Information Sharing to Promote the Sustainability of Outer Space Activity:

Towards Development of a Model Agreement

SECURE
WORLD
FOUNDATION

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What's the problem?

- The collective action problem of reducing risk for space activities so that they continue to develop sustainably – and embody discovery and innovation.
- Space is an inherently harsh and risk-heavy environment.
- It's inherently difficult to control space objects.
  - Physically and virtually
  - From Earth and in space
- The critical dependence on cyber capabilities – with their own set of risks.
- With the increasing commercialization and militarization of outer space, intentional and hostile threats are increasing.
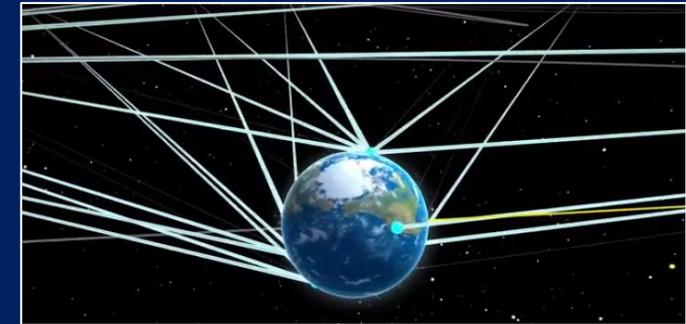- And…near-Earth space will become more and more crowded with space objects and debris.

The growing challenges of outer space activity urgently require an optimal understanding of the outer space environment.
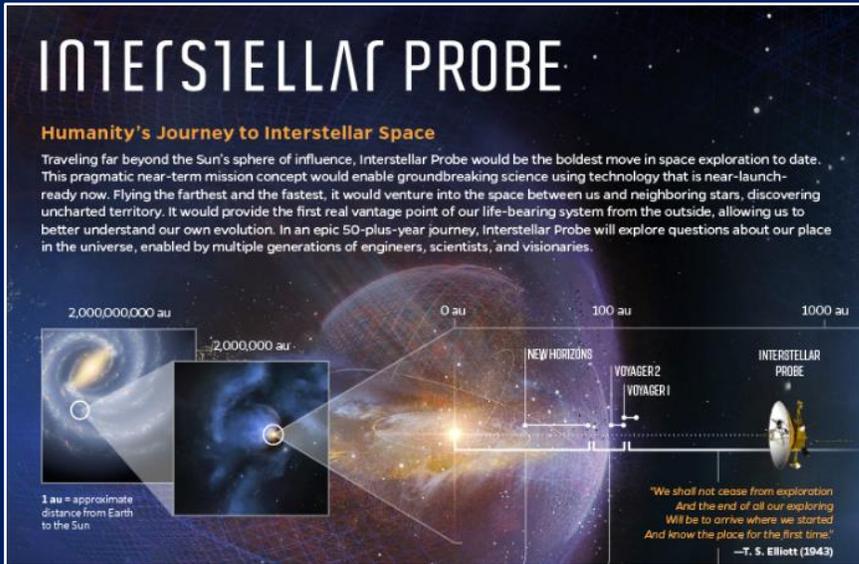
Interstellar probes

Mars rovers' scientific and technical transmissions

SSI – Solar System Internet

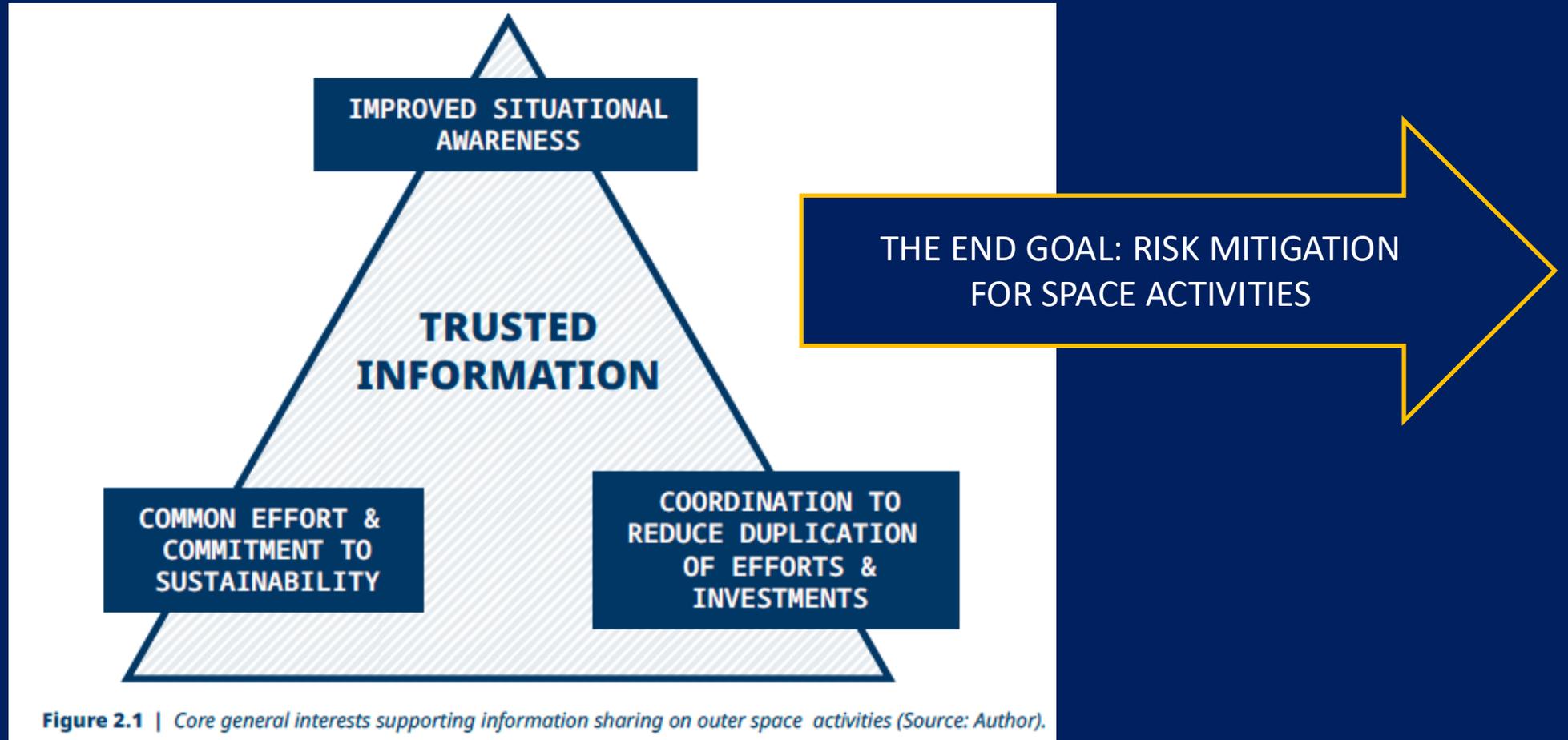
Planned International Lunar Research Station (2030s)

Lunar-based Data Centers

The premise of the research: sharing of information among space actors minimizes risk – when done effectively.

Figure 2.1 | Core general interests supporting information sharing on outer space activities (Source: Author).

Three topics

(1) Defining information sharing for space activities - and why it's critical for OS systems
- Real-time and actionable
- Short-to medium term
- Special characteristics

(2) Methodology and current trends
- Categories of platforms
- What's been the legacy situation?
- Current trends (Wayfinder)

(3) Main findings, conclusions and some ways forward
- Principles for a model IS agreement

Bottom lines

- ❖ Information sharing is no longer only a best practice, but rather a critical aspect of the feasibility and functionality of space activities.
- ❖ The IS process needs to be carefully managed in order to optimally incentivize and serve participants – hence the need to think about the critical elements of IS agreements.
- ❖ Given the increasing diversity of space actors, we need to invest thought, resources, and innovation in the ways to best incentivize IS, as a supporting pillar of space sustainability.
- ❖ Scalability of IS platforms is key, and standardized data formats and risk event codes will be come increasingly necessary to this process.

(1) Defining information sharing for space activities and why it's critical for OS systems

Defining information sharing for space activities

A familiar fundamental example of the IS principle:

> ### Article XI
>
> In order to promote international co-operation in the peaceful exploration and use of outer space, States Parties to the Treaty conducting activities in outer space, including the Moon and other celestial bodies, agree to inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities. On receiving the said information, the Secretary-General of the United Nations should be prepared to disseminate it immediately and effectively.

Registration Convention

→ Article II: National registry

→ Article III: Sec'y-Gen'l registry

The Report's working definition

Information sharing is a measure employed for the exchange of data deemed relevant by the sharing entities in a given domain of activity that is relevant to the resolution of a collective action problem.

The types of information shared include identification of entities' activities that have been pre-determined as of common interest, as well as potential vulnerabilities and risks to the sustainability of those activities.

The current academic and professional literature analysis of IS reflects a broad consensus that a critical level of trust is built over time when sharers exchange information that reliably brings them each some added value.

What do we mean by "information" sharing?

- This Report uses the term "information" to include more specific terms such as "data", "specifications", and "input"; and these latter terms may be used interchangeably with "information" herein.

- "Actionable" – immediately (72 hrs) or short-to-medium term (a few weeks)
  - Tactical rather than strategic

- Types (examples)
  - Conjunction data messages (CDMs)
  - Collision avoidance information
  - Re-entry trajectories
  - Debris path monitoring and alerts
  - Operator maneuver plans
  - Hazardous payloads

- Challenges to IS utilization and incentivization

NATIONAL SECURITY CONCERNS	BUSINESS AND COMMERCIAL CONSIDERATIONS
REGULATORY RESTRICTIONS	COSTS AND TRAINING

RELIABILITY AND INFORMATION SECURITY

(2) Methodology and current trends

IS for 5 categories of space activity

OVERALL SPACE DOMAIN AWARENESS

SPACE TRAFFIC COOR-DINATION

POST-MISSION DISPOSAL OF OBJECTS/ DEBRIS

LUNAR ACTIVITY

EARTH OBSER-VATION

overlap

- The concept of "space situational awareness" overarches all five types of platforms.

"[SSA] requires a network of globally distributed sensors as well as data sharing [...and it] forms the foundation of space sustainability as it enables safe and efficient space operations and promotes stability by reducing mishaps, misperceptions, and mistrust.

Ian Christensen and Victoria Samson, July 2024

#	Type and Name	Description	IS Formats Specified	Participation (Countries, Private Sector, Public)	Registration and/or Agreement	Actionability
		OVERALL SPACE DOMAIN AWARENESS (OSDA)				
1	UNOOSA Long-Term Sustainability of Outer Space Activities Information Repository	An open-source repository of information developed by the UN to build transparency, confidence, and capacity for long-term sustainability of OS activities. Registration of participants is required.	No	Countries, Private Sector, Public	No	Immediate, Short-to-Medium Term, Long-Term
2	ITU Space Sustainability Gateway	A comprehensive, diverse platform for space-related information, regularly updated by the ITU and its Radiocommunication Bureau. Information is also shared by Member States and other space stakeholders. Some access is restricted to Member States.	No	Countries, Private Sector	Yes	Short-to-Medium Term, Long-Term
3	Space ISAC	This industry-led platform focuses on space industry threats by monitoring and analyzing data about supply chain intrusions, space weather events, cyber threats, and other risks based on industry-to-industry intelligence, as well as IS with U.S. government. Participation is fee-based.	No	Private Sector	Yes	Immediate, Short-to-Medium Term
4	NATO Alliance Persistent Surveillance from Space (APSS)	APSS is notable for its creation of the Aquila "virtual constellation" of both national and commercial satellites from which a diverse range of information flows into a single IS platform. Currently, 17 NATO countries have signed the APSS MoU, and since 2025, NATO has been considering the inclusion of vetted private companies[TT3]. The nature of data shared on the APSS platform is not publicly available.	No	Countries	Yes	NS (Not Specified)
5	EU Space ISAC	This Information Sharing and Analysis Centre was established to provide the required IS in the space sector under EU regulation, specifically the Network and Information Security Directive (NIS2) under which the ground segment of the space sector is a designated critical infrastructure ("Sector of high criticality"). The proposed EU Space Act also refers to it as part of organizations' compliance with EU space law. Participation is limited to EU entities at present, but may require non-EU space providers' participation under the eventual Space Act.	Yes	Countries, Private Sector	Yes	Immediate, Short-to-Medium Term, Long-Term
		SPACE TRAFFIC COORDINATION				
6	LeoLabs Space Traffic Management	A private-sector global provider of space traffic management services in the LEO orbit to both government entities and commercial entities. Services include real-time conjunction data messaging, ephemeris (orbital) screening, identification of abnormal space object behavior, and space situational awareness using AI capabilities. Tracking support is provided using the proprietary Global Radar Network. Its satellite tracking catalogue contains 25,000 LEO space objects.	Yes	Countries, Private Sector	Yes	Immediate, Short-to-Medium Term
7	Space Data Association (SDA)	This platform supports entity-to-entity IS by collating vetted operator data in its Space Data Center that utilizes a secure machine-to-machine interface to share operational data between IS participants and redistribute it. SDA also maintains vetted contact data for specific space objects, including authoritative "points of contact" for each satellite operator to simplify coordination for collision-avoidance or radio frequency interference (RFI) mitigation.	Yes	Private Sector	Yes	NS (Not Specified)
8	TraCSS	Through the U.S. Office of Space Commerce, TraCSS has been mandated to provide space traffic safety data and services to support spaceflight safety to commercial and other private-sector space operators (both U.S. and other nations). This data will include real-time potential conjunction alerts, launch collision avoidance analysis, re-entry information, space weather data, and modeling and simulation (M&S) functionality.	Yes	Countries, Private Sector	Yes	Immediate, Short-to-Medium Term
9	Spacetalk	This collaborative communication platform serves as a hub for vetted space actors to transparently share their orbital data, space debris data, trajectory information, space object status, and maneuvering intentions. The platform itself does not provide independent assessments of collision or other space risks, leaving that aspect to the sharing entities themselves. Sharers communicate directly on the platform and may respond with direct communications to the platform as a whole or to a single user, and data is actionable in real time. Membership is open to nation-states, international organizations, and private companies.	Yes	Countries, Private Sector, Public	Yes	Immediate, Short-to-Medium Term
10	European Union Space Surveillance and Tracking	The EU SST Service Provision Portal is operated by EUSPA and 15 EU countries providing IS for approximately 500 space objects to assess the risk of in-orbit collisions and fragmentation, uncontrolled re-entry of space debris, space weather emergencies, and asteroid and comet Earth-approaches. Real-time collision avoidance support is provided to participants. The platform is open to EU-based sharers only at present.	Yes	Countries	Yes	Immediate, Short-to-Medium Term

LEGEND: ✓ Yes   ✗ No   🚩 Countries Participation   🏭 Private Sector Participation   👥 Public Participation   ◯ Immediate   ◖ Short-to-Medium Term   ● Long-Term   NS Not Specified

Space ISAC

This industry-led platform supports the Space Information Sharing and Analysis Center, which focuses on helping the space sector prepare for and respond to vulnerabilities, incidents, and threats by disseminating timely, actionable information among its members. Established in 2019, Space ISAC enables global commercial space service providers to share intelligence on supply chai[...] weather events, cyber threats, and other operational risks. [...] between industry members and U.S. government authoriti[...] classified or sensitive-but-shareable insights through the S[...] Participating agencies include NASA, the National Security [...] Reconnaissance Office, the National Oceanic and Atmosphe[...] the Department of State, the Missile Defense Agency, the O[...] National Intelligence, U.S. Space Command, and the U.S. Sp[...] also organizes communities of interest tailored to specific [...] as the LEO satellite operators' group created in 2024.[50] Its W[...] the Information Sharing Working Group, develop best prac[...] templates for participants. Access to the platform is restrict[...] industry members who sign an IS agreement, and sharers'[...] according to membership category.[51] See **Figure 5.1** below [...] IS participants via Space ISAC.

Space ISAC Members

- LAUNCH
- COMMUNICATIONS
- SPACE VEHICLES
- SPACE SYSTEMS ENGINEERING
- PAYLOAD DESIGNERS
- CYBERSECURITY
- CLOUD AND DATA PROCESSING

THREATS
INCIDENTS
VULNERABILTIES

SPACE ISAC
INFORMATION SHARING PORTAL

Partner Agencies

Alerts
Recommendations
Standards
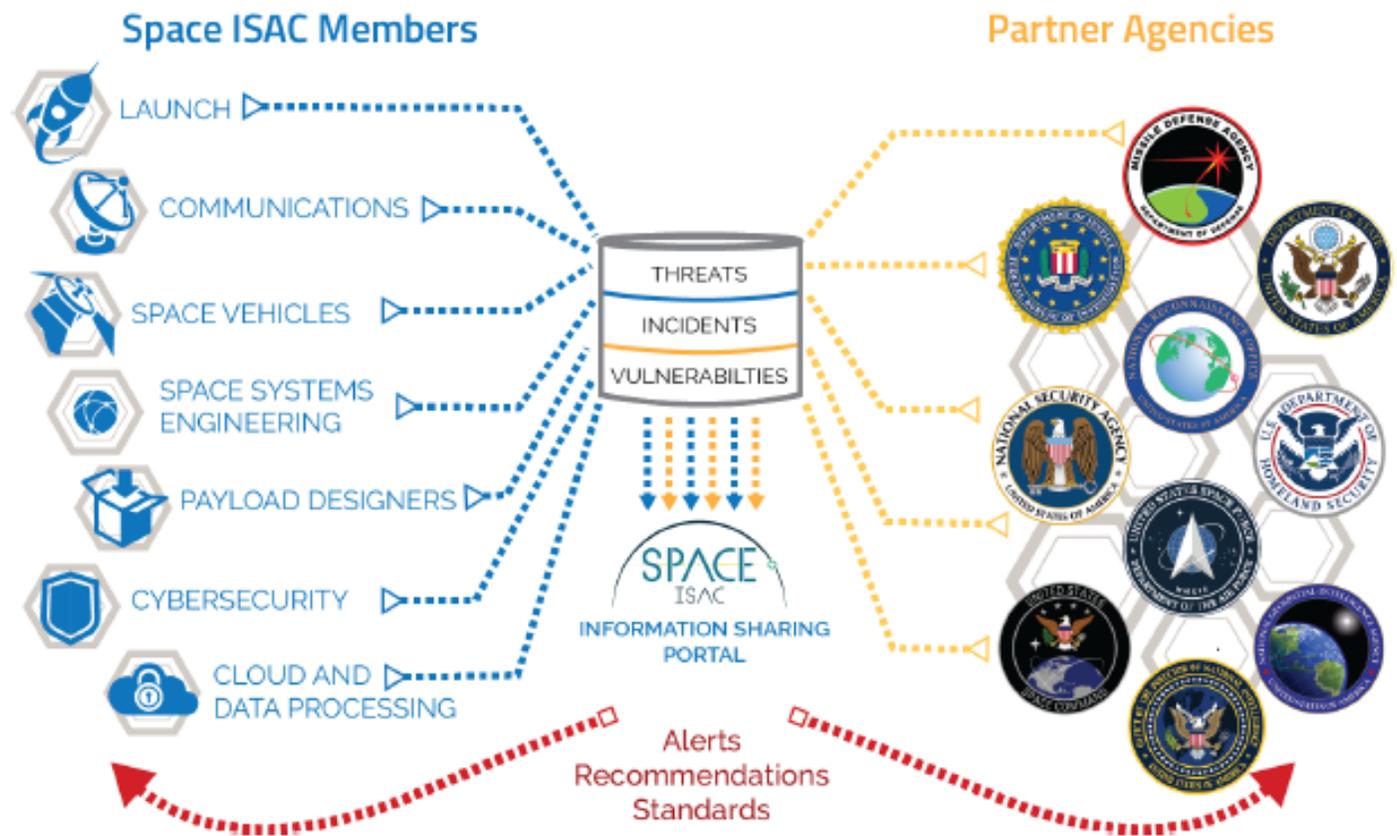
Figure 5.1 | *Information Sharing Ecosystem. Credit: Space ISAC*

WAYFINDER

PRIVATEER

Search

Objects List

	NAME	TYPE	NORAD ID			
☐	STARLINK-34950	ACTIVE	65193			

Search

See Only Objects in Objects List ⬤

STARLINK-34950 ⌄

Filters

Layers

Shortcuts

Objects List

Crow's Nest

Glint Evader

Reset View

GMT+2
13:47:27
Ω
OMEGA
Speedmaster
FEB 17 2026

LIVE ⏸ ⏩ ⏭

Feb 17 2026 13:35:00.000

KMI
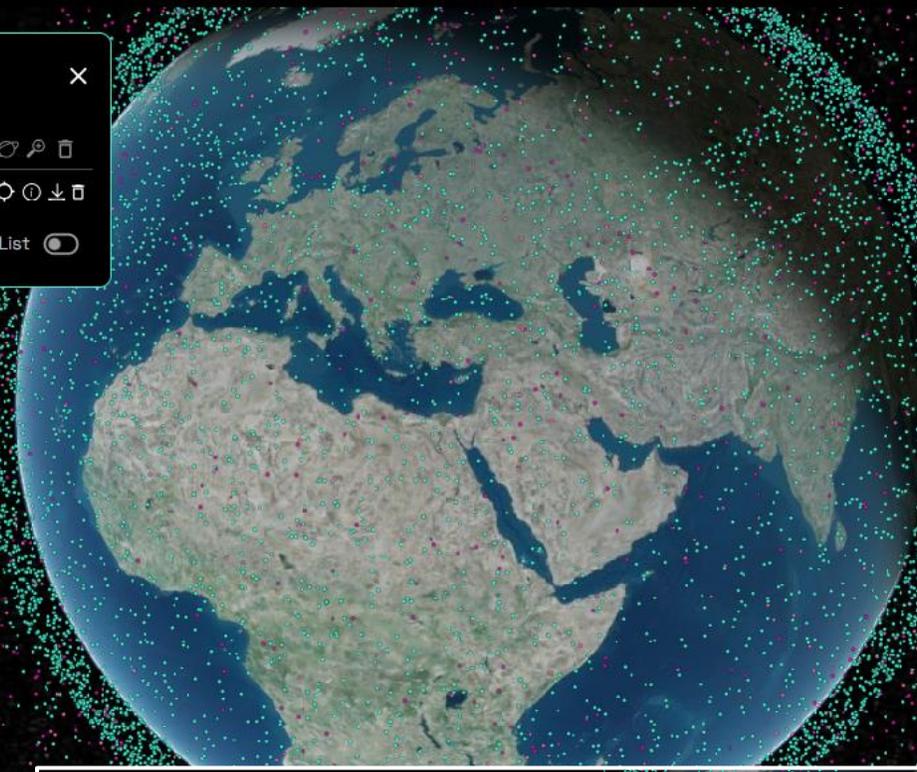
LEGEND

☐ ●	Active Satellite	(14816)

SPACE JUNK

☐ ●	Inactive Satellite	(2886)
☐ ●	Uncategorized	(14758)
☐ ●	Rocket Body	(2132)
☐ ●	Debris	(9606)

Crow's Nest

Want to be the first to know when new Crow's Nest features go live? Sign up here.

Time (Local)	Object 1	Object 2	Probability 2D*	Probability 3D*	Rel. Velocity [m/s]	Distance [m]	
2026-02-18T18:35:49.534	STARLINK-34262	STARLINK-35545	3.680334e-3	3.680336e-3	2452.2201	74.3802	ⓘ 🔍
2026-02-18T05:12:27.478	STARLINK-32695	STARLINK-35525	3.370743e-3	3.370805e-3	8578.3997	144.6184	ⓘ 🔍
2026-02-18T12:38:30.651	STARLINK-33751	STARLINK-34276	3.130073e-3	3.130086e-3	2481.5273	87.2499	ⓘ 🔍
2026-02-18T08:07:54.097	STARLINK-3717	STARLINK-4523	2.730843e-3	2.730805e-3	4657.3027	125.3388	ⓘ 🔍
2026-02-18T18:52:00.368	STARLINK-4200	STARLINK-4265	2.302246e-3	2.302271e-3	6980.8686	120.5936	ⓘ 🔍
2026-02-18T17:59:56.262	NETSAT-1	STARLINK-32465	2.111632e-3	2.111670e-3	14247.7040	55.5402	ⓘ 🔍
2026-02-18T06:43:14.790	STARLINK-2141	STARLINK-2521	2.098665e-3	2.098673e-3	8670.1605	100.7330	ⓘ 🔍
2026-02-18T05:08:43.186	STARLINK-3394	STARLINK-3551	1.979318e-3	1.979315e-3	6967.8113	83.7304	ⓘ 🔍

(3) Main findings, conclusions and some ways forward

- **Innovations.** Tailored user interfaces that are interactive and map-based, supporting ease of use; near-real-time aggregation of critical information; real-time alerts on space-based risks that may be calibrated to the requirements of specific platform tiers and sharers; direct communications between space actors and the platform, in addition to "pushed" data supplied by the platform; robust integration of space- and Earth-based data sources; deployment of dedicated AI.

- **IS incentives are shifting.** Commercial IS platforms offer marketing incentives; new economic models for information sharing, as well as IP protection incentives for privately-produced catalogues of space objects / vulnerabilities; different regulatory approaches:

    – The EU requires IS for space activities via regulation (NIS2 and the EU Space Act);
    – White House Executive Order of 18 December 2025 (*Ensuring American Space Superiority*, Section 4) may entail user fees or other charges associated with formerly free-of-charge SSA and STM data.

- **Current data formatting efforts are fragmented, hampering scalability.** Legacy formats v. innovative; space-specific standards exist but are not universally adopted; new proprietary formatting' lunar-specific IS. There are good initiatives, yet they're less coordinated than they could be.

- **Hidden actors.** Military and national security actors in space (largely exempt from OST / ITU notifications); and space insurers are space ecosystem actors which tend not to share the valuable information they gather.

A model IS agreement: structure and guiding principles

GOV'T / MILITARY INPUTS

IS platform facilitator (public sector, commercial entity, hybrid)

IS AGREEMENT

Platform participants/ sharers

GENERIC TERMS OF USE DOCUMENT – MAY BE PUBLIC

USER-SPECIFIC SERVICE CON-FIGURATION DOCUMENT - CONFIDENTIAL
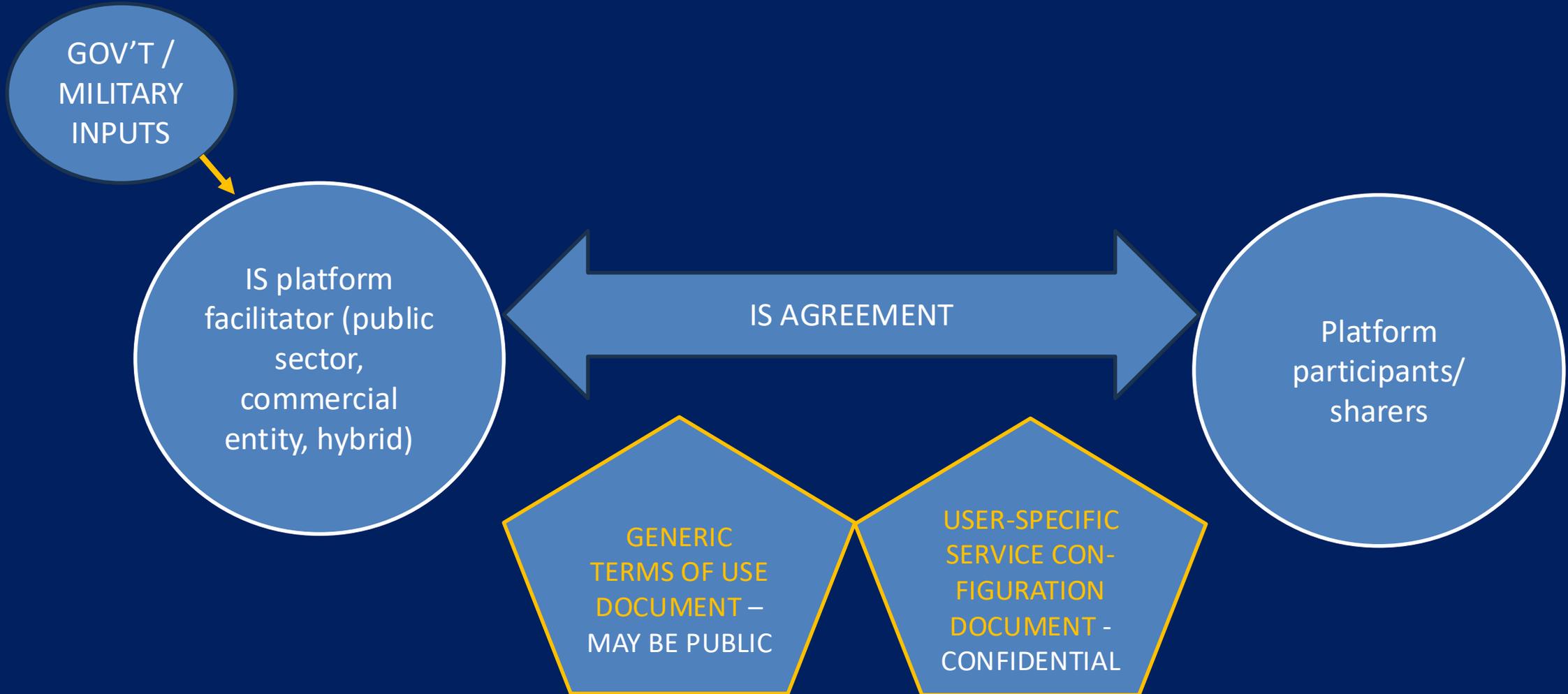
A model IS agreement: structure and guiding principles (2)

(1) Clear rules and thresholds for sharing.

(2) Pre-defined types of data to be shared in all directions (platform-to-participant, participant-to-platform, among participants), including anticipated uses.

❖ Standardized formats and event coding.

(3) Trusted vetting of all participants.

(4) Information security is be transparent to participants and complies with accepted, space-specific standards.

(5) Utilization of the platform is supported outside of real-time use by guidance, training, meetups, and tabletop exercises.

EU Space ISAC, *Terms of Reference*, version 3.0, 16 April 2024

5. Obligations in the context of the EU SPACE ISAC

1. Each Participant shall endorse the present ToR, thus committing to comply with the enclosed provisions.

2. Each Participant shall ensure that its Representative(s) comply with the obligations specified in this document.

3. Each Participant (both Representatives and Experts) and Guest shall maintain the trusted and secured environment of the EU SPACE ISAC – including by respecting the rules for information sharing (as stated under section 10) and for the protection of intellectual property (as stated under section 11).

4. Each Participant shall actively participate in the EU SPACE ISAC and bring added value in a manner that is coherent with its core business and proportionate with its resources.

5. Each Participant and its Representative(s) shall comply with the EU SPACE ISAC Code of Conduct defined by the Board.

6. Each Participant shall ensure that any communication related to the EU SPACE ISAC is aligned with the strategic objectives of the EU SPACE ISAC. To this end, communication and outreach efforts should be coordinated with the Board to ensure consistent messaging and alignment with applicable provisions included in the Code of Conduct.

7. In addition to the above obligations, each Member shall attend at least one General Meeting every year (see section 7.4).

10. Information sharing

10.1 General rules for information sharing

Information sharing in the framework of the EU SPACE ISAC shall respect by the following guidelines:

1. Only **UNCLASSIFIED** information shall be handled within the EU SPACE ISAC. It is the responsibility of every Participants to ensure that no classified information is shared.

2. The security and integrity of information and data shared within the EU SPACE ISAC shall be preserved.

3. Any information or data shared within the EU SPACE ISAC shall be used only to reach the objectives of the EU SPACE ISAC.

4. To enforce the need-to-know principle and secure data accordingly, different means of protection can be defined and used (e.g. encryption). A non-disclosure agreement shall be signed by all Participants to the EU SPACE ISAC.

5. Any corporate marking that would be specific to a Participant and would figure on a document shared for information purposes shall never be removed or modified. While working on common/shared deliverables within the EU SPACE ISAC, no corporate marking can be used. It is up to each Participant to add its specific marking on the common deliverable while circulating it within its company.

6. For activities of the EU SPACE ISAC, Participants shall use the virtual platform, cloud and communication channels made available by the EU SPACE ISAC.

7. If Members are willing to share security incidents and/or other similar information, they shall define and implement a data rating system (based on timeliness, relevancy, actionability and context incl. the source considerations).

8. Information shared within the EU SPACE ISAC shall be anonymised as much as possible.

9. Any sharing of personal information can only be done in accordance with applicable data protection regulations and following the principles of limitation and minimisation.
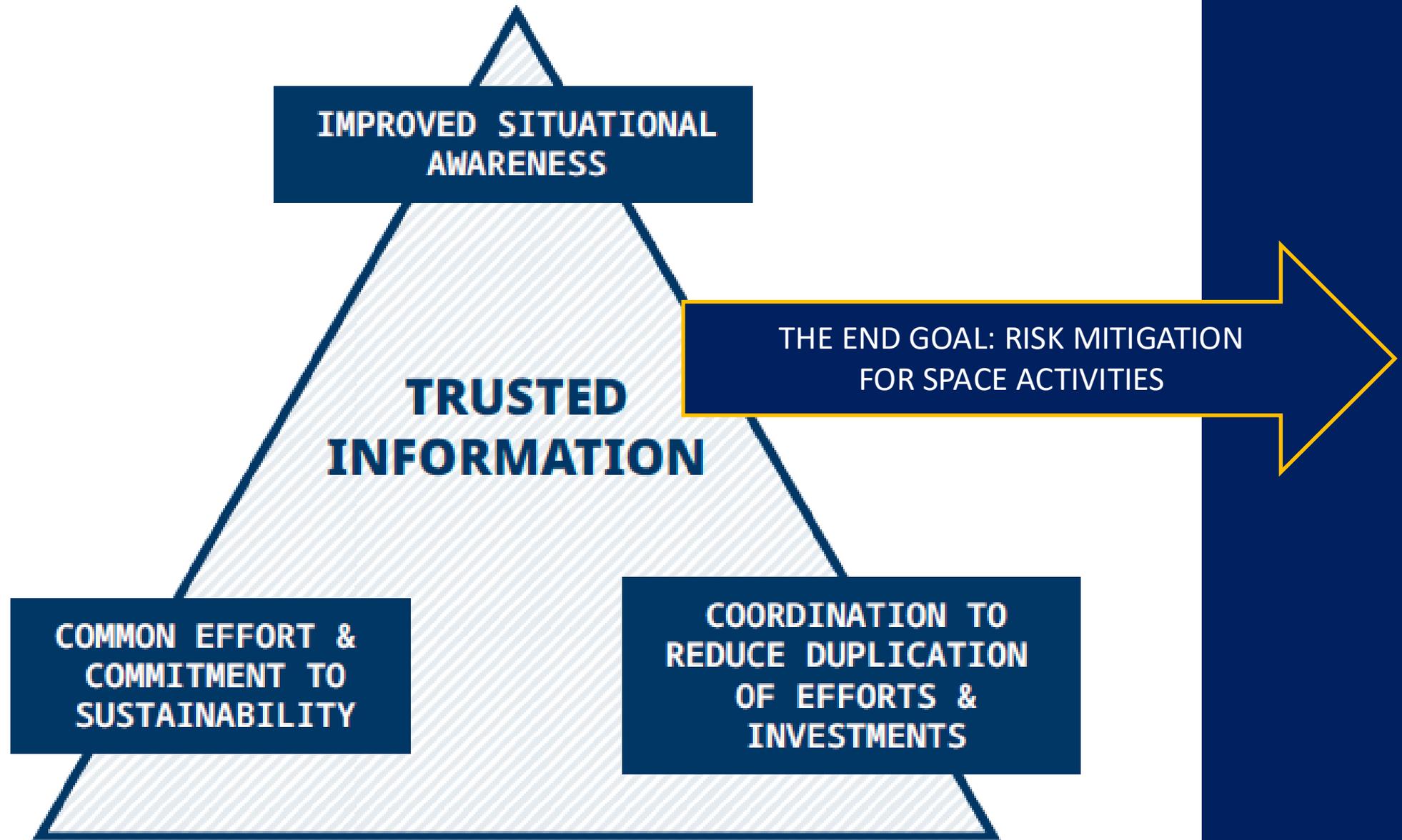
Figure 2.1 | *Core general interests supporting information sharing on outer space activities (Source: Author).*

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❖The IS process needs to be carefully managed in order to optimally incentivize and serve participants – hence the need to think about the critical elements of IS agreements.

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THANK YOU - ANY QUESTIONS?

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