



2021 ANNUAL REPORT

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 benefitting Earth and all its peoples.

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LETTER FROM THE FOUNDER

Well, we thought COVID would be over and things would go back to “normal” in 2021, but this proved to be another lesson learned in the way of the world and also in our resiliency. As Peter discusses in his letter, 2021 was a very busy year. Just when we thought we couldn’t get busier, we were called to do more as we moved into the world of the “new normal.”



Increased focus on space has brought SWF into the limelight as we build on our almost 20 years of working on space sustainability, long before most others even knew these words. The issues relevant then have become even more so now. What will the next 20 years look like? Will the world come to fear space for the damage and destruction done on Earth,

will we have limited access due to our own failure to recognize the consequences of our actions, or will we celebrate the benefits of cooperatively solving some of

Earth’s greatest issues through our use of space? We have choices to make now.

On a more personal note, the end of 2021 brought an end to our home and community of 42 years with the Marshall Fire in Colorado on Dec 30th. Flying home from vacation that day, I took for granted that I would sleep in my own bed that night, surrounded by the comforts of home. That night, 1200 homes were destroyed, including my own. A stark reminder of how quickly our lives can change. Let’s not wait for a crisis in space to appreciate all the opportunities and benefits we have from space. At SWF, we commit to not taking access to space benefits for granted and we will continue to build relationships across networks, finding the common goals that strengthen us and promoting cooperative solutions to the challenges that face us.

Cynda Collins Arsenault
President and Co-founder

LETTER FROM THE EXECUTIVE DIRECTOR

The year 2021 was another remarkable year for the world in general and the space world in particular. Despite continued disruptions due to COVID-19, 2021 was a record-setting year that witnessed the most launches of any year since the beginning of the space age in 1957. There were also a number of space “firsts” achieved during 2021. These included five new countries joining the other 90-odd countries that have launched at least one satellite. All told, there were 132 successful space launches that placed some 1800 satellites in orbit during 2021. Most of these satellites were launched by commercial entities, not States. The private sector continued to demonstrate increasing space capabilities. There were successful crewed suborbital and orbital flights conducted on commercial vehicles. We also witnessed the ongoing deployment of hundreds of satellites by commercial operators to form very large satellite constellations in low Earth orbit, as well as successful rendezvous and mission extension operations carried out by private sector entities.

At the same time, we also witnessed signs of the growing congestion in space as satellites from two of the major constellations experienced a close approach, highlighting the need for improved information sharing and rules of the road for space traffic. The already serious space debris situation in Earth orbit was further exacerbated in November when a destructive direct-ascent antisatellite test added another 1500 pieces of trackable debris to the 35,000 trackable objects already in orbit.

All of these developments are fundamentally reshaping space into a much more complex and dynamic shared domain, with unprecedented governance, safety and security challenges. Against this backdrop, Secure World Foundation continued in its mission to work with governments, industry, international organizations, and civil society to develop and promote ideas and actions aimed at achieving the secure, sustainable, and peaceful uses of outer space benefiting Earth and all its peoples.

During the period under review, SWF continued to act as a source of balanced and informed comment on trends and developments in the space arena. We produced another edition of the SWF open-source assessment of global counterspace capabilities and completed a satellite dashboard to support transparency in space. We supported capacity building in space policy and law for emerging space nations in partnership with the United Nations. We also completed French and Chinese translations of the SWF Handbook for New Actors in Space.

Secure World Foundation also continued to convene multi-stakeholder dialogues in the issue areas on which we work. We partnered with various governments and the UN to support a new multilateral initiative to start a dialogue on norms, standards and principles of responsible behavior as one of the means of preserving outer space for peaceful purposes. Together with various partners, we co-organized dialogues on space security, space situational awareness, and the commercial space component of the US-China relationship, to name but a few.

This annual report provides a summary of the accomplishments of SWF during 2021. I would like to take this opportunity to congratulate the staff of SWF on their accomplishments under difficult circumstances and to express our gratitude to all our partners and sponsors, without whose support we would not have been able to accomplish much of the work presented in this report. Last, but not least, I would like to thank our President, the Board and Advisory Committee for all their support during the year.

Peter Martinez
Executive Director



PROGRAM SPOTLIGHTS



The Summit for Space Sustainability

The third annual Summit for Space Sustainability was held virtually once more in 2021. Building on the lessons learnt in 2020, SWF was already equipped and experienced in hosting major virtual events. Once again, the Summit was an opportunity for the international space community to hold substantive conversations in an informal setting on key topics such as megaconstellations, active debris removal and geopolitical competition in space. With over 600 attendees from around the world, the Summit also offered an opportunity for major stakeholders, like United Launch Alliance, to speak candidly about what space sustainability means to them and how they are incorporating it into their operations.

The 2021 edition of the Summit also focused on students and young professionals who, after two years of COVID, had missed many critical opportunities for engaging with mentors and networking. SWF highlighted a number of young professionals working for sponsors, showing how these bright stars are contributing to their organizations and to space sustainability. SWF also held a workshop for students and young professionals where they could meet virtually with leaders and experts from the space community. In this way, young participants in the Summit were able to experience at least some of the networking benefits of attending an in-person conference.



2021 Space Security Conference

SWF was delighted to co-organize the 2021 Outer Space Security Conference with the United Nations Institute for Disarmament Research (UNIDIR). The conference was sponsored by the Governments of the Russian Federation, China, and France, as well as the Fondation pour la Recherche Stratégique and the European Union. This one-and-a-half-day hybrid event provided a unique forum for the Geneva-based diplomatic community—as well as visiting experts from military, industry and academic backgrounds—to consider challenges related to security in outer space and to exchange ideas regarding solutions. Key takeaways included: the Outer Space Treaty remains critical but

there is still work to be done; proposed measures to address space security can be complementary; and effective policies increasingly require cooperative use of technology and inputs from all stakeholders. For more information, please see the conference report at swfound.org.

SSA Dialogues at AMOS

In 2021, SWF held the eighth annual AMOS Dialogue in partnership with the Maui Economic Development Board (MEDB) as part of the Advanced Maui Optical and Space Surveillance Technologies (AMOS) Conference. The goal of the AMOS Dialogue series is to facilitate discussion among key stakeholders



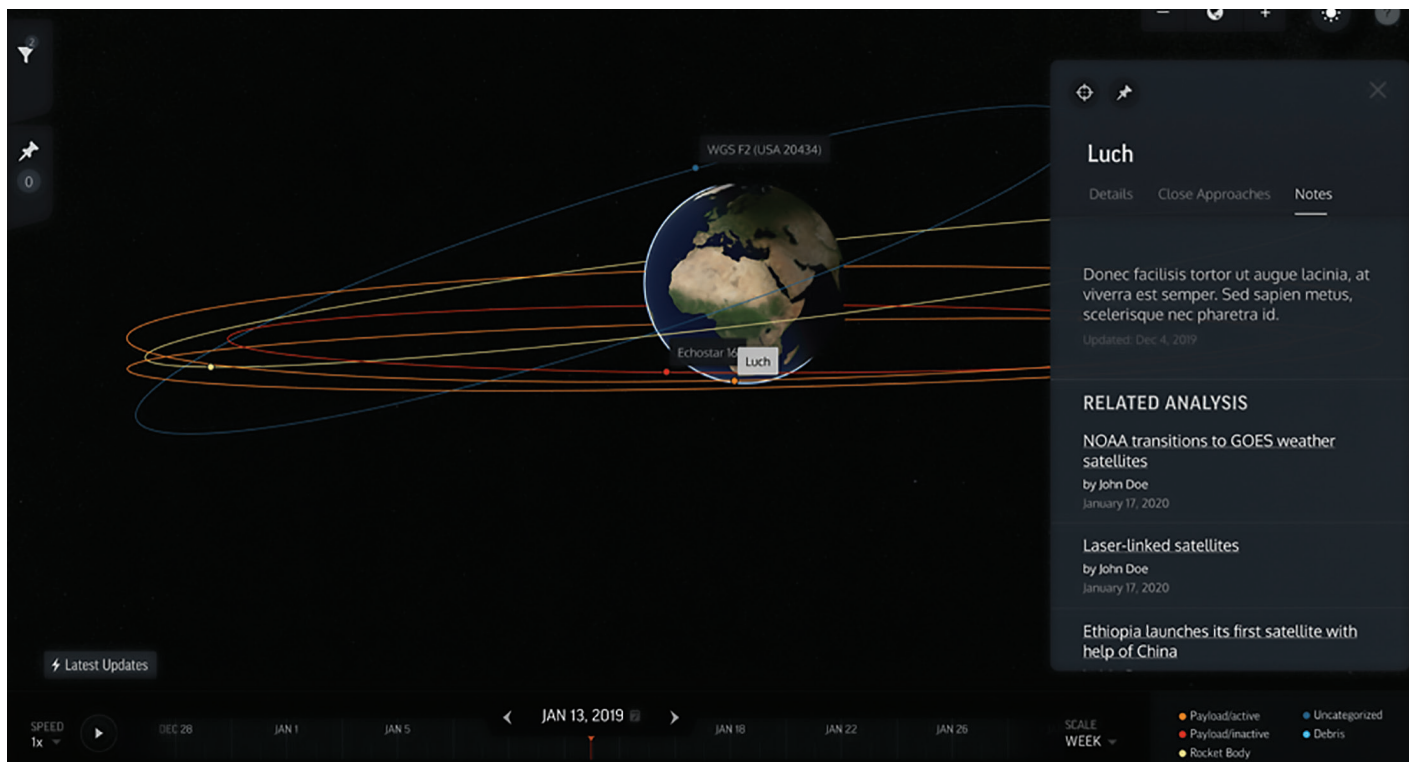
in space situational awareness (SSA), thereby promoting greater collaboration and cooperation to enhance SSA for safe and responsible space activities. To accomplish this, the Dialogue brings together representatives from current and future SSA programs and initiatives around the world with a variety of end users and stakeholders so that they may exchange information and views in a not-for-attribution setting.

The 2021 edition focused on the need for greater transparency of orbital activities and trusted space situational awareness (SSA) data from multiple providers as a result of the growing number of rendezvous and proximity operations (RPO) by governments and commercial actors. Participants discussed tools for increasing transparency of space activities, including recent proposals for developing trusted SSA data sharing networks based on blockchain and distributed ledger technologies.

A Satellite Dashboard

Also in 2021, SWF completed the initial phase of work on the Satellite Dashboard (<https://satelitedashboard.org/>), a web-based tool developed in partnership with the Center for Strategic and International Studies (CSIS) and the University of Texas at Austin, under a grant from the Smith Richardson Foundation. The Satellite Dashboard uses data from multiple government, commercial, and academic sources to provide more transparency into space activities. The goal is to create an enhanced, common understanding of space activities and potential threats so that decision makers are empowered to make sound policy choices, collaborate with allies and partners, deter adversaries, and communicate to the public.

In its initial phase, the Dashboard provides a set of tools to detect and analyze close approaches between space objects in the geosynchronous Earth orbit region. With



further funding, we plan to expand that to include close approaches in low Earth orbit and other types of space activities in the future. Our hope is that policymakers, space experts, commercial industry, and the media will be able to use the Dashboard as a reference to better understand potentially destabilizing activities in space in a way that supports informed decision-making and open dialogue.

Engaging in Dialogue with China

Since 2019, the Secure World Foundation and Caelus Foundation have been engaged in a research and dialogue program focused on the commercial space component of the US-China relationship. Research has been focused on illuminating existing perceptions, primary sources of miscommunication, and identifying meaningful subjects for targeted dialogue. The dialogue itself, the most substantial element of this program, has consisted of multiple workshops

that have brought US and Chinese commercial stakeholders together to share perspectives in order to better understand how both countries are working towards the commercialization of space. In February 2021 Secure World Foundation and Caelus Foundation released a paper entitled “Lost Without Translation: Identifying Gaps in U.S. Perceptions of the Chinese Commercial Space Sector.” Via interviews with private sector professionals across the space industry in the United States, this research explores current perspectives that US commercial space stakeholders have on the emerging Chinese commercial space sector and identifies significant questions and gaps in information that these stakeholders have. In 2021 we also held two formal dialogue sessions with our partners at the Chinese Society of Astronautics, both in a virtual format including a mix of pre-recorded and live discussion. The first, in April, focused on broad trends in space commercialization in each country, including discussion of the definition of commercial space in

each ecosystem. The second, held in October, focused on trends and viewpoints on human spaceflight activities. In November, Secure World Foundation and Caelus Foundation hosted a Small Group Dialogue on Space Traffic Management and Space Safety between American and Chinese commercial space stakeholders on the margins of the Paris Peace Forum. In addition, SWF, Caelus Foundation and the Chinese Society of Astronautics shared our collective experience in dialogue with a virtual panel session as part of the formal Paris Peace Forum agenda, entitled How to Establish a Space Commercialization Dialogue between the US and China? (recording via YouTube). Collectively during 2021 this dialogue resulted in 10 US space-sector experts sharing perspectives directly with Chinese counterparts, and is currently the only Track II dialogue between the US and China on space industry related activities. We have briefed the outcomes of both the dialogue and the research to US government stakeholders and have presented in public discussions and media.

UN Technical Advisory Missions on Space Law

Established in 2020, the Space Law for New Space Actors Legal Advisory Project is aimed at building UN Member State capacity in space law and policy. Administered by the United Nations Office for Outer Space Affairs (UNOOSA), the project facilitates advisory service missions to requesting countries, including countries beginning the process of drafting national space law and policies, and brings together policymakers and legislators of emerging spacefaring States with global experts, scholars, and practitioners in international and domestic space law and regulation.

This project is funded by voluntary contributions to the UN. SWF was the foundational sponsor of this project, which UN OOSA leveraged to secure support from the governments of Belgium, Chile, Japan, Luxembourg,

the Kyushu Institute of Technology, and the Asia-Pacific Space Cooperation Organization (APSCO).

In October 2021, a three-day national Technical Advisory Mission (TAM) was delivered to the Government of Chile, which is pursuing the creation of national space legislation as well as national space policies. SWF Space Law Advisor Christopher Johnson delivered a lecture on the governmental authorization and supervision of non-governmental (private) space activities at this event. The Kyushu Institute of Technology also hosted a global series of 16 online lectures for the Advisory Project from October 2021 to March 2022. Dozens of requests for advisory service missions have been received by UNOOSA and activities are being planned and executed in Asia, Africa, and the Latin American region.

Open-Source Report on Global Counterspace Capabilities

In April 2021, SWF published the fourth edition of its Global Counterspace Capabilities report, an annual open-source assessment of the spectrum of counterspace capabilities being developed by multiple countries. To broaden access to the main findings of this report, the Executive Summary was translated into Spanish, French, Russian, and Chinese. The 2021 edition also refreshed the appendix of satellite imagery showing various terrestrial facilities that support counterspace research, development, and operations.

The goal of the Global Counterspace Capabilities report is to create a reference document that fosters a more open and public debate on the implications of conflict on Earth extending into outer space. Over the last several years, there has been growing concern from multiple governments over their reliance on vulnerable space capabilities for national security, and the corresponding proliferation of offensive counterspace capabilities that could be used to disrupt, deny, degrade, or destroy space systems critical to national security. This in turn has led

NEXT GENERATION VIDEO SERIES



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to increased rhetoric from some countries about the need to prepare for future conflicts on Earth to extend into space, and calls from some corners to increase the development of offensive counterspace capabilities and put in place more aggressive policies and postures.

Supporting Young Professionals

Once again, in 2021 COVID-19 added an additional layer of complexity to engaging with students and young professionals. Knowing the importance of reaching the next generation of space stakeholders, SWF sought opportunities around the world to maximize its outreach.

Through its partnership with the Space Generation Advisory Council, SWF sponsored the first-ever Space-Gen Egypt event, in partnership with the Egyptian Space Agency. This event brought industry experts and global leaders together with talented young Egyptians as they sought to understand the breadth of career paths available in the space community. SWF also sponsored

the (virtual) SGAC Fusion Forum, an annual gathering of international students at the Space Symposium. Providing valuable expertise and mentoring, SWF staff were able to engage with students virtually from all over the world on a broad range of issues that included topics such as space debris and anti-satellite testing.

In addition, SWF made Young Professionals a key theme of the annual Summit for Space Sustainability. As part of its promotional campaign, SWF produced a series of short video interviews with Young Professionals employed by sponsors. The Young Professionals commented on how their employers promoted space sustainability and gave career advice to other aspiring space professionals. Furthermore, SWF hosted a Young Professional mentorship day following the Summit, wherein mentors from around the international space community were put into small groups with students interested in their field. It also served as a good opportunity for established members of the space community to meet potential future job hires.

OUR PARTNERS

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 achieve our vision and mission. Partnership is at the heart of SWF's way of doing business and in 2021 we partnered with over 100 entities from around the world.



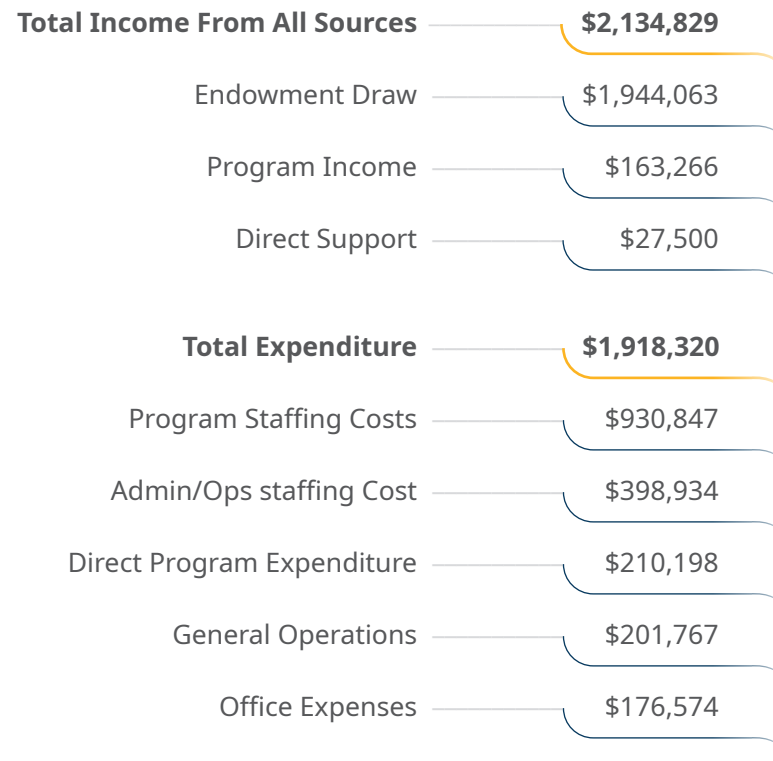
Where SWF's 2021 Partners Were Located (highlighted in blue)



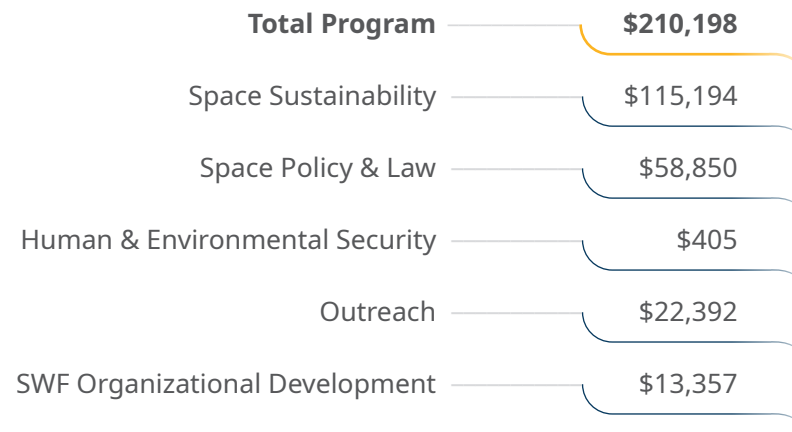
African Union
Agencia Espacial Mexicana
Astroscale
BHO Legal
Caelus Foundation
Center for Strategic International Studies
Chinese Society of Astronautics
Clifford Chance
COMSPOC
European Space Agency
KPMG
LeoLabs
Maui Economic Development Board
Observer Research Foundation
SatNews
SDA Bocconi Space Economy Evolution Lab
SpaceNews
SpaceWatch Global
United Kingdom Foreign, Commonwealth & Development Office
UN Office for Outer Space Affairs
UN Institute for Disarmament Research
University of Colorado, Boulder
University of Texas, Austin
Wilton Park

2021 FINANCES

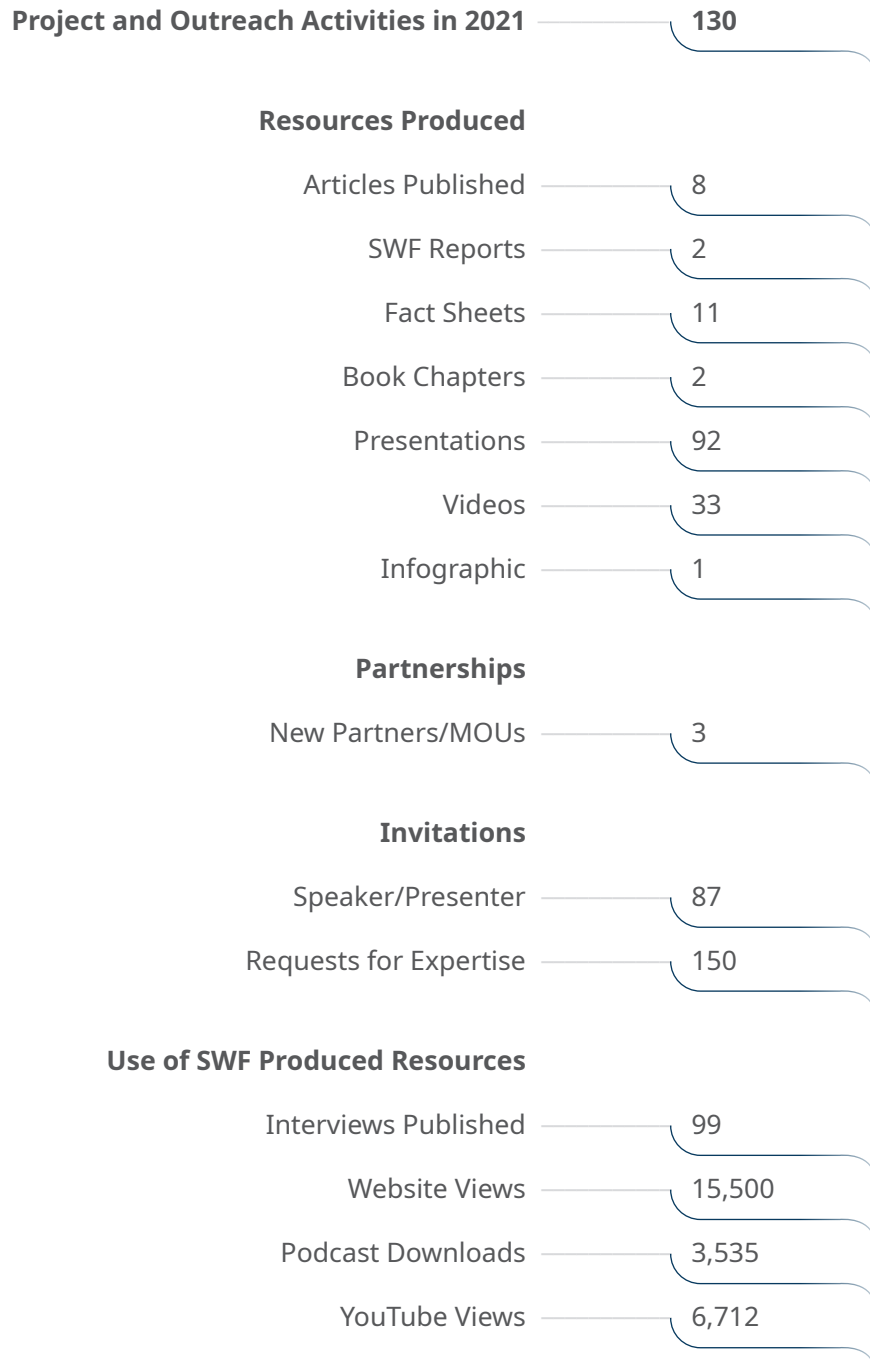
INCOME AND EXPENDITURE



EXPENDITURE BY PROGRAM AREA



SWF PROGRAM ACTIVITIES BY THE NUMBERS



OUR TEAM

Staff

Peter Martinez, PhD, Executive Director
Jihan Asher, Operations and Communications Associate
Krystal Azelton, Director of Space Applications Programs
Elizabeth Blevins, HR Manager and Executive Assistant for Dr. Peter Martinez
Ian A. Christensen, Director of Private Sector Programs
Lisa Croy, Operations Director
Bailey Geist, Operations Associate (From 18 October)
Christopher D. Johnson, Space Law Advisor
Chris Ludwig, Accountant
Nicole Nir, Operations Associate (Until 2 April)
Daniel Porras, Director of Strategic Partnerships and Communications
Victoria Samson, Washington Office Director
Brian Weeden, PhD, Director of Program Planning

Advisory Committee

Ariane Cornell
Richard DalBello
Laura Delgado López
Bruce McClintock
Elina Morozova
Bruno Sánchez-Andrade Nuño, PhD
William V. Parker
Xavier Pasco, PhD
Ruth Pritchard-Kelly
Rajeswari Pillai Rajagopalan, PhD
Guoyu Wang, PhD

With our deepest thanks to Richard Dal Bello for serving on SWF's AC since 2015.

Board

Cynda Collins Arsenault, President and Co-founder
Marcel Arsenault, Vice President, Treasurer and Co-founder
Angie Bukley, PhD, Secretary
Michael K. Simpson, PhD, Community Member
Marcia S. Smith, Community Member

SWF'S NEW LOOK

Organizations, like people, grow and evolve in response to changing circumstances, challenges and opportunities. Every once in a while, an organization should stand back and assess itself in light of its current context and circumstances, and also with a view to where it aims to go in the future. As part of the general five-year strategic planning exercise carried out during 2021, we decided that it was time for a refresh of the SWF brand. This led to a new logo that encapsulates SWF's vision. The new logo was introduced in September 2021, along with a new look for the SWF website.

The new SWF logo symbolizes our role as a facilitator of dialogue and a promoter of cooperative solutions for space sustainability. The design incorporates classical elements from Eastern and Western cultures, symbolizing our belief that all perspectives must be included to achieve a shared understanding for effective cooperative governance of space activities.



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