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Keynote Remarks: Ian Christensen, Senior Director Private Sector Programs

Space Data Association Workshop

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Good morning and thanks.

Secure World Foundation is a U.S. based non-profit organization. Our mission is to work with governments, industry, international organizations, and civil society to develop and promote ideas and actions to achieve the secure, sustainable, and peaceful uses of outer space benefiting Earth and all its peoples. We define space sustainability as the collective action and solutions needed to maintain stability in the space environment, so that society can continue to access and benefit from space activities. We focus on space sustainability not for the environment's sake alone - but for the benefits and outcomes of space activities.

SWF has been a source of policy information on SSA issues for nearly two decades, and regularly convenes dialogues across sectors and disciplines with the aims of advancing SSA related policy implementation, and supporting efforts to build capacity to access and use SSA information. In this we align with an aspect of SDA's mission - to provide advice on space sustainability related policy. And have collaborated at times in convening or policy discussion related to that.

So what perspective do I offer today?

I will speak from the viewpoint of civil society and as a non governmental organization with active interest in space stability -sharing reflections on changes in the environment, what it means for the need and role of SSA information sharing, and the role of SDA therein. I plan to speak for around 20 minutes, leaving time for Q&A at the end. My remarks hope to encourage discussion here in the room about the role of the SDA beyond its technical capabilities and successes.

Most of us here are probably well aware of the ongoing changes to the ways humanity is using the space environment. But let's start with a brief look at how we see it. Currently, more than 15,000 satellites are active in Earth's orbit. That's more than ten times the number of operational satellites a decade ago. In addition, more than 54,000 debris objects greater than 10cm in size are tracked in Earth orbit, and an additional 1.2 million pieces of debris between 1 cm and 10 cm in size are estimated to also be in orbit.

The pace of change is reshaping how we manage orbital activity.

There is an ongoing shift to a private sector driven domain. Space has changed from a government driven domain in which all operators were government entities to a multi-user domain characterized by private sector operators. This means - increasingly - that the operational experience and expertise related to space operations and space safety is found in private sector or industry actors.

At the same time, there is continued growth in new actors in space, including governments, industry and academic operators. These new actors may not have the breadth of technical and operational capacity that existing operators do, and in general are seeking to access the benefits of space capabilities, while following existing best practices of space operations and the international governance principles of the space sector. SWF has published our Handbook for New Actors in Space to provide an overview of these existing practices and principles.

Space also remains a domain which is inherently strategic in nature, and investment, activity, and policy priorities are driven or influenced by national security and strategy considerations. Most space applications and technologies - including SSA - can be dual-use in nature.

Specific altitude bands and inclinations are particularly high in demand, including sun-synchronous orbits for Earth observation, geostationary orbit for communications, and the LEO shells that house large constellations. As use of these operationally critical regimes

intensifies, the need for effective coordination mechanisms and safe operational practices grows. At the same time, the orbital environment is also becoming more dynamic, with emerging capabilities such as satellite servicing, refueling, autonomous maneuvering, and active debris removal pointing toward greater interdependence among systems. This transition toward a more operationally dense and interactive orbital environment raises new challenges for space situational awareness, coordination, interference mitigation, and safety.

The orbital environment is also affected by deliberate actions. Anti-satellite testing by China, India, Russia, and the United States has generated significant amounts of long-lived trackable debris. Beyond destructive testing, the development of capabilities to disrupt, degrade, or destroy space systems for national security reasons creates risks for all operators and complicates efforts to build norms of responsible behavior. SWF tracks these developments in our annual Global Counterspace Capabilities Report.

Importantly, these challenges are not independent. Congestion increases collision risk, collisions generate debris, and both are further complicated by security-related events that can destabilize the orbital environment as a whole.

Over the last several years SWF has convened a series of workshops and dialogues with SSA data providers, spacecraft operators and space safety experts to discuss practical measures for information sharing to enhance spaceflight safety and on the needs and drivers for space traffic coordination. A number of these dialogues have also featured governments from both established and emerging space faring countries. Throughout these meetings pragmatic ideas to advance space safety and enhance SSA information sharing were discussed. Some common points emerge as key themes from these discussions.

- First, that SSA information sharing is best understood as an operational coordination challenge, rather than a purely technical or policy problem. Effective SSA coordination depends less on the volume of information shared, than it does on the relevance, timeliness, and usability of that information.
- Second, that trust plays a central role in SSA information sharing. Building trust requires having clear mechanisms for data protection and transparency regarding the use of shared information. Recognizing and accounting for geopolitical and

commercial sensitivities related to SSA data and information sharing is also essential to building trust and participation in space safety cooperation.

- Third, efforts to enhance SSA information sharing at a global level should be compatible with and build upon existing national, regional, and industry coordination mechanisms. Ideally satellite operators should be encouraged to share information with one or more of these existing systems, and global coordination frameworks should help address challenges related to information sharing among these national and regional networks.
- Fourth, the foundational importance of the existing international consensus standards related to space safety (such as the format and info to be contained in Conjunction Data Messages) as well as industry voluntary guidelines and recommended practices. Improvements in SSA information sharing practices should be built from this existing baseline of standards and guidelines; rather than starting anew.

However, despite these points of common understanding, efforts remain uneven across jurisdictions and are perhaps not yet calibrated to the anticipated scale and speed of space activity. Collision avoidance coordination still largely depends on bilateral operator-to-operator communication, with varying data quality, operational norms, and response expectations. Many newer commercial operators lack access to high-quality SSA data and conjunction assessment capabilities or lack the full capacity to do this in house. Emerging space countries may lack the institutional capacity to develop and enforce the domestic frameworks needed to support ensure operational safety for national actors; and may struggle with how to prioritize investment in SSA related infrastructure.

Overall, the gap between voluntary best practice and operational regulatory frameworks, and between national rulemaking and international coordination, remains substantial. Closing that gap is the work ahead.

Improving global SSA information sharing is a progressive endeavor. It begins with low-risk exchanges that gradually build confidence, and expands in cooperative practices as trust allows.

This approach suits the operational realities of the current space sector landscape. Government-to-government information sharing carries different risks and responsibilities from operator-to-operator information sharing. And the technical and institutional capacities of both state and private sector actors can differ considerably; as can their access to information. As we look towards improving space traffic coordination frameworks, it is helpful to keep these differences in mind. In the medium term we at SWF envision the emergence of a cooperative (or federated) global framework for SSA information sharing consisting of many parts working in concert: national systems, regional systems, and direct exchanges between operators. Interoperability and consistency across these systems would be enabled by shared standards and practices, with appropriate safeguards to protect sensitive technical details, commercial information, and national security equities. This also where the practical and ongoing experience in data sharing and coordination through the Space Data Association can be instructive.

The Association has relevant and operational experience in many of the elements necessary to advance global SSA information sharing practices, in the context of efforts to develop global frameworks for space traffic coordination. Trust, transparency, operational best practices, data governance and interoperability. All of part of the SDA's success to date. This experience can provide evidence and practical outcomes that show that these difficult elements of enhancing SSA information sharing can be addressed. The challenge here is how to communicate and share this experience, while remaining focused on the SDA's core mission of safety of flight.

- Trust: at the heart of the space data association has been the ability to share data amongst operators that in many cases are competitors. It has also included sharing data across sectoral - government and private sector - lines; across different operational regimes; and across national boundaries. This experience shows that establishing trusted data sharing approaches in context of complexity, is not only possible, it is operationally beneficial.
- Transparency: SDA members have established the operational practice of sharing ephemeris and maneuver plans. This experience supports the emerging norm of behavior that ephemeris sharing is a best practice, even amongst operators that are

not SDA members. Transparency is also important to help delineate responsible operational behavior and data use in an environment characterized by dual-purpose technologies.

- Data Governance and Interoperability: The SDA has established clear practices and requirements for data governance and use including addressing concerns around proprietary information; as well as technical means for comparison, verification, and validation of data. This may be instructive as government space safety systems develop their own data-use policies related to data from external sources, and as conversations around interoperability of SSA systems increase in urgency.
- Operational Best Practices: SDA is a leader in operational practices for operator to operator coordination of space safety and interference mitigation. This operational experience relates to several of the UN COPUOS Guidelines for the Long-Term Sustainability (LTS) of Outer Space Activities, which are 21 voluntary, consensus-based guidelines designed to enhance the safety of space operations and minimize space debris. Including in particular Guidelines B1, B2, and B4 which relate to operator points of contact, space object information, and conjunction assessment. SDA, and its membership, could thus act as a source of experience and information on LTS Implementation, as the international community seeks to advance on specific mechanisms.

A key feature of the ongoing change in the nature of our activities in the space environment is the increasing domain knowledge being built up in the private and industry sectors. SDA represents a particular concentration of that expertise. The challenge and opportunity presented is how best for SDA, and its members, to share that expertise. If the international community moves towards a federated model for SSA information sharing - in which various national and regional space safety centers interact - can SDA itself serve as a node in that system?

As I approach the end of my remarks this morning, I want to reflect back on one additional element of discussion that has been a recurrent theme in SWF's dialogues with new actors, both industry and government, around space safety. This is that space situational awareness and space traffic coordination is not just about those that have assets in space.

It's also about those that plan to have assets in space, and those that rely on data and applications from space, even if not operating themselves.

This encapsulates the importance of this topic and discussion – it's not just the operational need now – but the foundation that this coordination will provide to policy, governance and practice for space activities and access going forward.

- This is a key aspect of the imperative driving the conversation and work here in Vienna as UNCOPUOS considers approaches to SSA information sharing and to space traffic coordination.
- It is, ideally, an objective that should be complementary and aligned to interests in operational space safety for existing and current operators.
- SDA has been successful in operationalizing, within its membership, reliable and efficient sharing of space safety data and information, and in developing related best practices for space safety.

But the environment becomes more complex and here - as one of the earlier speakers in today's program, I have the advantage of being able to pose questions, and leave the answers to the experts in this room. So I'd like to put three questions on the table, with the intent of seeding conversations about how the experience of SDA, and its members, can reach outward to different groups, and contribute to the development of improved SSA information sharing globally.

- First, the new and emerging entrants. The community of space operators is growing rapidly and becoming more diverse, with the locus of operations shifting into LEO. The SDA Space Data Centre (and now the Space Safety Portal) has been a key tool used by operators to protect existing – and upcoming – investments in space. How can the experience of SDA extend to this larger, more diverse community, to support capacity building and access to reliable SSA information?
- Second, the policymakers. SDA has provided some technical expertise in advising institutional SSA providers. Work is underway, both next door at COPUOS and within national bodies, to develop frameworks for space safety. Those deliberations stand to benefit from the considerable operational and technical experience that SDA and its

members have built up. How can that experience be effectively captured and shared with policymakers to inform these frameworks?

- Third, the connections within the wider space ecosystem. The SDA is part of a larger community working on space safety, alongside public sector bodies like the Inter-Agency Space Debris Coordination Committee, or IADC. Yet there is fragmentation within the community – between satellite operators in specific geographic regions, and between public- and private-sector decision-making bodies. What mechanisms can be developed to strengthen links and information sharing practices between them – and can a cooperative, association-based model help bridge the gaps?

Several times in these remarks I have referred to the increasing complexity of the space environment, and activities within it. That is a trend that is not likely to slow down. In fact we can see the outlines of a plausible future scenario of increasing complexity. Large LEO constellations will continue to deploy, with increasing launch rates and disposal/re-entry activity associated with that. We see planned - and speculative filings - at the ITU implying up to 1.8 million satellites by 2030. Over the last year we've seen a dramatic increase in interest in Orbital Data Center concepts, with a number of planned systems in various countries that would, if fully deployed, multiply the current total of operating satellites several times over. The current wave of ODC applications represents a shift in the scale of proposed satellite constellation operations. It is not merely an incremental expansion of existing LEO operations, but rather it raises novel technical, environmental, and governance considerations.

In this scenario the nexus of operational activity and experience shifts even more to the private sector. New actors continue to emerge, but very large constellations are the dominating factor in terms of number of objects. While GEO remains economically important, increasingly the hub of operations and business activity, is shifting to LEO, and to specific regimes within it. There is probably a diverse system of commercial SSA capabilities available in the market, including SSA information products offered by satellite operators themselves. We likely see a network of government operated space safety centers or systems in operation, but the balance of services that will be provided via these centers as a

public good versus a user-fee access model may be a point of debate. Operational exchange of space safety information continues to be supported by standards and a new layer of interoperability and coordination principles developed at the UN level.

A key aspect of space sustainability is the reality that the actions of one actor in the space domain can affect the ability of others to safely operate. Growing a space economy - and participation and access in it - will be easier if the environment is stable. The question I wish to leave you with is: In this future scenario - How can our current operational experience help us maintain that stability? What practices need to be scaled and what new capacity needs to be developed?