheran, Joshua Ehrlich, Kiran Tikare, Christiane Heinicke, Hady Ghassabian Gilan. Thermodynamic challenges of cooking food on Mars, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Samuel Hargrove, Guillaume Thirion, Danielle LeMieux, Jennifer Pouplin, Behnoosh Meskoob, Leila Ghasemzadeh, Melanie Grande, Hady Ghassabian Gilan, Kiran Tikare, Carmen Felix, Sebastian Hettrich, Carlos Salicrup, Ilaria Cinelli, Tajana Lucic. Preliminary results of the Poland Mars Analogue Simulation, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Maria Alexandra Lora Veizaga, Pablo Melendres Claros. SATS - Communicating as one. 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Chris Beauregard. Evaluating and communicating acceptable risk in space tourism, IAASS Space Safety Conference

Chris Beauregard. The case for domestic rocket engine procurement, Journal of Science Policy and

Governance

Ilaria Cinelli, Sebastian Hettrich , Jhon Alexander Sucerquia, Tajana Lucic. The Poland Mars Analogue Simulation as a stepping stone for future Mars exploration, 10th International Academy of Astronautics (IAA), Space Exploration Symposium, Turin

Reinhard Tlustos, Sebastian Hettrich, Tajana Lucic.The Poland Mars Simulation. European Mars Conference 2017

Kavya Manyapu, Melanie Grande, Laura Bettiol, Maria Grulich. Considerations for fostering international collaboration in exploring cislunar space, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Tobias Niederwieser, Ryan Wall, David Klaus, James Nabity. Development of a testbed for flow-through measurements of algal metabolism under altered pressure for bioregenerative life support applications, 47th International Conference on Environmental Systems (ICES) 2017

Tobias Niederwieser, Patrick Kociolek, David Klaus. Spacecraft cabin environmental effects on the growth and behavior of chlorella vulgaris for life support applications, Life Science in Space Research

Tobias Niederwieser, David Klaus. Algal research in space, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017; Acta Astronautica

Lorene Authier, Axel Blanc, Bernard H. Foing, Arthur Lillo, Pierre Evellin, Agata Kołodziejczyk, Christiane Heinicke, Matt Harasymczuk, Cynthia Chahla, Andjela Tomic, Sebastian Hettrich, PMAS astronauts, MoonMars astronaut, and CapCom protocols: ESTEC and LunAres PMAS Simulations, 2017 Annual Meeting of the Lunar Exploration Analysis Group

Axel Blanc, Lorene Authier, Bernard H. Foing, Arthur Lillo, Pierre Evellin, Agata Kołodziejczyk, Christiane Heinicke, Matt Harasymczuk, Cynthia Chahla, Andjela Tomic, Sebastian Hettrich. Logistics for MoonMars simulation habitats: ExoHab ESTEC and LunAres Poland, 2017 Annual Meeting of the Lunar Exploration Analysis Group

Bernard H. Foing, Arthur Lillo, Pierre Evellin, Agata Kołodziejczyk, Christiane Heinicke, Matt Harasymczuk, Lorene Authier, Axel Blanc, Cynthia Chahla, Andjela Tomic, Melissa Mirino, Irene Schlacht, Sebastian Hettrich, Tibor Pacher, Louis Maller, Aline Decadi, Julien Villa-Massone, Jolanda Preusterink, Anna Neklesa, A. Barzilay, T.Volkova. ILEWG EuroMoonMars research, technology, and field simulation campaigns, 2017 Annual Meeting of the Lunar Exploration Analysis Group

Arthur Lillo, Bernard H. Foing, Pierre Evellin, Agata Kołodziejczyk, Clement Jonglez, Christiane Heinicke, Matt Harasymczuk, Lorene Authier, Axel Blanc, Cynthia Chahla, Andjela Tomic, Melissa Mirino, Irene Schlacht, Sebastian Hettrich, Tibor Pacher. Remote operation of the ExoGeoLab Lander

at ESTEC and Lunares Base, 2017 Annual Meeting of the Lunar Exploration Analysis Group

Arthur Lillo, Bernard H. Foing, Pierre Evellin, Agata Kołodziejczyk, Clement Jonglez, Christiane Heinicke, Matt Harasymczuk, Lorene Authier, Axel Blanc, Cynthia Chahla, Andjela Tomic, Melissa Mirino, Irene Schlacht, Sebastian Hettrich, Tibor Pacher. Live from the Moon ExoLab: EuroMoonMars Simulation at ESTEC 2017, 2017 Annual Meeting of the Lunar Exploration Analysis Group

A. Tomic, Lorene Authier, Axel Blanc, Bernard H. Foing, Arthur Lillo, Pierre Evellin, Agata Kołodziejczyk, Christiane Heinicke, Matt Harasymczuk, Cynthia Chahla, Sebastian Hettrich. Growing plant(s) at a MoonMars habitat or/and dedicated external space, 2017 Annual Meeting of the Lunar Exploration Analysis Group

Cody Knipfer. International cooperation and competition in space: how and why should the United States proceed?, The Space Review

Cody Knipfer. Why should we go? Reevaluating the rationales for human spaceflight in the 21st century, The Space Review

Cody Knipfer. Space Security Index 2017, Indicators 3.2, 3.3, & 3.4, Space Security Index

Cody Knipfer. A coming communications crunch at Mars, The Space Review

Andrew Stiles. The NewSpace phenomenon, First Report Economic News

Bastian Wick. An agreement governing natural resource activities on the Moon and other celestial bodies, Studies in Air and Space Law

Peter Z. Schulte, David A. Spencer. Fault protection for Mars sample return autonomous rendezvous and capture. Symposium on Space Innovations

Peter Z. Schulte, David A. Spencer. State machine fault protection for autonomous proximity operations, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Massimo Pellegrino, Alexander Gibson, Juan Carlos Mariscal, Peter Schulte. UNISPACE+50: Shared vision, common action, 68th International Astronautical Congress, Adelaide, Australia

Funmilola Oluwafemi. Microgravity research and applications: roles in economic prosperity and poverty reduction, United Nations/United Arab Emirates, High Level Forum Space as a Driver for Socio-Economic Sustainable Development, Dubai, United Arab Emirates, 2017

Funmilola Adebisi Oluwafemi, Aliyu Bamidele Oke, Esther Moradeke Afolayan. Investigation of watermelon seeds growth under simulated microgravity and its advantages to agriculture sector, 1st

National Workshop on Microgravity and Environmental Research, Microgravity and Environmental Research for Sustainable Development, hosted by Centre for Atmospheric Research (CAR), of National Space Research and Development Agency (NASRDA), Anyigba, Nigeria, 2017

Esther Moradeke Afolayan, Funmilola Adebisi Oluwafemi, Aliyu Bamidele Oke. Space based technologies: a solution to food security on Earth, 1st National Workshop on Microgravity and Environmental Research, Microgravity and Environmental Research for Sustainable Development, hosted by Centre for Atmospheric Research (CAR), of National Space Research and Development Agency (NASRDA), Anyigba, Nigeria, 2017

Funmilola A. Oluwafemi, Divyesh Patel, Yasith Lakmal, Andrea De La Torre, Guzel Kamaletdinova, Joao Lousada. Microgravity effects in a long term manned mission, 1st National Workshop on Microgravity and Environmental Research, Microgravity and Environmental Research for Sustainable Development, hosted by Centre for Atmospheric Research (CAR), of National Space Research and Development Agency (NASRDA), Anyigba, Nigeria, 2017.

Isiaka Olamilekan Popoola, Kemi B. Doherty, Esther M. Afolayan, Funmilola A.Oluwafemi, AbelMark. Benefits of remote sensing in agriculture, 1st National Workshop on Microgravity and Environmental Research, Microgravity and Environmental Research for Sustainable Development, hosted by Centre for Atmospheric Research (CAR), of National Space Research and Development Agency (NASRDA), Anyigba, Nigeria, 2017.

Omotayo O. Johnson, Funmilola A. Oluwafemi, Orukpe Alex. Space food technology: an overview, 1st National Workshop on Microgravity and Environmental Research, Microgravity and Environmental Research for Sustainable Development, hosted by Centre for Atmospheric Research (CAR), of National Space Research and Development Agency (NASRDA), Anyigba, Nigeria, 2017.

Afolayan Esther Moradeke, Oluwafemi Funmilola Adebisi, Oke Aliyu Bamidele. Socio-economic benefits of microgravity research, Centre for Satellite Technology Development (CSTD) Week 2017, Abuja, Nigeria.

Rayan Imam. Onboard mission scheduling for the camera subsystem of Uoksat-3, 68th International Astronautical Congress (IAC 2017)

Rayan Imam. Space technology for sustainable development in Sudan - Initiative at University of Khartoum, United Nations/United Arab Emirates - High Level Forum: Space as a Driver for Socio-Economic Sustainable Development

Rayan Imam. Availability of space science and technology infrastructure in Africa, UN/Austria Symposium on Access to Space: Holistic Capacity-Building for the 21st Century

David Earle, Rayan Imam, Olga Mamoutova, Jorge Monteiro, Siddhesh Naik, Yasith Ramawickrama,

Daria Stepanova, Kiran Tikare, Alejandro Lopez, Patricia Randazzo. Technical knowledge gaps in niche use cases of small satellites, 4th IAA Conference on University Satellite Missions and CubeSat Workshop

Henry Adeniyi Ibitolu, Oniosun Temidayo Isaiah, Chris Chime. Prospects for leveraging on 3D-printing and local materials for space education development in Africa: a case of IrawoScope, Africa's first 3D-printed affordable telescope, United Nations/Italy Workshop on the Open Universe Initiative Vienna, Austria, 20-22 November 2017

Eleanor Morgan, Cristian Bank. Utilising the International Space Station as a simulation platform for deep space travel, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Ozan Kara. Preliminary analysis: prevention of HfQ-sRNA binding gamification applications, United Nations World Health Organisation Conference on Global Health in Space Technologies

Ozan Kara. Future Mars mission demonstration with gamification: next gen. Workforce development and self-KM for space education, United Nations/Russian Federation Workshop on Human Capacity-Building in Space Science and Technology for Sustainable Social and Economic Development

Joao Lousada, Guzel Kamaletdinova, Divyesh Patel, Yasith Lakmal, Funmilola Adebisi Oluwafemi, Andrea De La Torre, Uthpala Heshani, Maxim Onevsky, Sergey Skvortsov. Approaches and solutions for Martian spacesuit design, 68th International Astronautical Congress (IAC 2017), Adelaide, Australia, 2017

Joao Lousada. Mars space suit safety, International Association for the Advancement of Space Safety Conference, 2017

Joao Lousada, Guzel Kamaletdinova, Yasith Lakmal, Divyesh Patel, Funmilola Adebisi Oluwafemi, Andrea De La Torre, Istvan Revesz, Aureliano Rivolta. Mars Space Suit Safety, International Academy of Astronautics Symposium on the Future of Space Exploration

Stephanie Wan, Chiara Cocchiara, Arnau Pons, Ali Nasseri. Establishing and sustaining a young professional programme in an international space professional organisation, International Astronautical Congress (IAC) 2017, Adelaide, Australia.

Conferences and Events with Official SGAC Representation (61)

- High-Level Forum 2017, UAE

- Global Space Congress, UAE
- 54th session of the Scientific and Technical (S&T) Subcommittee of UNCOPUOS, Austria
- 56th Session of the Legal Subcommittee of UNCOPUOS, Austria
- 60th Session of the General Assembly of the UNCOPUOS, Austria
- UN/Austria Symposium on Access to Space: Holistic Capacity Building for the 21st Century, Austria
- ICAO/UNOOSA Aerospace Symposium (SPACE 2017)
- UN/Italy Workshop on the Open Universe Initiative, Austria
- IAF Spring Meetings 2017, France
- 68th International Astronautical Congress, Australia.
- NewSpace Innovation Challenge, Australia
- 6th Annual Future Space event, USA
- 33rd Space Symposium, USA
- National Space Club Goddard Memorial Dinner, USA
- Satellite 2017, USA
- ISS R&D Conference, USA
- ESPI Autumn Conference, Austria
- World Space Week Celebrations around the world
- UN/ICAO Conference, USA
- SpaceUp Mexico
- SpaceUp GLEX
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- SpaceUp London
- SpaceUp Stuttgart
- SpaceUp ISU
- SpaceUp Lisbon
- SpaceUp Bogotá
- Space Entrepreneurship Symposium 2017, Malaysia
- Yuri's Night Celebrations around the world
- APRSAF-24, India
- Airbus Moon Village Event, Munich, Germany
- Space Tech Expo Europe
- Space Tech Expo USA
- El Salvador National Aerospace Conference, El Salvador
- UN/South Africa Symposium on Basic Space Technology, South Africa
- UN ECOSOC Meetings, USA
- Paris Air Show, France
- IAA 10th Symposium on the Future of Space Exploration Towards Space Village and Beyond
- UKSEDS Reinventing Space 2017, UK
- NASA Space Apps Challenge

- Space Night VII: Launch Your Career In Space, Czech Republic
- Gate2Space 2017, Czech Republic
- Startup World Cup & Summit, Czech Republic
- EOVation Agriculture Hackathon, Czech Republic
- 8th International Conference on Mechanical and Aerospace Engineering, Hungary
- Near Space Conference, Poland
- European Mars Conference 2017
- 1st National Workshop on Microgravity and Environmental Research, Nigeria
- 9th International Association for the Advancement of Space Safety Conference, Toulouse, France
- United Nations/Russian Federation Workshop on Human Capacity-Building in Space Science and Technology for Sustainable Social and Economic Development
- DLR Knowledge Management Days
- 4th IAA Conference on University Satellite Missions and CubeSat Workshop
- Centre for Satellite Technology Development (CSTD) Week 2017, Abuja, Nigeria
- CSTD 2016 Annual Space Conference and Exhibition, Abuja, Nigeria
- United Nations World Health Organisation Conference on Global Health in Space Technologies
- 2017 Annual Meeting of the Lunar Exploration Analysis Group
- 47th International Conference on Environmental Systems (ICES) 2017
- Dawn of Private Space Science 2017, New York City, USA

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

ACTIVITY HIGHLIGHTS

General Highlights

- Ali Nasseri (Canada/Iran) succeeded Stephanie Wan (USA) as the new Chair of SGAC
- SGAC welcomed a new Co-Chair, Alexander Gibson (USA)
- SGAC welcomed a new Deputy Executive Director, Clémentine Decoopman (France)
- SGAC appointed Brittany Zajic (USA) and McLee Kerolle (USA) as the new Executive Secretaries
- SGAC appointed John Conafay (USA) as the new Treasurer
- SGAC appointed Monica Pascanu (Romania) as the new PR and Communication Co-Coordinator
- SGAC appointed Ciro Farinelli (Italy) and Kathryn Robison (USA) as the new Project Group Coordinators
- SGAC appointed Dan Malgran (USA) as the new Web Coordinator
- SGAC appointed Caroline Thro (France) as the new Regional Events Coordinator
- SGAC appointed Harriet Brettle (UK) as the new Strategic Partnerships Co-Coordinator
- SGAC reached out a network size of more than 13,000 members and alumni in 110 countries
- SGAC successfully organised its 2nd SGx event in collaboration with the Future Space Leaders

Foundation and Satellite 2017 with 205 attendees from 18 different nationalities.

- SGFF2017 was sold out with a record number of 147 applications with a substantial increase in military participants (20% versus previous maximum 5%), and a total of 40 organisations represented.
- SGC2017 was sold out (over 300 applications received) and was the most successful to date in terms of number of attendees (150), national diversity of attendees (43 nationalities), scholarships given (82 scholarships), caliber of speakers, and overall conference professionalism
- SGC2017 Closing Dinner was sold out, with the dinner being the largest ever organised, with 350 guests
- SGAC achieved remarkable participation at the IAC 2017 in Adelaide, Australia. SGAC members presented more than 40 technical papers covering varying areas of interest, and participated in panel discussions and organised incredibly successful outreach events
- SGAC and its partners offered more than 100 scholarships in 2017 for participation in SGAC events and events organised by our partners (an increase of almost 20% compared to last year)
- SGAC collaborated with more than 50 partners, and 10 national and regional space agencies in 2017
- SGAC had 97 papers, presentations and publications in 2017
- SGAC held 4 regional events and 30 local and thematic events around the globe
- The main SGAC website is now updated

Executive Office Highlights

SGAC Chair, Ali Nasseri, presented SGAC's general statement at the 54th session of the Scientific and Technical (S&T) Subcommittee of UNCOPUOS.

SGAC's Chair presented SGAC's general statement at the 60th Session of the General Assembly of the UNCOPUOS

SGAC's Chair moderated the second and third day of the 33rd Space Symposium at Colorado Springs, Colorado.

SGAC's outgoing Executive Director, Minoo Rathnasabapathy (South Africa/Australia), addressed a technical presentation at the 60th Session of the General Assembly of the UNCOPUOS

SGAC outgoing Executive Director was interviewed by the ABC Radio Adelaide on the future of the space industry and female role models

The IAF awarded the outgoing Executive Director as well as the outgoing Chair, Stephanie Wan (USA), the 2017 Young Space Leader Recognition Award

SGAC welcomed a new Executive Director, Clémentine Decoopman (France)

SGAC Executive Director was a panelist at the UN/Austria Symposium on Access to Space: Holistic Capacity Building for the 21st Century

SGAC Executive Director as well as SGAC Asia-Pacific Regional Coordinator, Zihua Zhu (China), were

panelists at the High-Level Forum 2017 in Dubai

SGAC Executive Director and SGAC Asia-Pacific Regional Coordinator were interviewed by the UNOOSA TV in French, Chinese, and English about SGAC's involvement in UNISPACE+50

SGAC Executive Director was Chair of the session 4: outreach and space citizen-science projects at the UN/Italy Workshop on the Open Universe Initiative

SGAC Executive Director was interviewed by SpaceWatch Middle East on the future of SGAC

Africa Region Highlights

In 2017, SGAC hosted the 1st African Space Generation Workshop in Akure, Nigeria, in November. It also organised a Space Meet-Up and a Yuri's Night event in Kenya and South Africa in April, as well as World Space Week in Kenya in October.

SGAC also helped put in place an Astronomy Outreach Programme since October 2017 in South Africa for rural hospitals across Kwazulu Natal.

In November 2017, SGAC members had the chance to interview astronaut. Don Thomas at the Durban Girls' College in Durban, South Africa.

SGAC members in Sudan participated to the NASA Space Apps Challenge.

SGAC welcomed a new Regional Coordinator for the region, Oniosun Temidayo Isaiah (Nigeria).

SGAC welcomed 9 National Points of Contact in the African region: Houssein Isman Hersi (Djibouti), Hansley Noruthun (Mauritius), Hamza Ouhssaine (Morocco), Damilola Oladeji and Tobiloba Akinwale (Nigeria), Leehandi De Witt (South Africa), Daniel K. Nanghaka and Charles Muhanguzi (Uganda), and Christopher Luwanga (Malawi).

On the occasion of Yuri's night in South Africa, an article was published in The Independent by Nadia Karrim, who hosted a quiz as part of the event.
In 2018, SGAC plans to host the 2nd African Space Generation Workshop.

Asia Pacific Region Highlights

In 2017, SGAC organised the 16th Space Generation Congress in Adelaide, Australia in September, the 4th Asia-Pacific Space Generation Workshop in Bangalore, India, in November, and the Malaysia Space Symposium.

SGAC welcomed 12 National Points of Contact in Asia Pacific in 2017, Faith Tng (Singapore) and Joanne Wong, (Singapore), Md Mahbubur Rahman (Bangladesh), Jayakumar Venkatesan (India),

KangSan Kim (South Korea), Jude Vijayanga Wijesekera (Sri Lanka), Pham Quoc Trung (Vietnam), Prabin Gyawali (Nepal), Anamol Mittal (Nepal), Arti Bandhana (Fiji), Zhanna Suimenbayeva (Kazakhstan), and Fakhri Babayev (Azerbaijan).

SGAC also co-organised SpaceUp GLEX and SpaceUp BIT.

SGAC formalised partnerships with the Singapore Space and Technology Association (SSTA) as well as with the University of Adelaide, Australia in 2017.

In 2018, SGAC plans to host the 5th Asia-Pacific Space Generation Workshop, SG[ASEAN] and co-organise the Y-SEF2 as well as a SpaceUp event in Beijing.

Europe Region Highlights

In 2017, SGAC hosted its first SG[Greece] in Athens, Greece, in February as well as its second European Space Generation Workshop in Paris, France, in March. SGAC also organised six SpaceUp events in Norway, Russia, United Kingdom, Germany, France and Portugal. SGAC also hosted the first Poland Mars Analogue Simulation in Torun, Poland, in August.

SGAC co-organised three MoonVillage Workshops in Germany in May, in Italy in June, and in Germany in October.

Finally, SGAC members in Europe participated to the European SGAC Christmas Dinner in Dublin, Ireland, in December.

SGAC welcomed a new Regional Coordinator for the region, João Lousada (Portugal).

SGAC welcomed 22 new National Points of Contact in 2017: Kseniia Lisitsyna and Valeria Skuratova (Russia), Jorge Monteiro (Portugal), Laura Manoliu (Romania), Stefan Filipovic (Serbia), Matjaz Vidmar (Slovenia), Hannah Peterrson and Terese Svensson (Sweden), Roman Mykhalchyshyn (Ukraine), Lucie Davidová and Jan Lukacevic (Czech Republic), Ines Radhima (Albania), Sophie Gruber (Austria), Jelle Gheldof and Maxim Mommerency (Belgium), Mirta Medanic (Croatia), Jophiel Wiis (Denmark), Audrey Berquand and Florian Marmuse (France), Leonidas Gargalis (Greece), Bojana Minić (Montenegro), and Kamil Muzyka (Poland).

SGAC formalised two new partnership in Europe with the Northwest public organisation of the Federation of Cosmonautics of Russia and Toulouse Business School in France.

Kseniia Lisitsyna, NPoC of Russia was granted the Russian Scholarship to attend the 16th Space Generation Congress and the 68th International Astronautical Congress in Adelaide, Australia.

Arnau Pons (Spain), Laura Bettiol, (Italy), Michal Kunes (Czech Republic), Caroline Thro (France/Germany), Guzel Kamaletdinova (Russia), Tajana Lučić (Croatia) were acknowledged as *SGAC member of the month* in 2017.

Marta Lebron (Spain), Olga Stelmakh (Ukraine) were awarded with the Space Generation Leadership Award enabling them to attend the 16th Space Generation Congress and the 68th International Astronautical Congress in Adelaide, Australia.

Joao Lousada, RC Europe and Johanna Pardo (Germany) were panelists in MoonMars Villages for Science, Technology, Innovation, Cooperation, Security and Inspiration at IAC 2017 plenary

In 2018, SGAC plans to host the third European Space Generation Workshop in Bucharest, Romania, as well as the SGAC European Student Forum in Budapest, Hungary. SGAC will also co-organise the SpaceOps 2018 and a workshop on nanosatellites operations and their launch activities in Marseille, France. In June 2018, SGAC will organise a two-day event on the occasion of UNISPACE+50 in Vienna, Austria. Finally, the Space Generation Congress 2018 will be hosted in Bremen, Germany, in September 2018.

Middle East Region Highlights

SGAC hosted its first local event SG[Iran] in June 2017 and SG[Israel] in January. SGAC also helped organise the First Youth Space forum in conjunction with the Global Space Congress in Abu Dhabi, UAE in June.

SGAC welcomed a new Regional Coordinator for the region, Leila Ghasemzadeh (Iran) and three new National Points of Contact, Charikleia Olympion (Cyprus), Sarath Raj N.S (UAE), and Vera Gutman (Israel).

The Middle East RCs were part of the PMAS mission 2017 in the Planning and Scheduling Team. The NPoC of Egypt was part of the Media and Outreach Team (MOT).

The Iran NPoC got the Iranian Space Agency's financial aid and support in organising the second National Funding Round of Manfred Lachs Moot Court Competition in Iran in cooperation with the Institute of Public Law Studies of University of Tehran.

SGAC members in Cyprus did a Podcast and an interview to a local magazine to introduce SGAC.

The NPoC of Egypt presented SGAC at the Arab Academy for Science and Technology and the Iranian NPoC presented SGAC at the International Day of Astronomy and the workshop on Modern Space Policy.

SGAC members Behnoosh Meskoob and Mina Takla contributed to the Find an Asteroid Search Campaign 2017.

In 2018, SGAC Middle East is planning to host the first ME-SGW. The organisation is also looking at hosting a SG[Kuwait], and other events in Iran, Egypt, UAE, and Israel, and a SpaceUp in Turkey.

Finally, SGAC will help co-organise two events in conjunction with the Global Aerospace Summit in Abu Dhabi in May.

North, Central America, & Caribbean Region Highlights

In 2017, SGAC hosted its 5th Space Generation Fusion Forum, Colorado Springs in April.

SGAC also co-organised a young professionals event including a speed mentoring session at the ISS R&D Conference in Washington DC, in July.

SGAC hosted a SGAC gathering in New York City and celebrated the Hispanic Heritage Month. SGAC members in the region also participated in the National Aerospace Conference, El Salvador, in June.

SGAC welcomed four new National Points of Contact, Cheyenne Polius (St Lucia), Kadeisha Edwards and Liam Alexis (Trinidad and Tobago), and Juan Carlos Mariscal Gómez (Mexico). It is the first time that SGAC is represented in Trinidad and Tobago.

A group of eight Mexican SGAC members participated in the Poland Mars Analogue Simulation (PMAS), subproject of the SGAC Space Exploration Project Group (SEPG) in July 2017.

In 2018, SGAC plans to host the 1st Central American SGAC Workshop.

South America Region Highlights

In 2017, SGAC organised a Yuri's Night event in Bolivia in April 2017, a SpaceUp in Bogota, Colombia, in October, as well as the third South American Space Generation Workshop in São José dos Campos, Brazil, in November.

SGAC welcomed a new Regional Coordinator for the region, Natalia Vargas Cuentas (Bolivia).

SGAC welcomed three new National Points of Contacts, Pablo Melendres Claros (Bolivia), Oscar Ivan Ojeda Ramirez (Colombia), and Roberto Adolfo Ubidia Incio (Peru).

Camilo Andres Reyes was a member of the LATAM I mars analogue mission at MDRS. Avid Roman Gonzalez was designed as distinguished lecturer of the Aerospace and Electronics System Society of the Institute of Electrical and Electronics Engineers. Natalia Vargas Cuentas was invited to participate to the United Nations/South Africa Symposium.

The South-American region now has a bimonthly newsletter named *InfoSGAC*, developed by SGAC-Argentina with different space news in the region.

In 2018, SGAC plans to host a SpaceUp in Lima, Peru, in January, and the 4th South American Space Generation Workshop.

SGx2017

In partnership with the Future Space Leaders Foundation (FSLF) and SATELLITE 2017, SGAC hosted its second technology-focused event, SGx, bringing together experts in the industry and government leaders to discuss pressing issues and innovative ideas in a brand new way.

SGx is a one-day thought-leadership and networking event that brings together young professionals, industry experts, and government leaders to discuss pressing issues that impact the global space community in an innovative way. The presentations are fast-paced and seek to inspire the next generation of space leaders to solve global challenges through the application of space technologies.

The one-day event brought together 20 speakers including Eric Stallmer (President, CSF), Danielle R. Wood (Goddard Applied Sciences Manager, NASA), Suzi McBride (Senior Vice President, OneWeb), Debra Facktor Lepore (Vice President and General Manager, Strategic Operations and Commercial Aerospace, Ball Aerospace), Will Pomerantz (Vice President, Special Projects, Virgin Galactic), and many more.

SPACE GENERATION FUSION FORUM

REPORT OF THE 6th SPACE GENERATION FUSION FORUM 2nd and 3rd April 2017

Speakers and Moderators

Jonathan Arenberg
Chief Engineer, James Webb Space Telescope, Northrop Grumman

Representative Jim Bridenstine
Oklahoma's First Congressional District

Dr Benton C Clark
Co Investigator, Geochemistry, Planetary Protection, Lockheed Martin

Ariane Cornell
North American sales for New Glenn, Business Development and Strategy Team for Blue Origin

Dr Mary Lynne Dittmar
Executive Director, Coalition for Deep Space Exploration

Pierre Delsaux
Deputy Director General, European Commission

Carlo des Dorides
Executive Director of the European Global Navigation Satellite Systems Agency (GSA)

W. Michael Hawes, D.Sc.
Vice President and Orion Program Manager, Lockheed Martin Space Systems Company

Steve Eisenhart
The Space Foundation Senior VP for Strategic and International Affairs

Sylvain Laporte
President, Canadian Space Agency

Phil Larson
Assistant Dean, University of Colorado Boulder

Col Paul Lockhart
United States Air Force (USAF) (Retired)

Andrew Rush
President, Made In Space

Michael Simpson
Director for Space Strategy and Plans in the Office of the Under Secretary of Defense for Policy in the US

Johann-Dietrich Woerner
ESA Director General

Human Spaceflight

2017 commenced with the loss of the last man to stand on the Moon, with no near-term plans for once again sending humans to other bodies of our solar system. Even as government and commercial players discuss the return of humans to the Moon, visitation of an asteroid, or exploration of Martian orbit, the debate regarding how to structure and fund human spaceflight continues. Should human exploration be preceded by robotic research? Do we have the necessary engineering and psychological know-how to sustain human life through long-duration space travel? Which destinations should be prioritised? What role does international collaboration play in human spaceflight efforts? This topic will explore the multifaceted nature of implementing human spaceflight, looking at proposed roadmaps and weighing the challenges facing this enduring aspiration.

Moderator: Dr. W. Michael Hawes (USA)
Rapporteurs: Kristin Shahady (USA), Jessica Todd (Australia)

Delegates:

Barret Schlegelmilch	USA
Chris Nie	USA
Jillian Yuricich	USA
Kavya Manyapu	USA
Scott Waters	USA
Vanessa Clark	Australia
Daniel Reynolds	USA
Eleanor Morgan	USA
KangSan (Antonio) Kim (Stark)	Republic of Korea
Jessica Todd	Australia
Saul Rexa Arcelus	Mexico
Anthony Yuen	Australia

The goal for this discussion track was to address important questions and issues regarding the future of human space exploration and, in particular, deep space exploration. The Discussion Group was in agreement that human exploration of the solar system should continue in conjunction with robotic missions. While both Mars and the Moon (including cis-lunar missions) were discussed as the potential next step in human deep space exploration, the group was divided on which should be humanity's next goal. Much of the support for the Moon as the next crewed goal stemmed from the use of the celestial body as a logical test-bed for technologies needed for Mars. Missions to the Moon could allow us to solve many of the problems that need to be addressed to get us to Mars (closed-loop habitation, radiation

shielding etc.) within a safe six day return trip to Earth. The Moon also offers the opportunity to establish a sustained human presence outside of low Earth orbit (LEO) and establish a space economy, before venturing deeper into the Solar System.

On the other side of the argument, many in the group were of the opinion that the current Mars hype that permeates pop culture and the media should be capitalised on. There is a great deal of public interest in going to Mars, and by returning to the Moon we risk dead-ending on the Moon and losing public support, as was seen towards the end of the Apollo era. Aiming for Mars now keeps public support, and therefore political support, on our side. On the ethics of currently sending humans to Mars, no consensus in the group was reached. As stated above, there was considerable support for further testing of technologies before any manned mission to Mars is launched. There was also the argument that no matter how many simulations and tests are run, either on Earth, on the surface of the Moon, or in cislunar space, there will still be unforeseen circumstances and problems to be addressed in a Mars mission. Aiming for Mars immediately allows us to wholly devote our resources to that goal, rather than spending years or potentially decades on the Moon testing technologies.

The key issue brought up within the discussion was that future human space exploration would only continue and be successful if it is sustainable. This concept of sustainable exploration refers to three key issues: economic sustainability, technological sustainability, and sustained interest and support from the general public.

Economic Sustainability

As it currently stands, human space exploration is an expensive endeavour. There is relatively low demand for the technologies needed for such missions and thus costs are incredibly high. Establishing a space economy, and increasing demand for technologies means costs can be driven down (for example, the cost of launch vehicles is decreasing as the number of launches increase). Any sustained human presence in deep space will require sustained financial backing and a sustained space economy. Space tourism may be one way to address the issue of financial backing, using the revenue generated to fund exploration missions, as SpaceX proposes. However, the establishment of a self-sustaining economy would ensure that demand continues. This requires the expansion of industries that rely on either space resources, or space technologies. The establishment of a continuous human presence on the Moon could potentially foster this growth. Companies which establish themselves on the Moon could generate revenue from in-situ resources, whilst also requiring supplies from Earth, generating some sort of trade between the two.

Technological Sustainability

Technological sustainability refers to developing technologies that allow a sustained deep-space presence, such as closed-loop habitats and life support systems. Technologies used for future human missions also need to be able to provide benefits back on Earth, in keeping with developing a space economy and making such missions economically viable.

Sustained Public/Media Interest

Future human space missions are likely to be long-term, ranging from months to years, and thus it is crucial that public interest and political support for these missions is generated and sustained. Whilst we, as professionals of the industry, understand the benefits of human missions back on Earth, the general public often has a skewed concept of space exploration and views it as a luxury. Generally speaking, people do not want to hear about money being spent on issues that do not directly affect them. It is crucial that the achievements made in space exploration are promoted to the general public by demonstrating the

trickle down effect of these achievements in their own lives. It is also important to remind the public that life as it currently stands is not sustainable on Earth. We cannot remain a one-planet species and thus exploration of the solar system is vital to our very survival.

An idea brought up in our discussion was to set milestones along the mission timeline, as a means of sustaining public interest. When milestones are achieved the public is kept engaged and excited, and thus support for the missions continue. Mars as a goal for human exploration requires sustained public interest for the next 10-15 years minimum. In the era of 24-hour news cycles and social media, it is important that various platforms are used to promote these missions (for example, Curiosity having a Twitter account has been a very successful PR move by NASA).

The final point of our discussion was the issue of international collaboration for future human missions, or rather, international collaboration versus international competition. Sending humans into deep space has long been described as needing a global effort. Such collaboration fosters good political relationships between international partners and allows the development for such a mission to be divided over a number of countries. The International Space Station is a prime example. With a collaborative effort, however, comes various political issues and conflicting interests and navigating these problems can slow the development process. In contrast, competition between countries or private companies has driven faster innovative thinking and development, the space race of the 1960s being an excellent example. We debated whether global cooperation is actually a help or a hindrance to the process of sending humans to the Moon or Mars, and came to the conclusion that cooperation *with* competition is the best way forward. Cooperation between governments, or between a government and a private company allows us to better overcome the steep learning curve needed for the next stage of human space exploration. We were also in agreement that landing on the next planetary body should be a global effort, not just the work of one country. Generating competitions between contractors or private companies would be a good way to ensure fast and innovative development of technologies, as NASA is currently doing with their commercial crew and supply vehicles for the ISS. The government remains the customer, and is able to cooperate with other governments, and competition between the various private companies continues to drive innovation.

Overall, everyone in the discussion group reached the same conclusion. Regardless of whether we choose to return to the Moon or head to Mars, action is required. In the last 30+ years there has been too much talk about deep space human exploration and too little action. Humanity cannot remain a one-planet species, and the technologies developed for these missions will have numerous benefits for those of us back on Earth. The foundation has been laid for these missions and now a solid mandate and commitment from the various global and industry partners is needed.

Science and Exploration

A quest for knowledge and passion for exploration lies at the heart of humanity's earliest interactions with space. Yet even as space agencies and universities around the world pursue scientific objectives in space, questions remain as to how best to channel efforts and undertake scientific missions. How can we balance the cost and scientific output of missions: what is the relative value of more low cost missions compared to fewer high cost missions? Is there an expanded role for industry to play in science and exploration, beyond as the contractor for construction and launch? What efforts can be made to include more nations in scientific pursuits, particularly those that have an interest but not yet the budget or expertise to conduct solo missions? How can the public once again become engaged with space exploration?

Moderator: Dr. Jonathan Arenberg (USA)
Rapporteurs: Daniel Brack (USA), Danton Bazaldua (Mexico)

Delegates:

Owen Hart	USA
Ana Raposo	Portugal
Jan Lukacevic	Czech Republic
Danton Bazaldua	Mexico
Patrick Harper	USA
Michael Kretzenbacher	Australia
Javier Stober	USA
Swetha Kotichintala	India
Alving Leung	USA
Marcia Fiamengo	USA
Ashley Morgan	USA
Tanya Harrison	Canada

During the 2017 Space Generation Fusion Forum, the round of the Science and Exploration Discussion focused on answering the question about the sustainability of space science and the exploration of deep space. The group identified the key points to be discussed between the scientific objectives and the engineering capabilities we currently have, in addition to the necessary funding for these projects for the benefit of the space sector. This tension is demonstrated in the two approaches taken by space agencies, the approach of science is the goal and the technological benefit for mission.

To strengthen ties of international cooperation with countries and space agencies around the world, more attention should be given to emerging nations in the space sector, as well as to the private sector that is focusing on sustainable space science. Exploration and space resources should be considered a

world-wide need and a benefit of all of humanity. Other important issues that were addressed were the possibility of expanding the space industry, taking advantage of novel technology and providing this expertise to developing space nations. Moreover, international space programmes could be developed to exchange information and technology and benefit the evolution of the global space sector and not only major space-faring nations

It is also important to involve the public sector and to create stronger links between the scientific sector and the political sector. The political sector has a great impact on decision making and development of projects that rely on government funding. Funding for space programmes should be shown relative to other budgetary requirements to demonstrate the real cost of space science and exploration to the average citizen. An additional way to achieve sustainable space science and exploration comes from reducing the costs of exploration missions. In recent years, private industry has proposed and begun to implement such missions.

In addition, there has been an increase in commercial and governmental activity in new areas of the space sector such as space mining, space medicine, space tourism, and space security and sustainability. In order to develop these new markets, we must devise international policies in which all nations contribute and form the necessary cooperation links, as well as international regulations necessary to help strengthen the bonds of mutual cooperation that have formed in recent decades among the powers in the space sector. Since the following projects would change humanity's perspective on space, future missions would aid global technological development.

Investing in Space and The New Space Economy

The emerging in-space economy is marked by the expansion of activities in Earth orbit (and possibly beyond it) that generate economic value. This includes new approaches to collecting and transmitting data on satellites and the development and deployment of non-traditional services and applications. New approaches include smallsats, CubeSats, constellation concepts, commercial uses of the ISS National Lab, satellite servicing and space debris mitigation services, space mining companies, and commercial space stations. Launch providers are trying to make access to space more affordable through such means as reusability, rideshare services, and smaller launch vehicles focused on smallsats. However, it is still uncertain which approaches will realise dramatic improvements in cost and launch volume. This track will address the variety of factors affecting new commercial activities in LEO/cislunar space, particularly how some companies are tackling the demand side of the equation. How can these new ideas (e.g. establish low-cost launch infrastructure, develop commercial space stations) be successfully implemented? What are the barriers (e.g. technical, policy, financial) that still need to be overcome?

Moderator: Mr Andrew Rush (USA)
Rapporteurs: Jim Behmer (USA), Harriet Brettle (UK)

Delegates:

Nike Moehle	Switzerland
Brandon Seifert	USA
Bruno Sarli	Brazil
Chris Beauregard	USA
Harriet Brettle	UK
Justin Park	USA
Mansoor Shar	UK
Mclee Kerolle	USA
Patrick Wessels	USA
Christian Arnold	USA
Jason Wallace	USA
Jacob Hacker	Australia

The New Space economy discussion was moderated by Andrew Rush, CEO of Made In Space, and began with an analogy to the railroads. Trains become rockets, cargo become satellites, instead of tracks think of low cost access to space, and the end destination is still to be discovered. With this framing we asked ourselves, what is the purpose of the space industry? How will this change in the future and where is the demand for the rapidly expanding space economy coming from? Our group covered a range of topics over

the course of the session that included many of the challenges and opportunities that the new space economy brings. We discussed the current state of play, how we got here, where we want the space economy to be in the future, and how we want to get there, all in under two hours.

The space industry has changed rapidly in recent years. Government agencies are no longer the sole providers and users in space as commercial viability becomes more attainable. Increased investment is driving the growth of the industry. In 2015, US$15 billion of investment was channelled into the space sector. This is more than the past 15 years combined.

Andrew shared Made In Space's unique perspective. They believe the New Space economy will be driven by in-space manufacturing and are currently developing such capabilities on the ISS. Future plans include building satellites in space and leveraging the space environment for its unique properties. One example of this is Made In Space's plans to manufacture exotic optical fibres in space that will be higher quality than those made on Earth.

A key theme of the discussion was the role of government in the future space economy and the dynamic between public and private players in the future space industry. Historically, access has been driven by government agencies as they have better resources to invest in the required infrastructure. The group agreed that government will always play a role but noted that the range of clients and providers in the space industry has diversified greatly. A good space industry has diversity on both the supply side and the demand side. Regulation of the industry represents both a potential challenge and opportunity and the group questioned how this will be addressed in the future.

Our group discussed new opportunities for commercial spaceflight including data analytics, in-space communication, and space tourism. There is a demand to get assets into space but the launch bottleneck is a big problem that needs to be addressed. Another constraint is the large upfront costs of space projects.

Our group predicted that the space economy will expand such that the term almost becomes meaningless. As in-space and terrestrial demand increases, companies will no longer define themselves as space companies as space technology provides solutions to customers from all industries.

Brandon Seifert represented the group in a panel discussion to conclude. The key takeaways were that the future for the new space economy is bright. The tracks are being laid, the cargo loaded, and the train is ready and eager to leave the station.

Security and Sustainability

Space activities are not merely activities that take place in outer space, isolated from Earth. On the contrary, space activities have a grave impact on both our planet and our long term ability to utilise the space environment. Considering the dual use nature of satellites, for example, we must address the security of commercial and governmental assets and the potential dangers of space weaponisation. The US military is already shifting its mindset and approach towards viewing space as a contested environment. At the same time, growing interest in smallsats and constellation based architectures obligates a discussion of space traffic management and debris mitigation. With the increasing role of the private sector in the space domain, our generation will be challenged to incentivise private enterprises to collaborate and preserve the space environment. These and other issues concerning space sustainability and security will be discussed within this discussion track.

Moderator: Mr. Phil Larson (USA)
Rapporteurs: Justin Kugler (USA), Lauren Smith (USA), Steven Jordan Tomaszewski (USA)

Delegates:

Megan Maikell	USA
Steven Jordan Tomaszewski	USA
Tara Halt	USA
John Bang	USA
Amelia Ahner	USA
Lauren Smith	USA
Nicolas Urias	USA
Michael Rutherford	USA
Anna Gunn-Golkin	USA
Alyssa Deardorff	USA
Amelia Bloom	USA
Kenneth Harris	USA

At the 2017 SGFF the Space Security and Sustainability Discussion Group engaged in thoughtful conversations and proposed policy ideas about the future of space security and sustaining the space environment. The group agreed that nation-states around the world depend on space assets for their national security and preserving a stable space environment is in the best interest of all countries.

SGFF members expressed concerns about finding employment in the space industry across national borders. For young space professionals who are passionate about space engineering and want to

contribute to our collective space security, it can be difficult to find work due to the current legal structure. The group encourages countries like the US to review their International Traffic in Arms Regulations (ITAR) policy that prevents foreign nationals from working in parts of the national security space sector.

As space debris continues to accumulate, we must work together to find solutions to keep space as free as possible of debris and to minimise collisions. Currently, the US Department of Defense provides collision warning information to satellite operators. Group members pointed out space traffic management responsibilities should be put in the hands of civil agencies in space-faring nations and the United Nations should have an organising body similar to the International Civil Aviation Organization (ICAO) which regulates operational spacecraft. This organisation should work to minimise unwanted impacts in space.

Another way space debris can be mitigated is by agreeing to international standards for deorbiting satellites and by having a regulatory body enforce those standards. Carefully crafted regulations could establish rules of the road for countries to abide by for sending up satellites in the future. This would be the most effective coming from an international body like the UN and having buy-in from major spacefaring nations. Our group emphasised the need to address space debris issues as soon as possible, and to not wait until major collisions in space are commonplace.

With companies proposing satellite constellations made up of hundreds or thousands of nodes, the international community needs to work together in order to help track active satellites in orbit. The group recognises the size and primary mission of a satellite will affect what kind of tracking mechanism will be available. Accurate and publicly available satellite ephemeris information will keep space preserved for the future.

Maintaining international cooperation in space will help to maintain collective security in space. Whether a country is engaging in a civil, commercial, or national security mission, international partnerships and agreements ensure countries are working together to achieve common goals for all mankind. Partnerships also make conflict in space less likely. If a country has intent and capability to cause temporary or permanent damage to an operational satellite, they may think twice before targeting a satellite with multi-country ownership. SGFF members encourage nation states to work together on future space missions.

Space for Earth

While the general public often perceives space as a distant activity with little bearing on Earth, the growth in space-based navigation, communications, and remote sensing capabilities has translated to a more connected and self-aware world. Yet untapped opportunities remain to leverage space for the benefit of life on Earth. In which ways might space services be designed, implemented, and marketed to create value? How can increased accuracy from new GNSS like Galileo impact industry and government operations, or even create entirely new services? Does the launch of new systems leveraging advanced technology and unique architectures offer a new opportunity to address challenges such as disaster response and mitigation? How can space-based assets contribute to sustainable development, aiding efforts to optimise economic growth, monitor natural resources, and build stable societies? How should civil and commercial opportunities and obligations be balanced, to effectively support citizen needs? What role might space play in the rise of Big Data? This discussion track will explore the ways in which satellites impact life on Earth, and how we can further leverage the space activities of tomorrow to enhance the societal and commercial return.

Moderator: Mr Carlo des Dorides (Italy)
Rapporteurs: Carolyn Belle (USA), Oniosun Temidayo Isaiah (Nigeria), Andreas Winther Rousing (Denmark)
Delegates:

PJ Valenzuela	USA
Rachel Narciso	USA
Temidayo Oniosun	Nigeria
Brandon Boese	USA
Marcia Fiamengo	USA
Elvis Silva	USA
Travis Doom	USA
Patricia Randazzo	USA
Danielle Wood	USA
Jillianne Pierce	USA
Lauren Badia	USA
Andreas Winther Rousing	Denmark

While the general public often perceives space as a distant activity with little bearing on Earth, the growth in space-based navigation, communications, remote sensing, and climate monitoring capabilities has translated to a more connected and self-aware world. Yet, untapped opportunities remain to leverage space for the benefit of life on Earth. This discussion track addressed numerous questions including what

is considered space for Earth, how to best provide incentives, appropriate regulatory and policy environment, and how to sustain public interest.

The group considered whether it was a public or private sector role to collect data and provide connectivity, and that ultimately we are all communicators and have many different ways to educate people on the role of space in their everyday life. It was noted that a large amount of data is already available for free, such as through the LandSAT program, and more attention must be given to how we can communicate this and ensure these resources are placed in the right hands. A method of doing this is the establishment of more regional working groups and conferences to aid in communicating this discussion to both local leadership and diverse commercial actors. Additionally, the critical challenge of climate change was a topic which the group agreed should be addressed by space resources, and that ultimately, space for Earth is a system of systems consisted of GNSS (navigation), remote sensing, and communications.

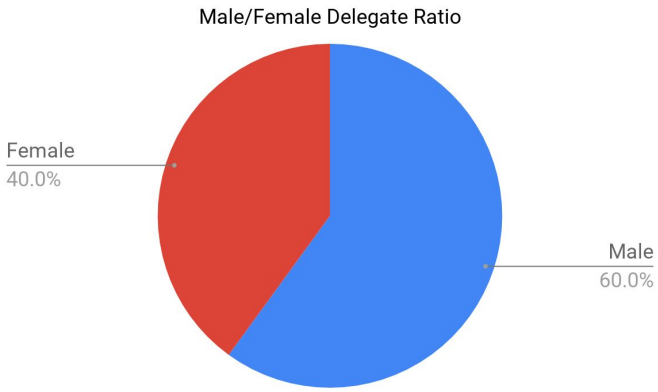
The group identified numerous recommendations for future action in this area. First, UN policies can be shaped to aid countries with very low Gross Domestic Product (GDP): top space agencies and commercial companies can make space data available to them for research purposes. Regulations should ensure more interoperability and a collaborative environment, control how many systems are launched, and propose deorbiting methods to curb space debris. More ambitious regulatory steps and guidelines should be established during the upcoming UNISPACE+50, especially with regard to small satellites. We should think more in terms of developing a few very large systems instead of multiple smaller ones.

Additionally, the predicted growth of the private space sector also resulted in recommendations from the discussion group. Specifically, additional UN regulations will be required to address issues such as a potential space data monopoly through a few private actors like Google and SpaceX's global internet project. These regulations should be formed on the basis of collaboration between the governmental and private entities in question. Regulations regarding open space data is the most important outcome, since making some space data available for free will enable us to solve some global problems on a large scale. We can learn also learn from Africa. For example, utilising satellite data such as LandSAT has helped thousands of research projects in the continent, especially regarding agriculture, climate change, urbanisation, land use/land cover, surface temperature measurement, border monitoring, and elimination of criminal activities such as slavery. Serious advocacy must be undertaken for the data that is currently free that most people are not aware of, such as GNSS and climate/environmental monitoring data, to boost awareness and positive outcomes.

Overall, the group concluded that while the whole space industry dreams of making Mars more like Earth, we should stop making Earth like Mars and also focus on using space technologies to solve strategic problems in all parts of the world, especially with regards to the global issue of climate change and global warming.

Space Generation Fusion Forum Statistics

The 2017 Space Generation Fusion Forum had the highest number of applicants to date, with 147 applications to attend the programme from which 70 were selectively chosen to participate. The young professional attendees came from a variety of space-related fields, including aerospace medicine, space law, space policy, operations, engineering and science. Delegates represented commercial and military organisations, space agencies, and universities from 14 different countries.



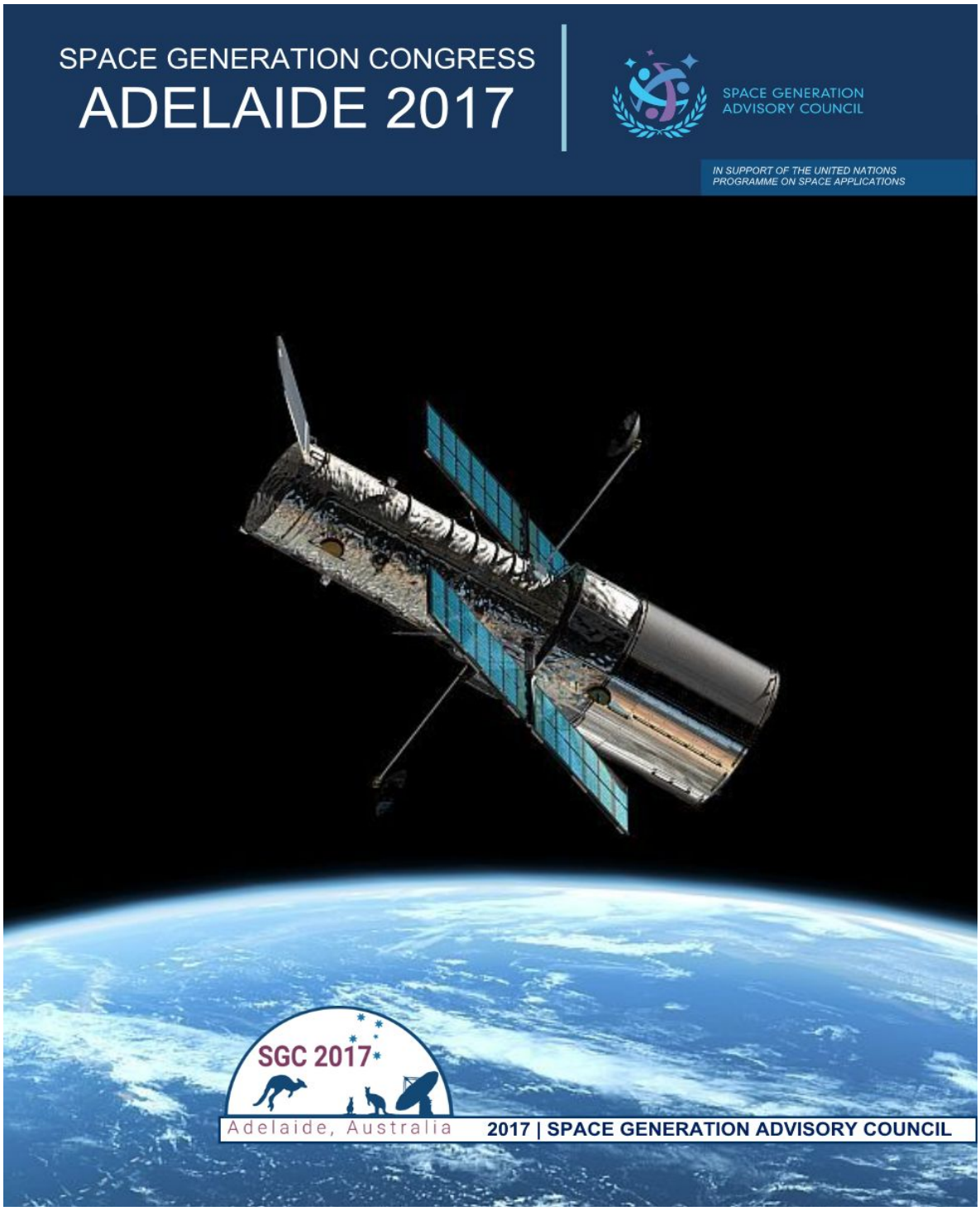
70 Delegates

11 countries

20 keynote speakers, Discussion Track moderators, and industry professional mentors

4 Global Grant Scholarship (from Australia, Mexico, the United Kingdom, and Nigeria)

SPACE GENERATION CONGRESS



Speakers and Moderators

Ms. Simonetta Di Pippo
Director, United Nations Office for Outer Space Affairs (UNOOSA)

Mr. Michael Davis
Chair/Ex Officio Chair, Space Industry Association of Australia / IAC 2017 LOC

Mr. William H. Gerstenmaier
Associate Administrator for Human Exploration and Operations, NASA

Lena De Winne
Chief Executive Officer, Asgardia

W. Michael Hawes, DSc
Vice President & Orion Programme Manager, Lockheed Martin Space Systems Company

Sarah Rietmüller
Trainee Event Coordination, Center of Applied Space Technology and Microgravity (ZARM) / IAC 2018 LOC

Birgit Kinkeldey
Head of Corporate Communication, Center of Applied Space Technology and Microgravity (ZARM) / IAC 2018 LOC

Mr. Jason Crusan
Director of Advanced Exploration Systems Division, NASA

Mr. Jose Ocasio-Christian
Chief Executive Officer, Caelus Partners

Dr. David Kendall
Chair, Committee on the Peaceful Uses of Outer Space United Nations

Piero Messina
Strategy Department, European Space Agency

Mr. Clay Mowry
Vice President - Global Sales, Marketing & Customer Experience, Blue Origin

Dr. Stephen A. Townes
Chief Technologist of the Interplanetary Network Directorate at JPL, NASA

Space Exploration

NAME	ROLE	NATIONALITY
Jason Crusan	Keynote Speaker	USA
Marshall Smith	Subject-Matter Expert	USA
Nicole Herrmann	Moderator	USA
João Lousada	Moderator	Portugal
Ryan Joyce	Rapporteur	USA
Carmen Victoria Felix Chaidez	Rapporteur	Mexico
Lisa Peacocke	Delegate	New Zealand
Ghanim Alotaibi	Delegate	Kuwait
Stacha Petrovic	Delegate	Netherlands
Evelina Onopriyenko	Delegate	Australia
Joshua Ehrlich	Delegate	USA
Samu Eshima	Delegate	Japan
Tobias Niederwieser	Delegate	Austria
Susanne Peters	Delegate	German
Hosub Song	Delegate	Republic of Korea
Peter Schulte	Delegate	USA
Kathryn Robison	Delegate	USA
Kenneth Lui	Delegate	Hong Kong
Jan Lukačevič	Delegate	Czech Republic
Siddharth Pandey	Delegate	India
Julie Mottin	Delegate	French
Madison Simmonds	Delegate	Australia
Marco Gómez Jenkins	Delegate	Costa Rica
Brandon Blake	Delegate	Australia
Didunoluwa Obilanade	Delegate	UK
Lorenzo Bucci	Delegate	Italy
Danielle Richey	Delegate	USA
Bernadette Maisel	Delegate	Chile
Eleanor Morgan	Delegate	USA
Andrea Colagrossi	Delegate	Italy
Maria Alexandra Lora Veizaga	Delegate	Bolivia
Pablo Melendres Claros	Delegate	Bolivia
Abinish Kumar Dutta	Delegate	Nepal

Continuing the 'Proving Ground Enabling Human Exploration' theme from Space Generation Congress (SGC) 2016, the Exploration Working Group of SGC 2017 was asked to investigate how cislunar infrastructure could influence and enable commercial and international partnerships, in addition to new scientific research. There were two main objectives of the investigation. The first objective was to identify compelling activities that could involve commercial and international partners and how those partners could benefit from planned cislunar infrastructure. The second objective was to determine what scientific research may be enabled by the unique environment of cislunar space.

The Exploration Working Group came up with three primary recommendations as a result of investigating these topics. The first recommendation is to establish a framework for partnership governance, with a goal to enable access to as many entities as feasible. The second is to ensure that the international and commercial communities are involved in the cislunar infrastructure development process from the beginning. The third recommendation is to provide a number of services from the cislunar spacecraft that can support multiple commercial and scientific interests. Appropriate planning in the design process to accommodate partnerships is the only way to ensure these cislunar developments are utilised to their maximum potential.

To improve on the collaboration that has sustained the International Space Station, the Working Group suggests establishing a multinational and multi-organisational partnership governance board. By making an internationally coordinated effort to explore deep space, costs could be spread among many partners while providing those partners with access to capabilities they may not have on their own. This model would help to reduce the amount of resources any one nation must contribute to sustain this exploration, and attract a number of different investors, including commercial, academic, and non-governmental organisations. A relationship that ultimately shares costs while providing increased access and capabilities would be mutually beneficial to all partners involved, as well as potentially enabling beyond Low Earth Orbit (LEO) exploration.

The Exploration Working Group envisions the Deep Space Gateway (DSG) as a platform that could provide multiple services for the partners involved in its creation and operations, as well as customers who are interested in the operational environment. The delegates propose four main categories of services the Gateway could provide, which include Transportation, Maintenance and Manufacturing, Communications, and Working Volume.

With the provided services mentioned above and the ability to offer hosted payload volume and power allocations, the DSG could be leveraged for a number of different technology demonstrations and research opportunities. The group suggests prioritising high energy, low dose rate radiation research to reduce the uncertainty around the effects of deep space radiation on the human body. The group would also like to see prioritisation of research on environmental control and life support systems that can handle transition to and from quiescent and crewed operational states and address microbial growth, detection, and mitigation strategies.

There are many opportunities on the DSG and/or other cislunar spacecraft capable of supporting crew to provide, accommodate, and request services that can engage international and commercial partners, as well as stimulate the growth of the global space industry. A partnership governance model should seek to incentivise inclusion of developing and emerging entities in flight projects. The governing board would have the potential to reduce the barrier to entry for smaller nations, institutions, and companies. It would also be able to request space-based services or capabilities to be contributed by various partners. Over time, including a wide variety of partners will increase the supply of space-based services and hardware,

increase the number of competitors for contracts and flight projects, and ultimately reduce the cost of spaceflight. The DSG also provides unique opportunities to conduct science which are not possible in LEO and will enable the future of human space exploration. The group recommends making the most of this opportunity by leveraging the DSG as a focal point of this effort.

Space Diplomacy

NAME	POSITION	NATIONALITY
Ian Christensen	Subject-Matter Expert Secure World Foundation	USA
Krystal Wilson	Subject-Matter Expert Secure World Foundation	USA
Jose Oracio-Christian	Topic Keynote Speaker Caelus Partners	USA
Kyle Acierno	Invited Speaker iSpace Europe	Canada
Caroline Thro	Moderator	Germany
Maryanne Muriuki	Rapporteur	Kenya
Olga Stelmakh	Rapporteur	Ukraine
Alex Norm Linossier	Delegate	Australia
Benjamin Piggott	Delegate	Australia
Brock Little	Delegate	Australia
Claudiu Mihai Taiatu	Delegate	Romania
Elise Harrington	Delegate	Canada
Leehandi De Witt	Delegate	South Africa
Julia Heuritsch	Delegate	Austria
Manfred Ehresmann	Delegate	Germany
Mark Fittock	Delegate	Australia
Matthew Lyn	Delegate	USA
McClain Goggin	Delegate	USA
Meika Liveris	Delegate	Australia
Samuel Lapris	Delegate	Canada
Steven Apirana	Delegate	Australia
Tasman Powis	Delegate	Australia
Watanabe Yusuke	Delegate	Japan

The combination of increased access to outer space and expected rise in demand for vital resources on Earth and in space has increased awareness concerning the importance of the access and availability of resources. Interest has particularly grown in resources that are off-Earth, leading to the recent burgeoning of commercial ventures and state-driven projects dedicated to exploring the viability of space resource utilisation. Current commercial ventures including iSpace, Deep Space Industries, Moon Express, and Planetary Resources, are all pursuing space resource utilisation at a rate that current international policy cannot match.

To date, activities in outer space have been largely regulated under five international treaties, four of which are widely ratified by most major spacefaring nations and, to varying degrees, adopted into national

law. Of these, the Carta Magna of space law is the Outer Space Treaty of 1967, which outlines the basic laws and principles governing all space activities. The Outer Space Treaty was drafted half a century ago, before space resource expropriation was a realistic commercial venture, and its guidance on this topic is rather vague. While the treaty is clear on the point that neither nation-states nor the private entities under their jurisdiction can claim sovereignty over celestial bodies, the ambiguity around whether nations/companies can assert property rights over resources extracted from an asteroid or celestial body, such as the Moon, has remained an open question.

This legal ambiguity at an international policy level has become problematic in recent years as the business case around space resource extraction has strengthened. With current asteroid valuations ranging between US$195 billion to US$10,000 quadrillion, and technology seemingly not far behind making these ventures achievable, a growing nascent industry has begun placing pressure on both national and international policymakers. As a result, in 2015 the US Congress sought to resolve this dilemma by explicitly giving American companies ownership rights to whatever they extract but stopped short of giving them rights to own the asteroid itself.

In 2017 Luxembourg followed suit. In addition to extending property rights for asteroid miners, Luxembourg's new law sets up a framework for authorising and supervising these miners, including provisions on corporate governance. Many companies are now looking to benefit from these laws which could also mean gaining a possible share in the US$200 million made available for related Research and Development (R&D) investment. Currently, the only condition that must be met by these companies is the requirement to have a Luxembourg office. While these laws are somewhat controversial, they have boosted a nascent industry that had been inhibited by uncertainty.

This Working Group makes the following recommendations:

1. Drafting of guidelines, including built-in risk controls and minimum standards for operations and commercial ventures, coordinated with the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) operations guidelines.
2. Private entities should demonstrate to their respective State, through a regulatory and licensing scheme, that they meet required guidelines.
3. Clarification between non-appropriation and freedom of use is to be developed by a UN Working Group, which considers the acquisition and ownership of space resources.
4. Privileged access granted to scientific activities alongside industrial activities.
5. Setting up a UN Working Group to investigate the establishment of an international regulatory body for space resources.

The Space Diplomacy Working Group (on Space Resources Governance) would like to kindly thank our sponsor, the Secure World Foundation.

Space Law

NAME	POSITION	NATIONALITY
Duncan Blake	SME, IALPG	Australia
Roger Franzen	SME, Shoal	Australia
Crystal Forrester	SME, DSTG	Australia
Tyson Lange	Moderator	Australia
Monique Hollick	Rapporteur	Australia
Kristin Shahady	Rapporteur	USA
Matthew Miller	Delegate	USA
Joel Dennerley	Delegate	Australia
Desislava Gancheva	Delegate	Australia
Imogen Rea	Delegate	Australia
Merve Erdem	Delegate	Turkey
Wei-Yu Louis Feng	Delegate	Taiwan
Matthew Driedger	Delegate	Canada
Mia Brown	Delegate	USA
Caitlyn Georgeson	Delegate	Australia
Andrew Butler	Delegate	Australia
Oliver Paxton	Delegate	Australia
Mark Novakovic	Delegate	Australia
Zaid Rana	Delegate	Canada
Victoria Van Dyk	Delegate	Canada
Alexander Gibson	Delegate	USA

Sponsored by Shoal, Australian Department of Defence Science and Technology Group (DSTG), and the International Aerospace & Law Policy Group (IALPG).

The *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, commonly known as the Outer Space Treaty (OST), is the cornerstone of international law governing the activities in, and the uses of, outer space. The foundations for the treaty were laid by the United Nations General Assembly (UNGA) Resolutions, prompted by the launch of Sputnik by the Soviet Union in 1957 and the ensuing global tensions that arose in relation to the potential ways in which outer space may be exploited if left unregulated.

As of this year, the OST has been ratified by 105 States and is generally considered to have been very successful in guiding and shaping the ways that outer space has been used over the past 50 years. However, over recent years there have been revolutionary developments in the way space is exploited and the nature of the players involved in space activities. This has created a pressing need for the OST to be adapted to continue to preserve the benefits of outer space for future generations. To this end, the Space Law Working Group asks:

How can the Outer Space Treaty be adapted for the next generation to enjoy the benefits of space over the next 50 years?

The Working Group has addresses this question in relation to: (i) military uses of space; (ii) commercialisation and democratisation of space; and (iii) space debris.

Working Group Subtopic 1: Military Uses of Space

This subgroup made the following recommendations in relation to military uses of space:

- Draft a supplementary protocol to the OST to improve transparency and confidence-building measures (TCBMs) for outer space activities,
- Draft a supplementary protocol to explicitly extend the Law of Armed Conflict (as reflected in Additional Protocol 1 of the Geneva Convention)[10] to outer space.

A supplementary protocol to improve transparency of outer space activities will mandate the establishment of an intergovernmental body, similar to the International Civil Aviation Organisation (ICAO), to address disputes related to space activities in order to prevent conflict from arising. A second supplementary protocol to extend the Law of Armed Conflict will address the key principles of International Humanitarian Law in the context of outer space, to regulate possible military conduct in outer space.

Working Group Subtopic 2: Commercialisation and Democratisation

This subgroup made the following recommendations in relation to commercialisation and democratisation:

- Draft a supplementary protocol to the OST related to commercialisation and democratisation of outer space in respect of:
    - space resources (Art I),
    - appropriation by nationals of States (Art II),
    - recognising equality of certain commercial rights (Art III),
    - no restriction on the basis of nationality (Art IV), and
    - reaffirming international law (Art V).

Adopting these articles will allow for the undertaking of commercial activities without diminishing the principles provided in the OST.

Working Group Subtopic 3: Space Debris

This subgroup made the following recommendations in relation to space debris:

- Draft a supplementary protocol to the OST related to space debris that:
    - provides for definitions of terms that have previously been contested (Art I),
    - imposes an obligation to track launching states (Art II), and
    - allocates responsibility in event of debris being created (Art III).

Adopting these articles can form the basis of a new regime that prevents and addresses issues arising from space debris as it is created.

Space Innovation

NAME	ROLE	COUNTRY
Josef Wiedemann	Moderator	Germany
Daniel Wischert	Rapporteur	Germany
Timothy Fist	Rapporteur	Australia
Piero Messina, Strategy Department at ESA	Speaker	Italy
Kyle Acierno, Managing Director at iSpace Europe	Subject Matter Expert	Canada
James D. Burke, retired JPL lunar settlement and exploration expert	Subject Matter Expert	USA
Ahmed Abdi	Delegate	Netherlands
Deepak Atyam	Delegate	USA
Radim Badsi	Delegate	France/Czech Republic
Sungmoon Choi	Delegate	South Korea
John Conafay	Delegate	USA
Veruari Erind	Delegate	Italy/Albania
Alberto Fedele	Delegate	Italy
Enrique Garcia Bourne	Delegate	France/Spain
Maria Grulich	Delegate	Germany
Longee Guo	Delegate	New Zealand
Mohammad Iranmanesh	Delegate	Belgium/Iran
Kseniia Lisitsyna	Delegate	Russia
Adam McSweeney	Delegate	England
Davide Petrillo	Delegate	Italy
Narayan Prasad	Delegate	India
Orzuri Rique	Delegate	Spain
Bruno Sarli	Delegate	Portugal/Brazil
Livia Savioli	Delegate	Italy
Graeme Taylor	Delegate	England
Anna Thomas	Delegate	USA
Ani Vermeulen	Delegate	South Africa
Matjaz Vidmar	Delegate	Slovenia

In this report, the arguments already made are re emphasised—that the Moon Village concept offers a unique opportunity to further knowledge, enlarge the economic sphere, and provide humanity with a unifying goal for peaceful cooperation [1, 2]. In order to realise this vision in the current environment, the following recommendations are offered to space agencies and relevant organisations:

- The creation of a communications strategy which identifies and targets key stakeholders in government, business and society. The messaging for all groups should rest on a global vision, focused on the classic ‘three S’s’ of a permanent lunar presence—supplies, science and

staging—and also on a fourth S—society. A concerted effort is required to connect and motivate stakeholders in the absence of a dominant driving organisation.

- The enlistment of a professional marketing agency to conduct a campaign based on the communications strategy. The Rosetta and Curiosity marketing campaigns showed that trained marketing professionals are very effective at reaching a broader scope of audiences outside the space community. This is a key enabler for a global Moon Village movement.
- The establishment of a bottom-up coordination group at the United Nations level to provide governance and legal frameworks. This is necessitated by the challenge of integrating nation-states' interests into the Moon Village vision. A prominent, successful example of this approach is the Paris climate accord.
- The promotion and/or subsidisation of shared power and data infrastructure on the lunar surface. Subsequent lunar missions would benefit from extra survivability, a nascent lunar economy, and the immediate practical benefits of in situ data and power. Having this infrastructure in place on the Moon reduces risks and costs, while enabling commercial growth.
- The creation of lunar-analogue testbed environments for companies and researchers, especially those traditionally not involved in space, to test technology and conduct research. Space agencies have the unique capability to provide these facilities, with some prominent examples being the National Aeronautics and Space Administration (NASA) Extreme Environment Mission Operations (NEEMO) and the Hawai'i Space Exploration Analog and Simulation (HI-SEAS). Such facilities could be coupled with the creation of dedicated business incubators for companies that are interested in commercial lunar activities. Hubs like these would be key enablers for the early stages of a sustainable lunar economy.

Space Innovation Working Group Members

Space Transportation

NAME	ROLE	COUNTRY
Matthew Richardson	Moderator	Australia
Joshua Kiefer	Rapporteur	Germany
Marta Lebron	Rapporteur	Belgium
Christian Bach	Delegate	Germany
André Bauer	Delegate	Australia/Germany
Chris Beauregard	Delegate	USA
Brittany Chamber	Delegate	Australia
Sukmin Choi	Delegate	South Korea
Philipp Dahm	Delegate	Australia/Germany
Dennis Daub	Delegate	Germany
Karl Domjahn	Delegate	Australia
Filip Drazovic	Delegate	Australia/Serbia
Jack Hooper	Delegate	Australia
Sungmin Lee	Delegate	South Korea
Hamish McPhee	Delegate	Australia
Johanna Pardo	Delegate	Germany/Colombia
Viha Parekh	Delegate	Australia/India
Vilde Rieker	Delegate	Norway
Mehdi Scoubeau	Delegate	Belgium
Sonali Sinha Roy	Delegate	India
Andrew Wilson	Delegate	Scotland
Seun Yinka-Kehinde	Delegate	Nigeria/Australia

The disruption of the traditionally stable launch vehicle market by new commercial players is driving the space transportation sector through its greatest period of change. Although this unprecedented level of growth is aiding in increasing the accessibility of space, it does not come without its challenges. In order to identify, analyse, and address the challenges facing the current and future launch sector, the Space Transportation Working Group at the 2017 Space Generation Congress assessed the existing and incoming stakeholders, their changing needs, and the roles each could play in meeting these challenges. This aim was encapsulated in the following goal statement:

Addressing future challenges to foster an economically sustainable launch market

The primary stakeholders in the sector (government space agencies, commercial industry, and launch customers) are undergoing changes in their traditional roles, enabling increased cooperation. In parallel, upcoming stakeholders, such as academic institutions and non-government organisations, may provide support in brokering these developing partnerships.

These interactions almost always involve compromise, and from this analysis the following trade off challenges were focused on:

1. Innovation and risk
2. Global collaboration versus national interests
    a. Global collaboration—commercial versus institutional
    b. Addressing security issues

After analysing these individual challenges and how they affect the sector, the following recommendations were developed:

1. Governments should facilitate innovation by providing market support, while managing risk responsibly through effective regulation.
2. The barriers to international technology exchange should be reduced in order to support global collaboration and further commercialisation.
3. Space agencies should engage in more intimate collaboration to limit the duplication of efforts at an international level.
4. Education on working within international export regulations should be provided through an independent body to help grow international trade and cooperation.

As the launch sector is rapidly evolving and the interdependent challenges being faced are both complex and detailed in nature, this Working Group recommends that the Space Generation Advisory Council (SGAC) establish a permanent Space Transportation Project Group, to serve as an ongoing forum for topics related to space launch.

Space Transportation Working Group Members

Space Technology

NAME	ROLE	COUNTRY
Kate Becker	Subject Matter Expert	USA
Ken Grant	Subject Matter Expert	Australia
Dr. Stephen Townes	Invited Speaker	USA
Shreya Santra	Moderator	India
Graham Johnson	Rapporteur	UK
Alena Probst	Rapporteur	Germany
Roxy Fournier	Delegate	Canada
Andrew Gibbs	Delegate	Australia/Canada
Christian Gilbertson	Delegate	USA
Doris Grosse	Delegate	Germany/Australia
Rayan Imam	Delegate	Sudan
Emma Kohlhagen	Delegate	Australia/Germany
Junho Lee	Delegate	South Korea
Alexandra Long	Delegate	USA
Alex Miller	Delegate	Canada
James Murdza	Delegate	USA
Kaveh Razzaghi	Delegate	Iran
Luisa dos Santos Buinhas	Delegate	Portugal/Germany
Ahmad Shaqeer	Delegate	Malaysia
Nathaniel Shearer	Delegate	Australia
Steven Shumsky	Delegate	USA
Adi Wasserman	Delegate	USA
Sarah Wittig	Delegate	Australia/Netherlands

The 16th Space Generation Congress was held in Adelaide, Australia in 2017 and established a Working Group on the subject of laser communications in space. The Working Group reviewed the topic and the current state of the technology, identifying different scenarios for its application.

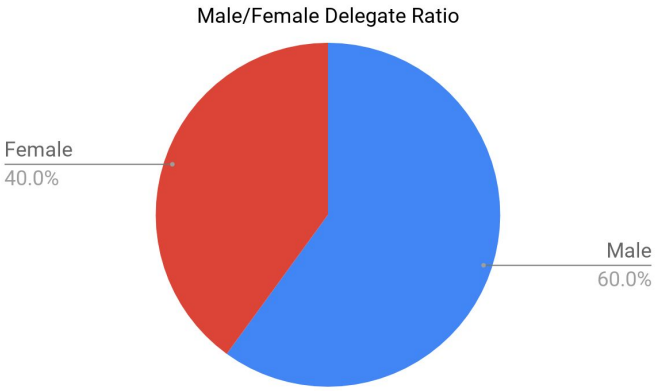
The Working Group also investigated the state of the standards that govern the use of space technology, noting that universally agreed upon standards are not yet in place. For example, the National Aeronautics and Space Administration (NASA) and European Space Agency (ESA) systems currently in operation use different wavelengths. For this specific issue, the Working Group has concluded that the best way forward is to develop systems and standards with compatible infrastructure so that platforms can flexibly operate across both or multiple standards.

The Working Group identified that the key challenges in achieving this standard would be development costs, technical complexity, and negotiations. To address these challenges, the Working Group recommends that costs be distributed as widely as possible through the creation of joint programmes, and that the standards be broad and allow for flexibility. A living document generated by all stakeholders is recommended to address the complexity of negotiations.

The Working Group also examined the human elements of the standard development process. The relevant challenges include encouraging industry support, accounting for cultural differences, and dealing with the diversity of technological maturity within industry. To address these issues, the Working Group recommends promoting the benefits of standardisation, holding regular, in-person meetings, establishing a dedicated liaison between stakeholders, and using the location of the Consultative Committee for Space Data Systems (CCSDS) meetings as a tool to encourage participation. The Working Group also recommends gathering information from relevant stakeholders, and incentivising the major stakeholders to represent the interests of their subcontractors.

Space Generation Congress Statistics

This year has been a remarkable year for SGAC, as we celebrated our landmark 16th Space Generation Congress. Highlights of the 16th Space Generation Congress include:



150 Delegates

43 Nationalities

90 scholarships and awards

~20% increase in scholarship opportunities were made available for SGC 2017 compared to SGC2016

The 16th Space Generation Congress had 6 Working Group topics supported by:

- NASA Advanced Exploration Systems
- NASA Space Communications and Navigation
- Defence Science and Technology Group Australian Department of Defence
- Secure World Foundation
- European Space Agency
- BlueOrigin

This year's SGC Closing Dinner was also a chance for us to highlight the unwavering support of our partners for SGAC and the next generation, attended by over 350 space professionals from industry,academia and government. We are honored to welcome several Heads of Agency and His Excellency,Administrator of the Commonwealth (Acting Governor General), The Honourable Hieu Van Le AC and Mrs Le to the dinner.

UNITED NATIONS INVOLVEMENT

UNCOPUOS and Subcommittees

The United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) was established by the General Assembly in 1959 to review the scope of international cooperation in the peaceful uses of outer space, to devise programmes in this field to be undertaken under the United Nations auspices, to encourage continued research and the dissemination of information on outer space matters, and to study legal problems arising from the exploration of outer space. COPUOS and its two subcommittees, the Scientific and Technical Subcommittee (S&T Subcommittee) and the Legal Subcommittee, each meet annually to consider questions put before them by the General Assembly, reports submitted to them and issues raised by the Member States. The Committee and the Subcommittees, work on the basis of consensus and make recommendations to the General Assembly.

Scientific and Technical Subcommittee

As a permanent observer of the Scientific and Technical (S&T) Subcommittee of the Committee on the Peaceful Uses of Outer Space (UNCOPUOS), SGAC participated in the 54th session held from the 30th January - 10th February 2017 at the United Nations in Vienna, Austria.

SGAC's Chair at the time, Stephanie Wan, presented SGAC's general statement in which she covered SGAC's developments since the last session of S&T in February 2016. The statement highlighted SGAC's achievements in 2016, namely:

- SGAC's eight year-round Project Groups' contributions to the space community.
- The 5th Space Generation Fusion Forum, in conjunction with the 33rd Space Symposium, in Colorado, US.
- SGAC's regional workshops in 2016: the 3rd Asia-Pacific Space Generation Workshop (AP-SGW) held in conjunction with the Asia-Pacific Regional Space Agency Forum (APRSAF) in the Philippines; the 2nd South American Space Generation Workshop (SA-SGW) held in conjunction with the 1st Latin American Congress of Astrobiology in Lima, Peru; and the first European Space Generation Workshop (E-SGW) held in Budapest, Hungary.

Legal Subcommittee

The Legal Subcommittee of UNCOPUOS held its 56th session in Vienna from the 27th March to the 7th April 2017.

Thomas Cheney, the SGAC Space Law and Policy Project Group Co-lead, made a statement for SGAC at this session detailing the activities of his Project Group. Underlined in this speech were:

- The topics the Space Law and Policy Project Group was currently working on.
- The key recommendations from discussions pertaining to the topics relevant to the Legal Subcommittee of UNCOPUOS.

General Assembly

The 60th Session of the UNCOPUOS was held on 7th - 16th June in Vienna, Austria. SGAC, which has been a permanent observer at COPUOS since 2001, contributed with a general statement and a technical presentation.

SGAC's Chair, Ali Nasseri, presented an official statement for SGAC, which explained broadly the activities that SGAC has engaged in since COPUOS met in June 2016. Underlined in this speech were:

- The second SGx event in Washington DC in conjunction with Satellite and in partnership with Future Space Leaders Foundation
- The Space Generation Fusion Forum in conjunction with the 33rd Space Symposium in Colorado and in partnership with Space Foundation
- The second European Space Generation Workshop held at ESA headquarters in Paris
- Several national events: SG[Greece], SG[Iran], and SG[Israel], Yuri's night celebrations, World Space Week events, various SpaceUps (Skoltech, Cannes, Norway, Toulouse, and London), and online events in France and Nigeria
- SGAC's eight year-round Project Groups' contributions to the space community

SGAC's Executive Director at the time, Minoo Rathnasabapathy, addressed COPUOS once again with a technical presentation on the results of the 6th Space Generation Fusion Forum—SGAC's prominent US-based annual event—and the second European Space Generation Workshop held at ESA headquarters in Paris.

UN Economic and Social Council

ECOSOC was established under the United Nations Charter as the principal organisation to coordinate economic, social, and related work of the 14 UN specialised agencies, functional commissions, and regional commissions. The Council also receives reports from 11 UN funds and programmes. The ECOSOC serves as the central forum for discussing international economic and social issues and for

formulating policy recommendations addressed to Member States and the United Nations. It is responsible for:

- Promoting higher standards of living, full employment, and economic and social progress
- Identifying solutions to international economic, social, and health problems
- Facilitating international cultural and educational cooperation
- Encouraging universal respect for human rights and fundamental freedoms
- It has the power to make or initiate studies and reports on these issues. It also has the power to assist the preparations and organisation of major international conferences in the economic, social, and related fields and to facilitate a coordinated follow-up to these conferences. With its broad mandate, the Council's purview extends to over 70 percent of the human and financial resources of the entire UN.

Since 2003, SGAC has had consultative status at UNECOSOC. As such, SGAC representatives can participate in meetings of the UNECOSOC, the UNCOPUOS, and also of the UN General Assembly and its Committees. It can also propose inputs when relevant. SGAC UNECOSOC representatives have the opportunity to participate during the fall as observers in the UN General Assembly in New York.

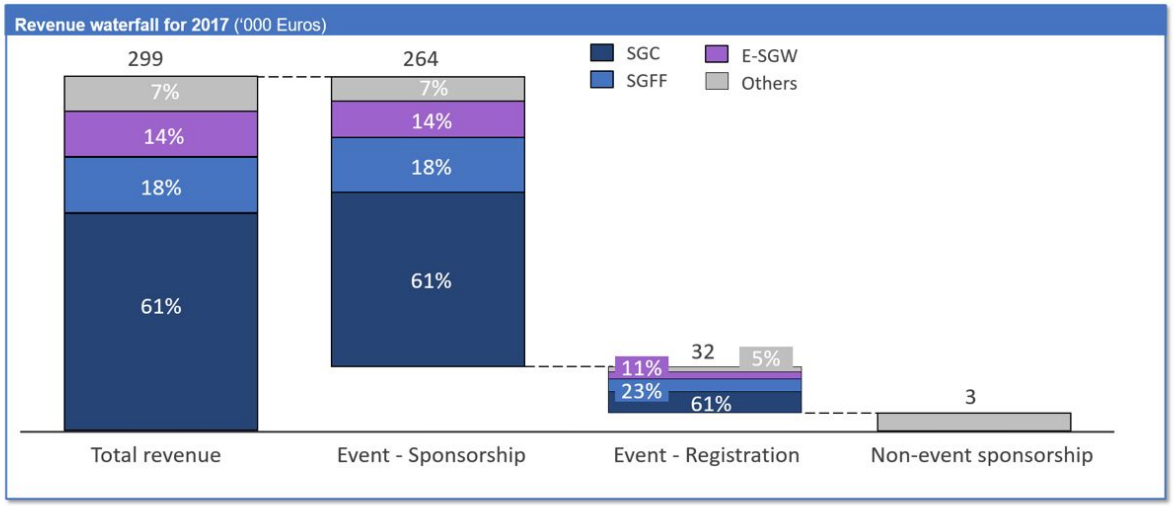
Preparations towards UNISPACE+50

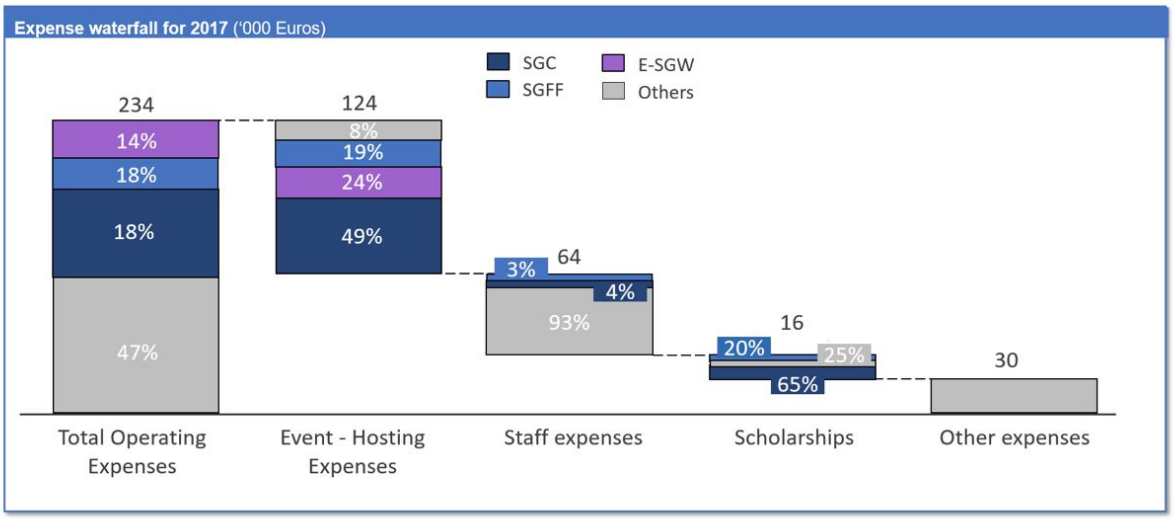
UNISPACE+50 will articulate a long-term vision for space, investigating challenges and responses to global space governance, defining a roadmap towards 'Space 2030', and becoming a milestone for the long-term development of UNCOPUOS (including its subsidiary bodies and secretariat). Today, more than ever before, public and private organisations in the space sector have the opportunity to contribute to shaping and nurturing the UNISPACE+50 process, further defining and adjusting their own role, priorities, and objectives.

As a product of the UNISPACE III, SGAC is expected to play an important role in fostering and shaping the UNISPACE+50 thematic priorities, bringing into the process the views of the future generation of space leaders as regards their long-term visions for space and the tools with which to act.

SGAC has also continually used its events and other activities to gather inputs in preparation for UNISPACE+50 as highlighted by the topics selected for the European Space Generation Workshop or the Working Groups at SGC2016. SGAC is planning to hold a Space Generation Forum anniversary event as part of this initiative with the theme 'SGAC: through the generations' on the 16th and 17th of June 2018. The aim of this is to bring together all the different SGAC generations together to celebrate SGAC's 19th anniversary and to discuss how SGAC's activities should evolve considering the UNISPACE+50 recommendations.

FINANCIAL SUMMARY





STRATEGIC GOAL REVIEW

The SGAC Strategic Plan 2017 outlined 10 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 2018.

1. Continued efforts towards financial stability and diversification of SGAC revenue streams

SGAC will

- Improve financial stability by continuing to foster strong relationships with sponsors and looking for additional funding resources. The organisation will attract new sponsors from new areas of the space sector, such as the satellite telecommunication companies and aerospace organisations, and through grants.
- Develop concise individual budgets for SGAC events, PR & communications, Project Groups, regions, scholarships, and staff expenses.
- Create an operational reserve and monitor its maintenance throughout the year.
- Study the possibility of forming an endowment fund in support of SGAC. A report based on this study will be presented to the SGAC Executive Committee by the end of the year.

At the end of the year 2016, SGAC managed to create a financial reserve for the organisation to bring stability to its operational finances such as paying employees. In 2017, this fund was almost doubled, bringing SGAC closer to financial stability. The SGAC finance team also studied the formation of the endowment fund, a study which will be continued in the coming year.

Most SGAC activity teams developed their own budgets last year, which were approved by the finance team prior to each event. While a set of guidelines was developed in 2016 for these budgets, it seems more work is needed to standardise these budget items, something that SGAC will aim for in 2018.

SGAC used all its activities as sources of funds, and was able to grow regional budgets in regions such as Europe, where the events showed great growth in fundraising. SGAC also relied on longer term contracts for its activities with partners, improving the stability and predictability of fundraising efforts.

SGAC managed to grow its base of supporting organisations around the world and formed new partnerships. An area of improvement is engaging with more actors in the satellite industry (in segments such as data analysis and sharing) and working with organisations whose work interfaces with the space sector such as academia.

2. Improve the quality of global events

SGAC will:

- Use all three global events as a revenue stream and not focus on SGC as the sole source of income.
- Improve promotion of the three events on social media in collaboration with partners.
- Maintain and slightly increase the number of scholarships for these events.
- Improve the quality of event reports and highlight the recommendations and their impact through a variety of media (including graphics and video content).
- Create a repository of discussion topics for future events based on the current state of the sector and integrate these topics with other areas of activity of SGAC such as Project Groups.

SGAC managed to improve its fundraising efforts for its global events, raising funds through SGC, SGFF, and SGx. The three events were also better promoted on social media, and in some cases there was live social media interaction happening for the event.

The number of scholarships for the events increased, with 82 scholarships for SGC (half the participants), and five scholarships for SGFF. SGAC aims to continue this trend in 2018 as well.

Unfortunately, SGAC was not able to use multimedia content to highlight outcomes of these events. However, the quality of the reports and formats was improved.

SGAC is not moving forward with creating a repository of discussion topics for future events at Executive Committee level.

3. Growth of the Space Generation Workshop (SGW) series

- SGWs will be held in five regions in 2017
- SGAC will strengthen the standards of these events to maintain consistency between events held in different regions
- All SGWs will showcase a report presenting the views of the next generation

SGAC held four regional events in 2017, with the 5th event being postponed due to hosting issues. These include:

- The 2nd E-SGW hosted by the European Space Agency in Paris, France
- 1st AF-SGW in Akure, Nigeria
- 4th AP-SGW in conjunction with the Asia Pacific regional Space Agency Forum (APRSAF) in Bengaluru, India
- 3rd SA-SGW in Sao Paulo, Brazil

Of these events, two (E-SGW and AF-SGW) also included scholarships to support participation of delegates. SGAC started creating an event managers handbook for these events, along with standardised bidding and recruitment processes. The outcomes of these efforts will be used in 2018. Unfortunately, the reports for these events have not been made available yet; this has been used as a lessons learned to improve reporting for these events in 2018.

4. Growth of local activities

- SGAC will aim to increase the number of SG local events held by NPoCs, with at least three local events organised in each region (including virtual events).
- SGAC will encourage NPoCs to collaborate with partners such as World Space Week and SpaceUp in holding local events.
- The roll out of national mailing lists for all countries with an NPoC will be completed in 2017.

Last year, SGAC managed to hold about 30 local and thematic events organised by our team. We found that the term *local* event can be misleading at times, as many events included local involvement along with global support, hence the introduction of thematic events. All regions held more than three local or thematic events.

SGAC continued rolling out the national mailing lists, with a total of 33 mailing lists activated by the end of 2017.

5. Deepening of relationships with partner organisations and creation of new ones

- Continue to formalise the relationship with existing and new partner organisations through Memoranda of Understanding, which outline the long term benefits of collaboration and provide a better visibility of SGAC, especially in the areas where SGAC is not yet a reference such as the telecommunications sector.
- Each MoU will have a point of contact identified on the SGAC side and on the side of the partner. The points of contact will meet annually to assess the implementation of the MoU, reporting back the outcome to the SGAC Co-Chairs and Executive Director.
- SGAC National Points of Contact will be introduced to relevant partners in their country to help communication with partners.

SGAC continued to formalise new partnerships with other organisations, with about five MoUs signed in 2017. Unfortunately, SGAC was not successful in tapping into sectors such as telecommunications, but will aim to work on this in 2018. SGAC identified points of contact for several MoUs to test this process, and will extend this to all MoUs in 2018.

In some countries such as Canada, the UK, France, and Germany NPoCs worked closely with the partners in coordinating SGAC activities. This is now a general process followed for most partners.

6. Continuation of SGAC membership database

- SGAC membership managers will help maintain national mailing lists with member data from events and the website.
- A membership survey will be conducted to assess the needs of the members.
- The membership managers will provide statistics derived from the membership data on a quarterly basis to the Executive Committee. The relevant metrics are presented in Appendix A.

SGAC increased the number of active national mailing lists to 33 and also moved forward with the membership survey, which will be rolled out as part of the website upgrade in 2018. Regular statistics from membership data and specific metrics were provided to the Executive Committee at every meeting.

7. Development of the SGAC Alumni strategy and database

- SGAC global events will each have an informal alumni event to enable interaction between the alumni and members.
- A more detailed alumni strategy will be prepared by the end of 2017 to identify ways to incorporate alumni into advisory and support roles within the organisation or to keep them engaged with SGAC.

SGAC continued the tradition of informal gatherings for alumni, with the alumni event at SGC/IAC having more than 250 participants. An alumni strategy has been drafted and will be finalised in 2018, highlighting long terms goals for alumni activities and improved engagement.

8. Strengthen relations with UN bodies in preparation for UNISPACE+50

SGAC will:

- Initiate periodic meetings at the UNOOSA facilities outside of the annual COPUOS meetings to establish a closer relationship.
- Take part in the planning and participation of UNISPACE+50. In preparation for this, some Working Groups and Project Groups activities will be focused on UNISPACE+50. SGAC will also take an active role in the High Level Fora organised by UNOOSA in the lead up to UNISPACE+50.
- Apply to form partnerships with other UN bodies such as UNESCO.

In 2017, SGAC continued its close work with the United Nation Office of Outer Space Affairs (UNOOSA) and was committed to play a role in fostering and shaping the UNISPACE+50 thematic priorities, bringing into the process the views of the future generation of space leaders and their long-term visions for space. The priority seven on capacity building has been flagged as a priority for SGAC which needs a common vision and shared actions.

SGAC participated to the thematic Capacity Building UN Workshops in preparation of UNISPACE+50 namely:

- UN/Austria Symposium on Access to Space: Holistic Capacity Building for the 21st Century
- UN/Russian Federation Workshop on Human Capacity-Building in Space Science and Technology for Sustainable Social and Economic Development
- UN/UAE High Level Forum on Space as a Driver for Sustainable Development in Dubai, UAE
- United Nations/Italy Workshop on the Open Universe Initiative in Vienna, Austria
- The United Nations/South Africa Symposium on Basic Space Technology in Vienna, Austria

As a product of UNISPACE III, the organisation will celebrate its birth in 2018 and has started the preparations towards the Space Generation Forum 2.0, which will occur in June 2018 in Vienna, Austria, in support of UNISPACE+50.

As a permanent observer of the UNCOPUOS, SGAC regularly reported on the organisation's activities during the different subcommittee sessions in 2017:

- The Scientific and Technical Subcommittee
- The Legal Subcommittee
- The General Assembly

SGAC was honoured to have the Director of UNOOSA, Ms. Simonetta di Pippo, as a keynote speaker during the 16th Space Generation Congress Gala Dinner in Adelaide, Australia. As a symbol of the close

work with UNOOSA, SGAC thanked Ms. Simonetta di Pippo and UNOOSA with a SGAC flag that flew to space in 2014 on board the Orion EFT-1.

SGAC also submitted an application to become an official partner of the the United Nations Educational, Scientific and Cultural Organisation (UNESCO).

9. Continuation of PR and communication branding strategy

- SGAC will continue to enforce its visual identity and improve social media presence
- The SGAC newsletter will be reintroduced, with at least two issues released in 2018
- SGAC will focus on increasing the development of audiovisual content to not only highlight global events, but also regional and local activities along with the achievements of our members.
- At least ¼ of SGAC communication efforts will be dedicated towards the dissemination of information about outcomes of SGAC activities
- SGAC continued to enforce its visual identity, checking all visual media to follow our color descriptions. SGAC also released a core message highlighting what SGAC is and does

A series of audiovisual content was developed during SGC 2017, which is still being processed for release. SGAC was active on social media with more than 400 posts shared on Facebook.

10. Knowledge transfer, internal policies, and team development

- SGAC will continue asking team members for workplans, with proper enforcement of the relevant bylaws
- By the end of 2017, all team coordinators will have prepared a documentation for their role
- SGAC team members will be encouraged to report metrics and numbers at Executive Committee meetings. A preliminary set of high level metrics has been identified in Appendix A. Additional detailed metrics might also be used for each specific SGAC activity
- SGAC will continue to introduce relevant policy documents and internal guidelines for activities. A database of all guidelines will be developed, accessible to the Chairs and Executive Director. A simpler version of this database will also be accessible to the Executive Committee members.
- SGAC will identify professional development programmes that could help skill development in both the general team and for paid staff. By the end of 2017, a list of such opportunities will be compiled and made accessible to team members.
- SGAC workplans were implemented in 2017 as well, and will be continued in 2018. SGAC failed to use the workplans from NPoCs and Project Groups at executive level in 2017, which is an something to improve in 2018
- Metrics were reported monthly at Executive Committee level and also reviewed at quarterly meetings to help better understand the evolution of SGAC activities
- Training packs and a database of relevant documents were created near the end of 2016 and updated by team members in December 2017.
- SGAC did not focus on compiling a list of professional development opportunities, as it was felt this could be more useful as part of the website update.

11. Website Update

- SGAC will be updating its website by the end of 2017. The new web will introduce a new membership management tool, improve navigation, and create a repository, and other requested capabilities.

The SGAC web team worked on creating a new website for SGAC, which will roll out in January 2018. The old website will also be maintained as an archive of past activities.

SPACE GENERATION
ADVISORY COUNCIL

In support of the United Nations Programme on Space Applications

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