
SECURE
WORLD
FOUNDATION
2023 ANNUAL REPORT

SECURE WORLD FOUNDATION

Annual Report 2023

SECURE
WORLD
FOUNDATION

The Secure World Foundation strives to be a trusted and objective source of thought leadership, analysis and information on the effective and sustainable uses of outer space to benefit humanity.

SWF VISION

Secure World Foundation envisions the secure, sustainable, and peaceful uses of outer space, contributing to global stability and benefits on Earth.

SWF MISSION

The mission of the Secure World Foundation is to work with governments, industry, international organizations, and civil society to develop and promote ideas and actions for international collaboration that achieve the secure, sustainable, and peaceful uses of outer space, benefiting Earth and all its peoples.

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"We are all living in an extraordinary era of outer space activity, innovation, discovery, and opportunity."

GUY RYDER

Under-Secretary-General for Policy, United Nations

AT THE 5TH SUMMIT FOR SPACE SUSTAINABILITY

Letter from the Founder

CYNDA COLLINS ARSENAULT PRESIDENT AND CO-FOUNDER

Recently, a friend returned from a trip to visit her astrophysicist daughter in Geneva. She brought back two magazines she thought I'd be interested in.

Each magazine's front cover featured articles about space sustainability ("Sustainability Questions" and "Providing the Scientific Foundation for Sustainable Use of Space"). I couldn't help but reflect back 20 years ago when we started Secure World Foundation; you ***never*** saw the words' space' and 'sustainable/sustainability' in the same sentence. Now, it is everywhere. I like to think that we had a role in that. SWF found a niche in the space world - looking at the larger, global context of our use of outer space. What is needed to ensure we can continue utilizing and benefit from this vast resource? What are the issues that we face now and in the future?

Twenty years is a good time to reflect - looking back and also looking forward. It has been my pleasure over the last two decades to have met many intelligent, thoughtful people working in all areas of space. Each year, we bring many of them together at our Summit for Space Sustainability. We have made progress - space sustainability is now a recognized and talked about issue, statements have been made about best practices to keep it sustainable, policies and treaties have been proposed to eliminate destructive practices, and discussions are held at every conference recognizing the dangers of debris. But now it's time to not just talk about it - it's time for actionable solutions. Our world is so interconnected and interdependent. Nowhere is this more recognizable than in outer space.

Our world is so **interconnected** and **interdependent**.

Nowhere is this more recognizable than in outer space.

It's easy to get depressed reading the day's headlines. Will we ever learn? But I relate to the quote by Vincent Van Gogh: "I don't know anything with certainty, but seeing the stars makes me dream." Let's keep looking to the stars and find the hope that we CAN find solutions to our problems and continue to reap the benefits space provides for our children and their children. ■

Letter from the Executive Director

DR. PETER MARTINEZ EXECUTIVE DIRECTOR

Secure World Foundation is the premier civil society organization devoted to ensuring the secure, sustainable, and peaceful uses of outer space for the benefit of all nations in the present and future generations, what is now broadly understood by the term 'space sustainability'.

Since our establishment, nearly 20 years ago, Secure World Foundation has been at the forefront of shaping our collective and evolving understanding of space sustainability. Indeed, the topic has been growing in salience in recent years, but 2023 was a watershed year in the sense that space sustainability finally reached a sort of critical mass of awareness in the broader space community to become a dominant strand of all prominent space dialogues. Suddenly, the topic was being discussed everywhere. All the major space conferences in 2023 had high-profile keynotes and panels devoted to the topic, and many smaller events took up space sustainability as a theme as well.

I believe this explosion of interest in space sustainability stems from the great acceleration in the pace of space activities that we have witnessed in recent years. Whatever metric one uses, be it the number of new satellites launched into space, or the number of new space actors, or the number of new kinds of space applications proposed or under development, the numbers are all increasing. While this explosion of space activities holds out the hope of providing great benefits to people on the ground all over the world, it also raises questions about how sustainable space activities are going to be in the long run. Witness, for example, the challenges to ground-based optical and radio astronomy by the rapidly increasing number of satellites passing overhead, concerns over the use of large commercial constellations in conflict situations, and concerns about the carrying capacity of orbits and implications of this for the freedom of access to space for nations that do not yet have their own space activities, but aspire to do so one day.

Addressing space sustainability is going to be a **multi-generational endeavour.**

The increased prominence of space sustainability as a topic has both positive and negative aspects. On the positive side, we are seeing many more voices engaging in the space sustainability dialogue. This

is important because space sustainability challenges are inherently both multilateral and multidisciplinary. The operational environment in space is becoming more congested with active satellites, more contaminated with debris, and more contested by State and non-State actors alike, with the result that no single State or private sector actor, or group of like-minded actors, can ensure the safety of their space assets through their actions alone. It requires collective action by the global space community as a whole, so having more voices engaged in space sustainability dialogues can only be a good thing. Another positive development has been the interest shown in space sustainability by young space professionals, which is good because addressing space sustainability is going to be a multi-generational endeavor. On the negative side, the proliferation of dialogues on space sustainability across multiple fora raises a concern about the potential for dilution of the effectiveness of multilateral fora to deal effectively with these issues at the level of global cooperative governance. We must also be mindful of the danger of over-using the phrase "space sustainability" to the point that it becomes hollow trendy tokenism and "greenwashing" with no real substance behind it.

Since its establishment, Secure World Foundation has been at the forefront of shaping and growing our collective understanding of the concept of space sustainability, informing, convening and providing thought leadership to identify and promote cooperative solutions for space sustainability challenges. Whether supporting dialogues on space security, or promoting the development of norms for responsible behavior among private sector space actors, or the supporting capacity-building efforts of the UN, the dedicated staff at SWF are focused on achieving our vision of the secure, sustainable, and peaceful uses of outer space, benefiting Earth and all its peoples.

During 2023, we continued to support the progressive development of space law through capacity building activities and through activities aimed at the strengthening of the multilateral system of space governance. We supported multilateral dialogues in space security through the publication of research on global counterspace capabilities, contributing to a lexicon of terminology commonly used in space arms control discussions , and working on a space security portal that tracks space security policies globally. We continued to promote and support private sector engagement in space sustainability dialogues and we convened 53 multi-stakeholder dialogues on six continents. Our flagship event was the 5th Summit for Space Sustainability, which was held in New York City on June 13-14, 2023. Over 500 people from 49 countries attended. Of these attendees, 193 were students or young professionals.

This annual report highlights the topical and geographical breadth of the many international activities of the Foundation during the year under review. Given the broad nature of space sustainability challenges, almost all of our activities have been accomplished in partnership with a wide range of colleagues from entities in national governments, intergovernmental organizations, the private sector and academia. I would like to take this opportunity to acknowledge and thank our dedicated staff, our Board and Advisory Committee, and all of the partner organizations we worked with during the year under review for their outstanding efforts.

Meeting the challenges of space sustainability is going to require active engagement by all space actors. We call upon you to join us in this endeavor to preserve outer space as a domain for peaceful exploration and use. ■

2023 At a Glance

PROJECT & OUTREACH ACTIVITIES

113

RESOURCES PRODUCED

82

ARTICLES
15

PRESENTATIONS
27

FACT SHEETS
6

CHAPTERS
2

REPORTS
7

BOOKS
2

VIDEOS/WEBINARS
23

USE OF SWF RESOURCES

∞

79 Interviews published
89,433 Website views
1,248 Podcast downloads
11,141 Youtube Views

INVITATIONS

211

119 Expert Input/ Reviewer
92 Speaker/Presenter

NEW PARTNERSHIPS

8

FOLLOWER GROWTH

10,250 Newsletter Subscriber (*+11%*)
4,938 Twitter/X (*+25%*)
4,350 LinkedIn (*+34%*)
530 YouTube Subscribers (*+21%*)

2023 Program Highlights

5th Summit for Space Sustainability, held in New York City

The 5th Summit for Space Sustainability was a pivotal forum for advancing responsible space behavior. Held in New York City in June 2023, it brought together industry leaders, policymakers, and academics to devise strategies for avoiding further degradation of the outer space environment.

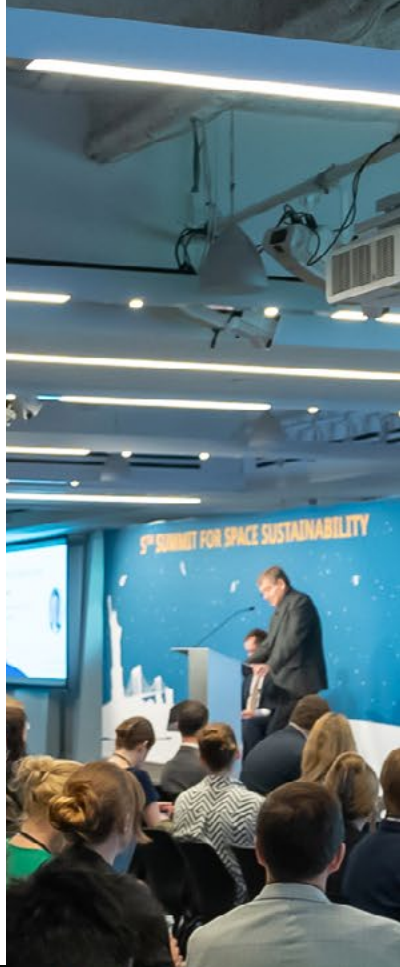
The conference featured three primary themes:

- *Reinforcing sustainability and responsibility through corporate performance, aligning with Environmental, Social, and Governance (ESG) principles,*
- *Strengthening space governance and institutions, with a specific focus on the prevention of destructive direct-ascent anti-satellite missile testing, and*
- *Building a sustainable cislunar space economy, covering the economic activities and developments in the region between Earth and the Moon.*

To set the scene for the Summit, the opening keynote was delivered by Guy Ryder, Under Secretary-General of the United Nations, who spoke about the importance of integrating space sustainability into broader governance frameworks. Other keynote speakers included Lt. Gen. John Shaw (Space Force), Julie Black (UK Space Agency), and a fireside chat with Nikolai Khlystov (World Economic Forum) and Bryn Orth-Lashley (GHGSat), who emphasized the critical need for collaborative efforts in space governance.

The conference also addressed geopolitical challenges, stressing the importance of diplomatic collaboration to achieve global consensus on space sustainability priorities. The event aimed to promote a stable, predictable, and sustainable space environment, embodying both urgency and optimism about the future of space activities.

By uniting diverse perspectives, the conference underscored the importance of responsible behavior in space and outlined practical steps for enhancing the long-term sustainability of space activities and the prevention of conflict in space.



Leadership at Advanced Maui Optical and Space Surveillance Technologies (AMOS) Conference

SWF once again played an important role at the 2023 Advanced Maui Optical and Space Surveillance Technologies (AMOS) Conference, held in a hybrid format from September 19-22. Marking its eleventh year of involvement, SWF co-organized the daily Policy Forum which had keynote speeches and panels discussing the evolution of the commercial Space Situational Awareness (SSA) data market and the United States' progress on civil SSA and Space Traffic Management (STM). These discussions reviewed the last decade's advancements, the ongoing challenges in commercial sector growth, government roles in spaceflight safety, and updates on implementing Space Policy Directive 3. As well, SWF also co-organized the AMOS Dialogue, a side event that examined how to leverage the growing number of industry and civil society best practices in order to move towards a global set of space traffic management "rules."

These contributions underscore SWF's commitment to shaping global policies in SSA and STM, reinforcing its role as a leader in international space policy discourse and the development of STM frameworks.

SWF's Open-Source Report on Global Counterspace Capabilities

The sixth edition of SWF's report, "Global Counterspace Capabilities: An Open Source Assessment," detailed significant shifts in the space sector, driven by increasing national and commercial engagement. The report revealed that technological advancements in space are accompanied by heightened competition and congestion. Enhanced national security efforts have led countries to develop counterspace capabilities that could disrupt or destroy space systems.

The analysis covered developments in both destructive and non-destructive technologies across five strategic areas: direct-ascent, co-orbital, electronic warfare, directed energy, and cyber technologies, with a focus on current and future uses.

These insights will help to inform dialogue on the potential impacts of space-based conflicts, as well as provide a holistic assessment contextualizing counterspace activities globally, with the goal of shaping international policy towards a more secure, stable, and predictable space environment.

428
DOWNLOADS

REPORT DOWNLOADS
Full Report vs. Executive Summary

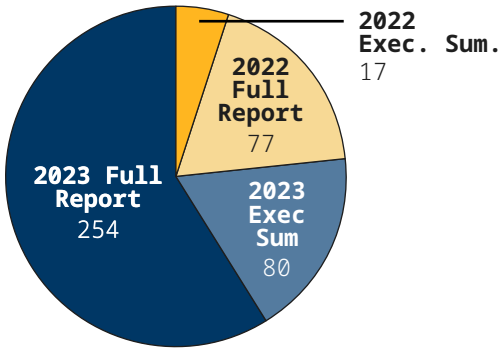


TABLE 5-1 — ORBITAL DEBRIS CREATED BY ASAT TESTS IN SPACE

DATE	COUNTRY	ASAT SYSTEM	TARGET	INTERCEPT ALTITUDE	TRACKED DEBRIS	DEBRIS STILL ON ORBIT	TOTAL DEBRIS LIFESPAN
Oct. 20, 1968	Russia	IS	Cosmos 248		252	76	50+ years
Oct. 23, 1970	Russia	IS	Cosmos 373		147	35	50+ years
Feb. 25, 1971	Russia	IS	Cosmos 394		118	45	50+ years
Dec. 3, 1971	Russia	IS	Cosmos 459		28	0	3.3 years
Dec. 17, 1976	Russia	IS	Cosmos 880		127	56	45+ years
May 19, 1978	Russia	IS-M	Cosmos 970		71	64	40+ years
Apr. 18, 1980	Russia	IS-M	Cosmos 1171		45	5	40+ years
Jun. 18, 1982	Russia	IS-M	Cosmos 1375		63	59	35+ years
Sept. 13, 1985	U.S.	ASM-135	Solwind	530 km	287	0	18+ years
Sept. 5, 1986	U.S.	Delta 180 PAS	Delta 2 R/B		18	0	< 1 year
Dec. 26, 1994	Russia	Naryad-V?	Unknown		27	24	25+ years
Jan. 11, 2007	China	SC-19	FengYun 1C	880 km	3536	2686	15+ years
Feb. 20, 2008	U.S.	SM-3	USA 193	220 km	175	0	1+ year
Mar. 27, 2019	India	PDV-MK II	Microsat-R	300 km	130	0	3+ years
Aug.-Dec. 2019	Russia	Cosmos 2535	Cosmos 2536		30	14	3+ years
Nov. 15, 2021	Russia	Nudol	Cosmos 1408	470 km	1807	67	Unknown
				Total	**6863**	**3133**	

Release of the Space Industry Statement in Support of International Commitments to Not Conduct Destructive Anti-Satellite (ASAT) Tests

In response to growing concerns over the sustainability of space activities, SWF led the development and release of the Space Industry Statement in Support of International Commitments to Not Conduct Destructive Anti-Satellite (ASAT) Tests. This initiative aligns with the United Nations General Assembly Resolution 77/41, adopted in December 2022, which calls on countries to refrain from conducting destructive ASAT tests that produce hazardous orbital debris.

In November 2023, a virtual launch event marked the initial release of the statement. This event brought together industry leaders to discuss the critical role of the commercial space sector in fostering a sustainable and economically viable space environment. Panelists from Astroscale, Digantara, Planet, and Axiom Space emphasized the necessity of such commitments for the future of space exploration and the protection of space assets.

The statement articulates a collective industry stance against ASAT tests, highlighting the potential risks these actions pose to satellite safety and the broader economic interests in low Earth orbit. It advocates for a cooperative approach to space activities that upholds the long-term sustainability and safety of space operations. After its release, the statement gained additional endorsements, reflecting a growing industry consensus on this critical issue.

By the close of 2023, this statement had attracted 36 signatories from 11 countries, demonstrating their commitment to safeguarding space for future generations. SWF will continue to welcome new signatories in 2024, stressing the statement's ongoing relevance and the space community's proactive engagement in preserving the orbital environment.

Space Industry Statement in Su
Commitments Not To Conduct D

Given the growing societal reliance on spa
increasingly being provided through comm

Recognizing the increased policy and regu
governments to growing and supporting th

Noting the voluntary operational commitm
avoid the intentional creation of space deb
end-of-life,

And in appreciation of the growing numbe
commitment not to conduct destructive di
testing (37 countries, including all membe
October 20, 2023),

We the undersigned members of the globa
space systems, providers of space-based se
state our support of such commitments. W
similar declarations.

These commitments build upon the resolu
missile testing," passed by the UN General
vote of 155 in favor to 9 against.

Destructive DA-ASAT tests directly threate
long-term sustainability of the environmen
can create long-lasting orbital debris whic
spacecraft, human spaceflight platforms, a
humanity uses on a daily basis. Such debri
activity and innovation in low Earth orbit
operations and creating uncertainty for inv

The deliberate destruction of space objects
firmly believe that the commercial space in
humanity's economic sphere further into lo
will yield extraordinary benefits to humani
and improve conditions on Earth. Working
deliberate destruction of space objects will

With each additional country to make this
widely-accepted international norm that re
create long-lived debris that threatens the

The COPUOS Briefing Book

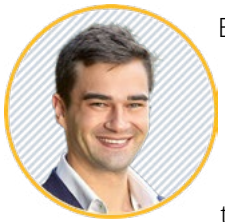
In 2023, SWF launched ***The COPUOS Briefing Book***, which quickly became an essential resource for international delegates to the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). Known affectionately as the “Little Yellow Book," this publication offers a comprehensive guide to COPUOS, providing in-depth insights into its structure, history, and critical role in global space diplomacy.

Designed to assist new and experienced delegates alike, the Briefing Book details the workings of COPUOS' subcommittees and the process of fostering international cooperation in space exploration. Its scholarly yet practical approach has made it a popular tool, enhancing understanding and participation in the committee's pivotal discussions.

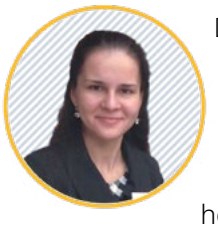
SWF introduced the COPUOS Briefing Book during the 66th Session of COPUOS in June 2023, with copies distributed to delegates to aid their engagements at the committee. SWF also offers the book as a digital download, ensuring wide accessibility as it continues to support the committee's efforts in sustaining the peaceful uses of outer space.

2023 Space Sustainability Fellows

In 2023, the SWF Space Sustainability Research Fellows program hosted Fellows Benjamin Silverstein and Dr. Olga Volynskaya, who conducted research on the role of verification mechanisms and customary international law in advancing space security. Their findings were showcased in a webinar on December 1, 2023.

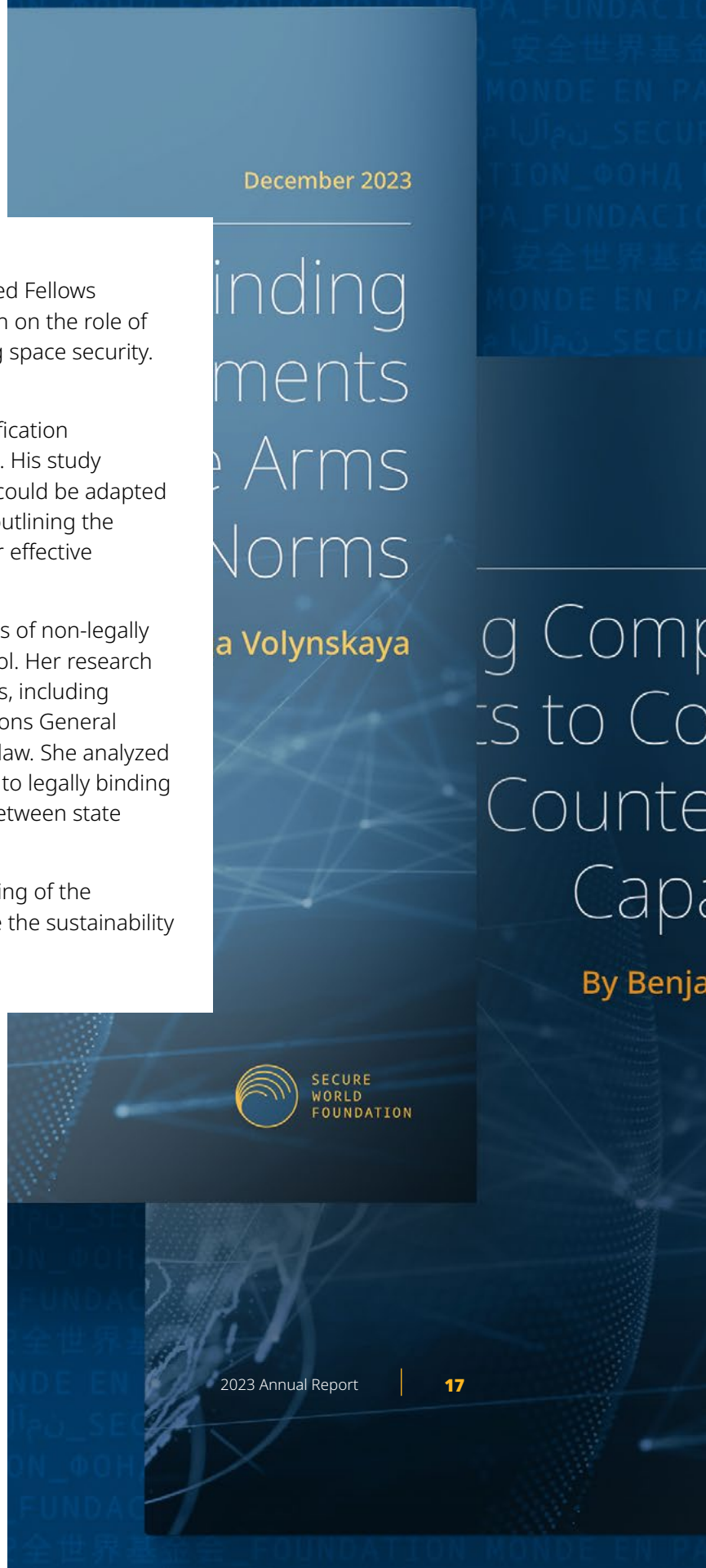


Benjamin Silverstein's research investigated the verification mechanisms for anti-satellite (ASAT) weapons tests. His study assessed how existing international mechanisms could be adapted to verify compliance with space security treaties, outlining the political and technical advancements necessary for effective treaty enforcement.



Dr. Olga Volynskaya focused on the legal implications of non-legally binding political commitments in space arms control. Her research examined the transformation of such commitments, including unilateral and bilateral statements and United Nations General Assembly resolutions, into customary international law. She analyzed how these informal agreements might indirectly lead to legally binding international norms, highlighting the complex interplay between state actions and legal obligations in space law.

Together, these research efforts contributed to a broader understanding of the dynamics inherent in space law and proposed frameworks to enhance the sustainability of outer space activities



International Workshop on Space Resources Perspectives of Emerging Space Program

SWF and several Korean research institutes (the Korea Aerospace Research Institute (KARI), Korea Institute of Geoscience and Mineral Resources (KIGAM), Korea Institute of Civil Engineering and Building Technology (KICT)) co-hosted the International Workshop on Space Resources Perspectives of New Entrant Space Exploration Programs in November 2023 in Daejeon, South Korea. This workshop established information-sharing links between the space resource community and the emerging space agency community. Experts presented the science, technology, business, and policy aspects of space resources and also discussed approaches to effectively engage emerging space programs so that they can contribute to and benefit from space resource activities in the future.

Participants explored partnership opportunities, emphasizing each nation's unique contributions to space resource utilization. Sustainability was a central theme, highlighting the need for inclusive and intergenerational approaches to space activities. Additionally, the workshop identified the necessity of improving communication about the benefits of space resources to enhance engagement by the public and policymakers.

There was a consensus on the value of recurring events to discuss this topic. Future workshops could expand to include broader lunar exploration topics and become critical annual events for the Asian space resources community.

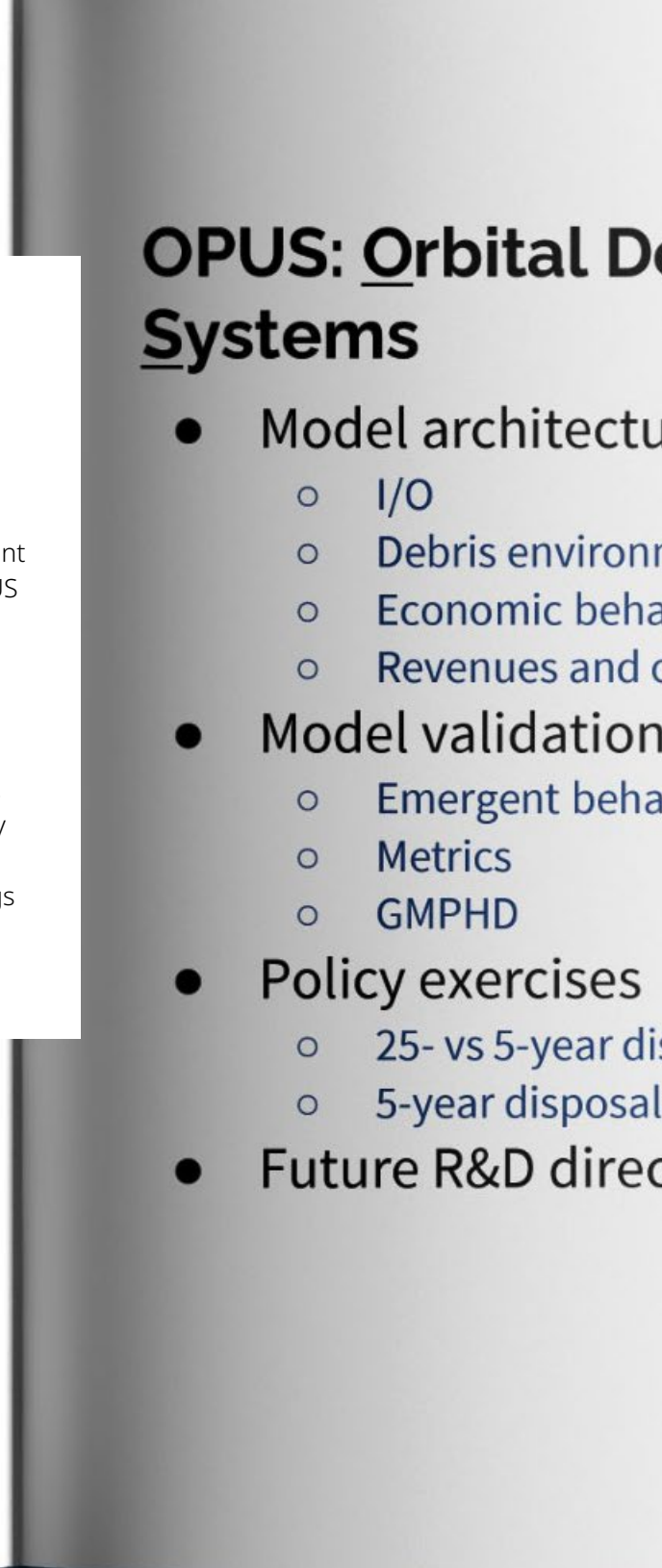
Overall, the workshop catalyzed a dynamic exchange of ideas and set a foundation for continued international collaboration in space resources development. A follow-on workshop is being planned in Brazil in late 2024.

SWF Helps Develop New Model to Assess Policy Proposals for Space Sustainability

In 2022, SWF began participating in a NASA-funded project to develop the Orbital Debris Propagators Unified with Economic Systems (OPUS), an innovative model addressing space sustainability challenges.

On September 27, 2023, SWF and its research partners briefed NASA on OPUS, demonstrating its ability to integrate a physics-based model of the orbital environment with an economic model of space actors' behaviors. This dual approach enables OPUS to predict not only the physical impacts of policy changes, such as collision rates and orbital congestion, but also the economic responses of satellite operators to new incentives and risks.

OPUS simulates user-defined scenarios involving variables such as constellation size, launch rates, and economic factors, including launch costs and satellite depreciation. This methodology underscores how economic factors can lead to behaviors that may diverge from those predicted by physics alone, providing a comprehensive tool for evaluating policy effectiveness in promoting space sustainability. The detailed findings and the OPUS model are accessible through various platforms, supporting ongoing research and policymaking efforts in the space sustainability arena.



SWF Participates in the Inaugural Space For Island Nations (SINC) Conference

SWF was proud to participate in the inaugural Space for Island Nations Conference (SINC), hosted in the Maldives by the Maldives Space Research Organization. This event marked a significant milestone as the first event dedicated to addressing space-related challenges and opportunities for island nations. This conference brought together global experts to explore issues such as the Blue Ocean Economy, Resilient Communities, and Space Exploration. SWF contributed to these discussions through participation on the panel "New Space Diplomacy - How Does International Cooperation Keep Pace with Emerging Space?" SWF emphasized the importance of including island nations in the global dialogue to enhance space security and the continuity of space-derived information and services.

Indian Space Research Organization SSA Workshop

SWF co-organized three regional events about the relevance of space security to all countries, not just geopolitical superpowers, and encouraged the generation of region-specific recommendations to multilateral discussions on norms, rules, and principles of responsible behavior in space. The first was held in February 2023 in Singapore in affiliation with the 2023 Global Space & Technology Convention (GSTC) as organized by Singapore Space & Technology Ltd (SSTL). This workshop, co-hosted by the UK Space Agency, raised awareness of the importance of space sustainability for all space actors in general and the APEC region specifically. It discussed how behavior/actions can either enhance space sustainability or hamper it, identifying specific examples of the latter like destructive anti-satellite testing.

The second was held in Nairobi, Kenya, in March 2023. This workshop, co-organized by the United Nations Institute for Disarmament Research (UNIDIR), the Kenyan Space Agency, and the United Kingdom, was designed to raise awareness about the matters addressed in the Open-Ended Working Group (OEWG) among States of the Africa region and foster a better understanding of regional perspectives on space security. The event brought together a diverse range of experts, and provided an informal discussion around current challenges to space security and stability, and the role that norms, rules, and principles can play in keeping space a peaceful domain.

The third event was held in August 2023 in Buenos Aires, Argentina. This workshop, co-organized with UNIDIR, the Comisión Nacional de Actividades Espaciales (CONAE), and the Argentinian Ministry of Foreign Affairs, International Trade and Worship, was designed to raise awareness about the matters addressed in the OEWG among States of the Latin American and Caribbean regions and foster a better understanding of regional perspectives on space security. The event brought together a diverse range of experts, and provided an informal discussion around current challenges to space security and stability, and the role that norms, rules, and principles can play in keeping space a peaceful domain.

Our Partners in 2023

Aerospace Corporation

Amazon - Project Kuiper

Astroscale

Australia Space

Axelspace

Caelus Foundation

Catapult Space Applications

Chinese Society of Astronautics

Clearspace Today

COMSPOC Corp.

Governance & Accountability Institute

GVF

Inmarsat

Iridium

Korea Aerospace Research Institute

LeoLabs

Luxembourg Space Agency

Maxar

National Space Activities Commission, Argentina

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Rocket Lab

Satnews

Seraphim Space

Slingshot Aerospace

Space & Satellite Professionals International (SSPI)

Space Court Foundation

Space Generation Advisory Council

Space Logistics

SpaceNews

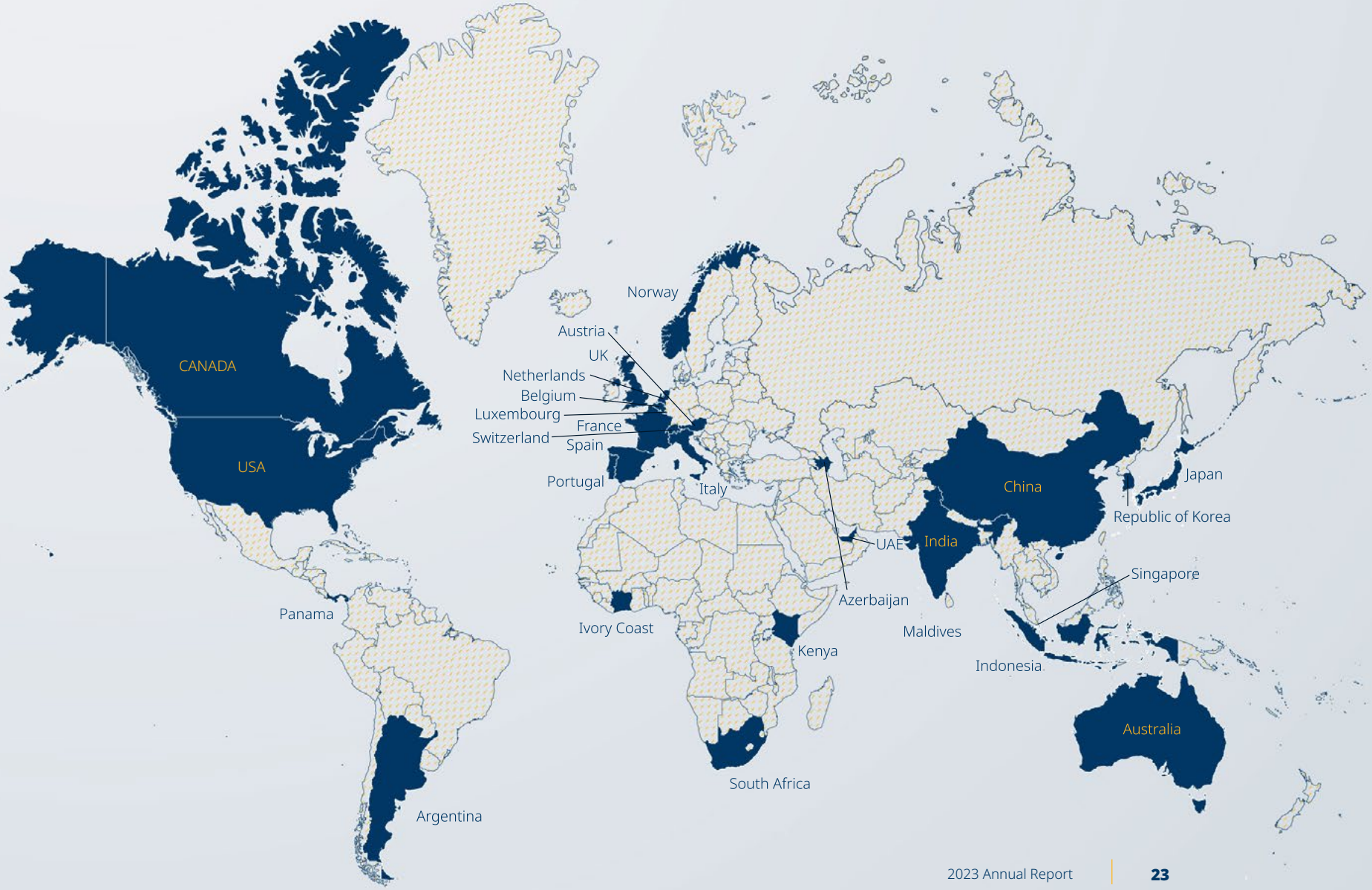
SpaceWatch Global

UK Space Agency

UN Institute for Disarmament Research (UNIDIR)

UN Office for Outer Space Affairs (UN OOSA)

Almost all of the work of SWF is done in partnership with other organizations. We work with governments, academia, civil society, intergovernmental organizations, and companies to marshal the voices, perspectives, and resources that are critical to achieving our vision and mission. Partnerships are at the heart of SWF's way of doing business, and in 2023 we partnered with over 50 entities from around the world. In addition to participating in virtual and hybrid events and activiites, SWF was invited to, co-hosted, or attended over 100 events in 41 cities in 29 countries in 2023.

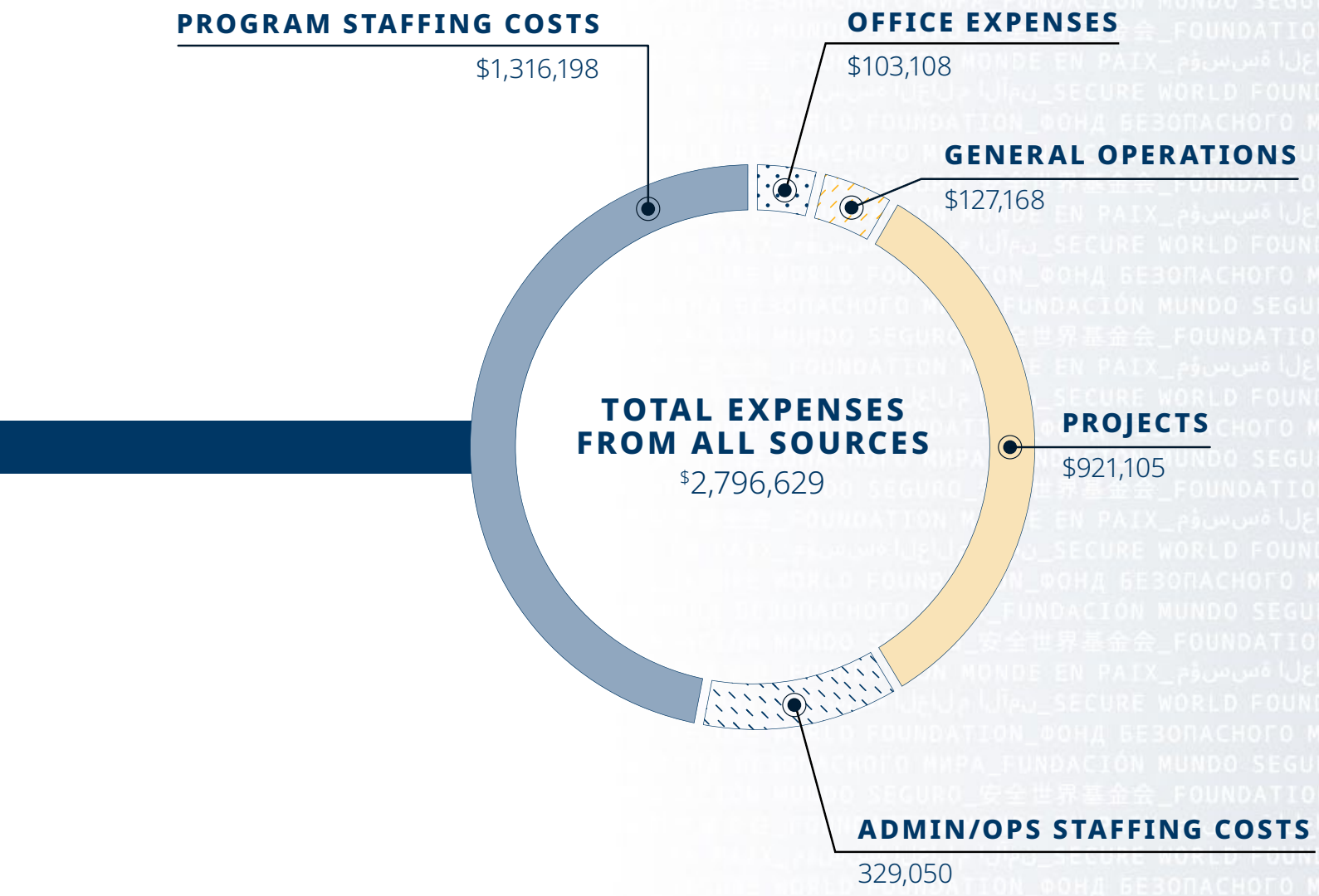


2023 Finances

ENDOWMENT DRAW
$2,251,018

TOTAL INCOME FROM ALL SOURCES $2,749,514

PROGRAM INCOME
$498,496


PROGRAM STAFFING COSTS
$1,316,198
OFFICE EXPENSES
$103,108
GENERAL OPERATIONS
$127,168
TOTAL EXPENSES FROM ALL SOURCES
$2,796,629
PROJECTS
$921,105
ADMIN/OPS STAFFING COSTS
329,050

Board, Advisory Committee, and Staff in 2023

STAFF

Dr. Peter Martinez, *Executive Director*

Lisa Croy, *Operations Director*

Dr. Brian Weeden, *Director of Program Planning*

Victoria Samson, *Director of Space Security and Stability*

Krystal Azelton, *Director of Space Applications Programs*

Ian A. Christensen, *Director of Private Sector Programs*

Christopher D. Johnson, *Space Law Advisor*

Robert Pemberton, *Director of Communications*

Elizabeth Blevins, *HR Manager and Executive Assistant for Dr. Peter Martinez*

Christopher Ludwig, *Finance Manager (Jan. to Sept.)*

Eileen Holtry, *Finance Manager (from Oct.)*

Kelly Moulton, *Bookkeeper*

Seth Walton, *Program Associate*

Bailey Geist, *Operations Associate*

Tamara Tanso, *Operations Associate*

ADVISORY COMMITTEE

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Ms. Laura Delgado López

Mr. Bruce McClintock

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Ms. Ruth Pritchard-Kelly

Dr. Beyza Unal

Dr. Guoyu Wang

Dr. Jessica West

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Marcia S. Smith, *Community Member*

525 Zang Street, STE. D
Broomfield, CO 80021 USA
v : + 1 303 554 1560
e : info@swfound.org

1779 Massachusetts Ave. NW
Washington, DC 20036 USA
v : + 1 202 568 6212
e : info@swfound.org

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