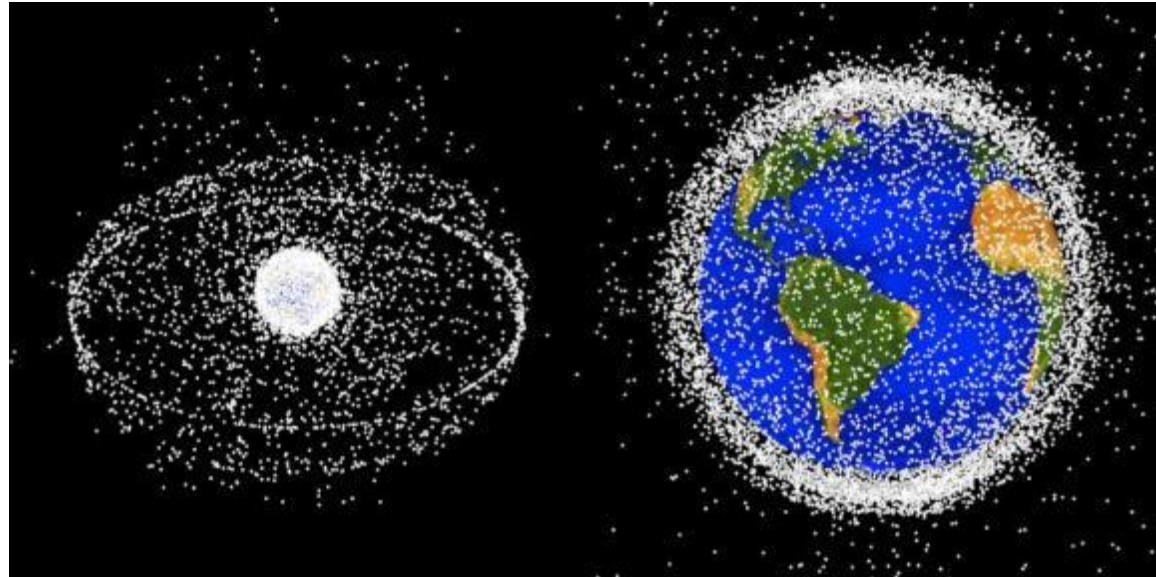


To Infinity & Beyond! But Who's Going To Take Out The Trash?



Professor Michael Mainelli

Chairman, Z/Yen Group; President, London Chamber of Commerce & Industry
Late Lord Mayor of London 2023-2024

Aircraft Builders Council Annual Conference
Monday, 15 September 2025, Austin, Texas USA

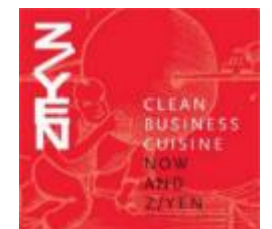
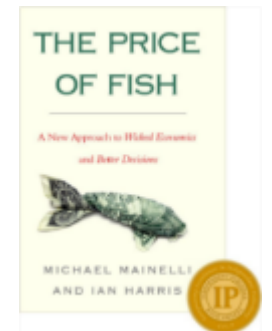
michael_mainelli@zyen.com
www.zyen.com

Z/Yen Group

**“City of London’s leading commercial think-tank that
spots, solves, and acts”**

Zen & Yen – “a philosophical desire to succeed” – a ratio recognising that all decisions are trade-offs

- Services – projects, strategy, expertise on demand, analytics, modern systems
- Sectors – technology, finance, government, voluntary, professional services, outsourcing
- Research – scientific, information technology, markets, commercial centres
- Commercial centre development - Global Financial Centres, Smart Centres, and Global Green Finance indices



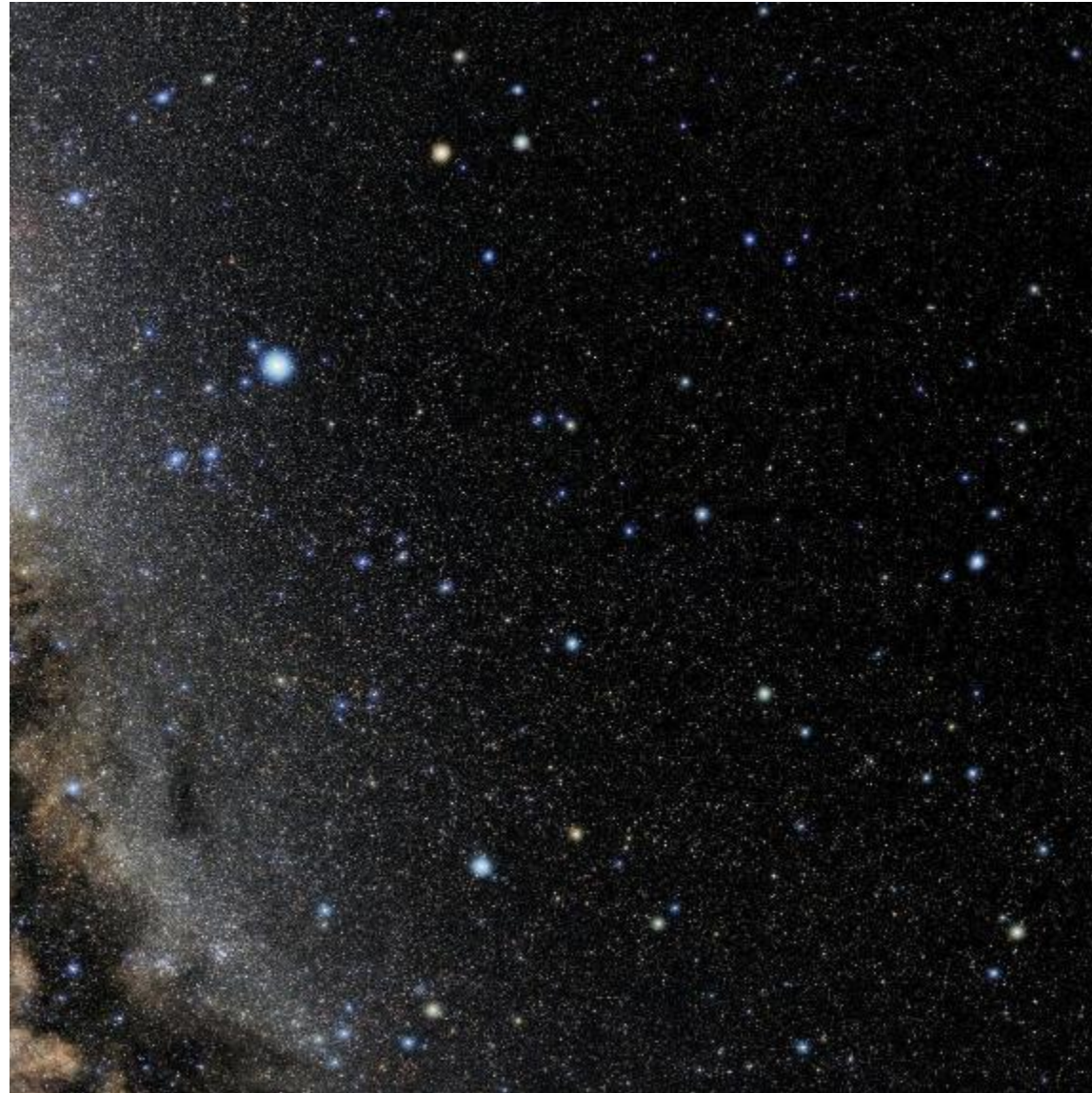
Connect To Prosper



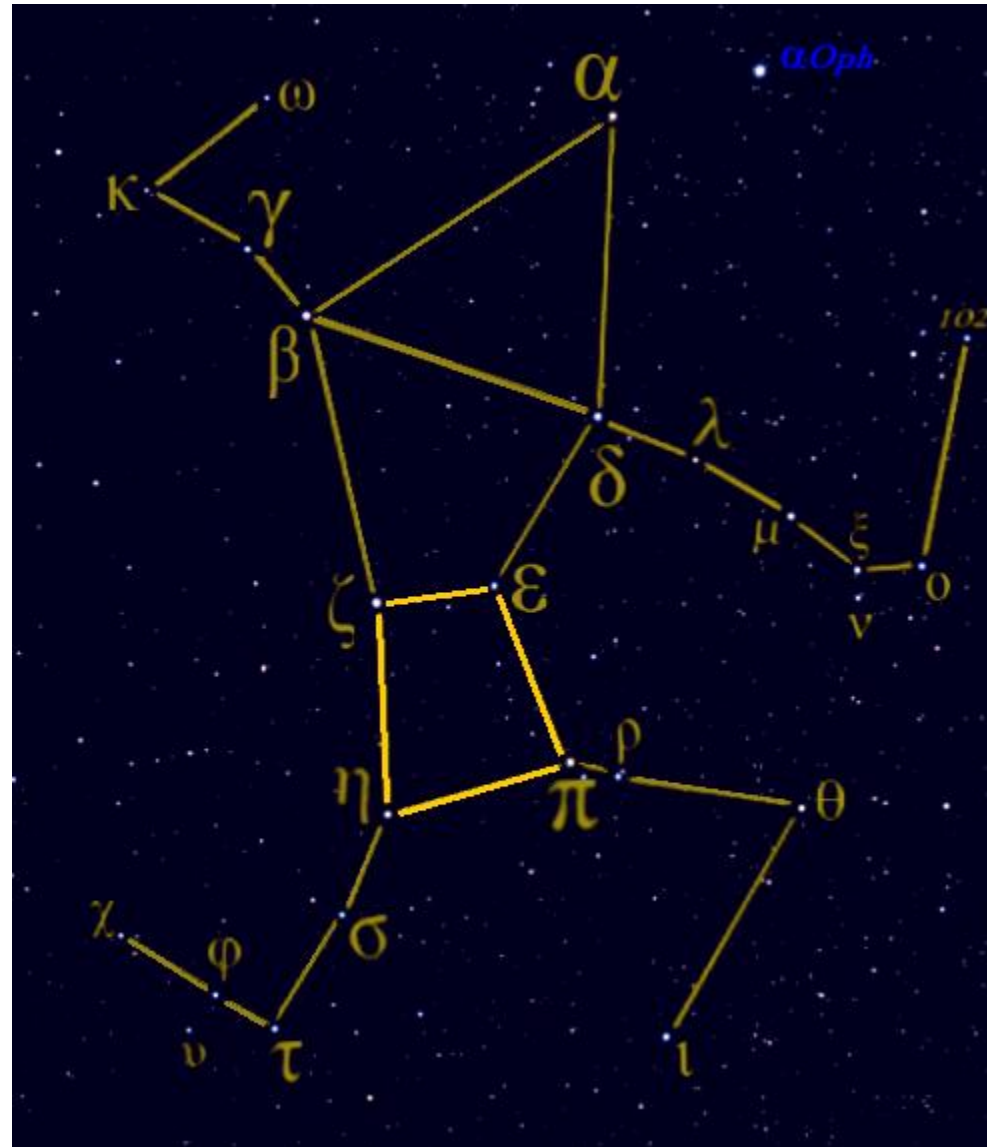
“Celebrating the many knowledge miles that flow through the square mile, the world’s coffee house”

- **695th Lord Mayor’s Space Protection Initiative – a combined technology and financial services initiative to use space debris retrieval insurance bonds and other financial instruments to keep space ‘clutter free’ in aid of meeting 40% of the UN’s Sustainable Development Goals**
- 695th Lord Mayor’s Ethical AI Initiative - promoting ISO 42001 and related AI standards
- 695th Lord Mayor’s Constructing Science: Offices to Labs Initiative – promoting the international standard for converting offices to life sciences facilities, both in London and worldwide.
- 695th Lord Mayor’s Sustainability Initiative – crossing ETS markets with voluntary carbon
- 695th Lord Mayor’s Smart Economy Networks Initiative - promoting X-Road standards
- GALENOS – developing mental health pre-print and ontology standards

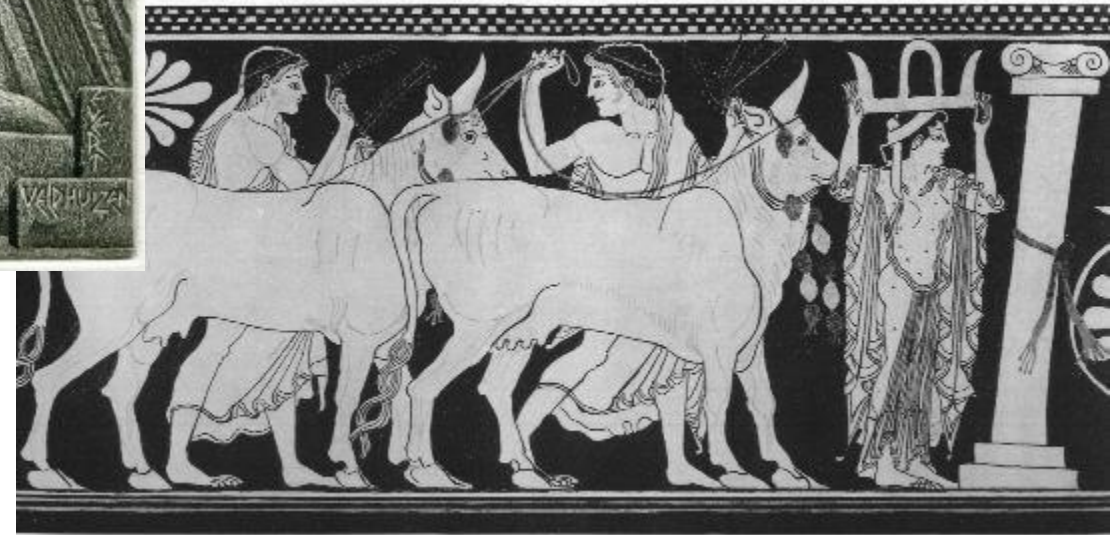
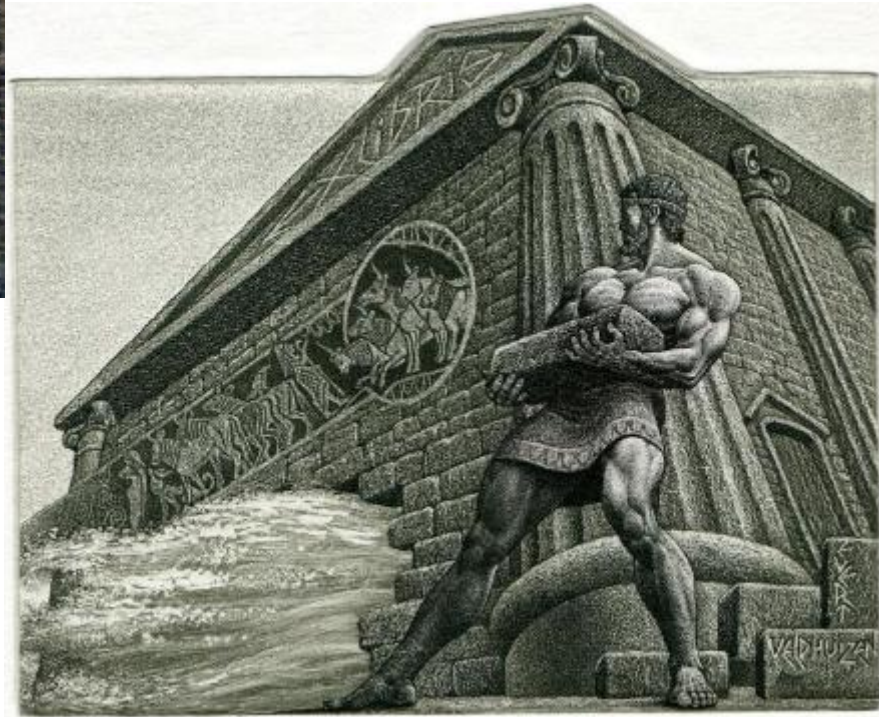
What Do You See?



What Do You See Now?



Why Am I Showing You Stars?



Agenda

- What is the space junk problem?
- Why should a Lord Mayor care?
- How did we address the problem?
- What have we achieved so far?
- What is our goal and how can you help?

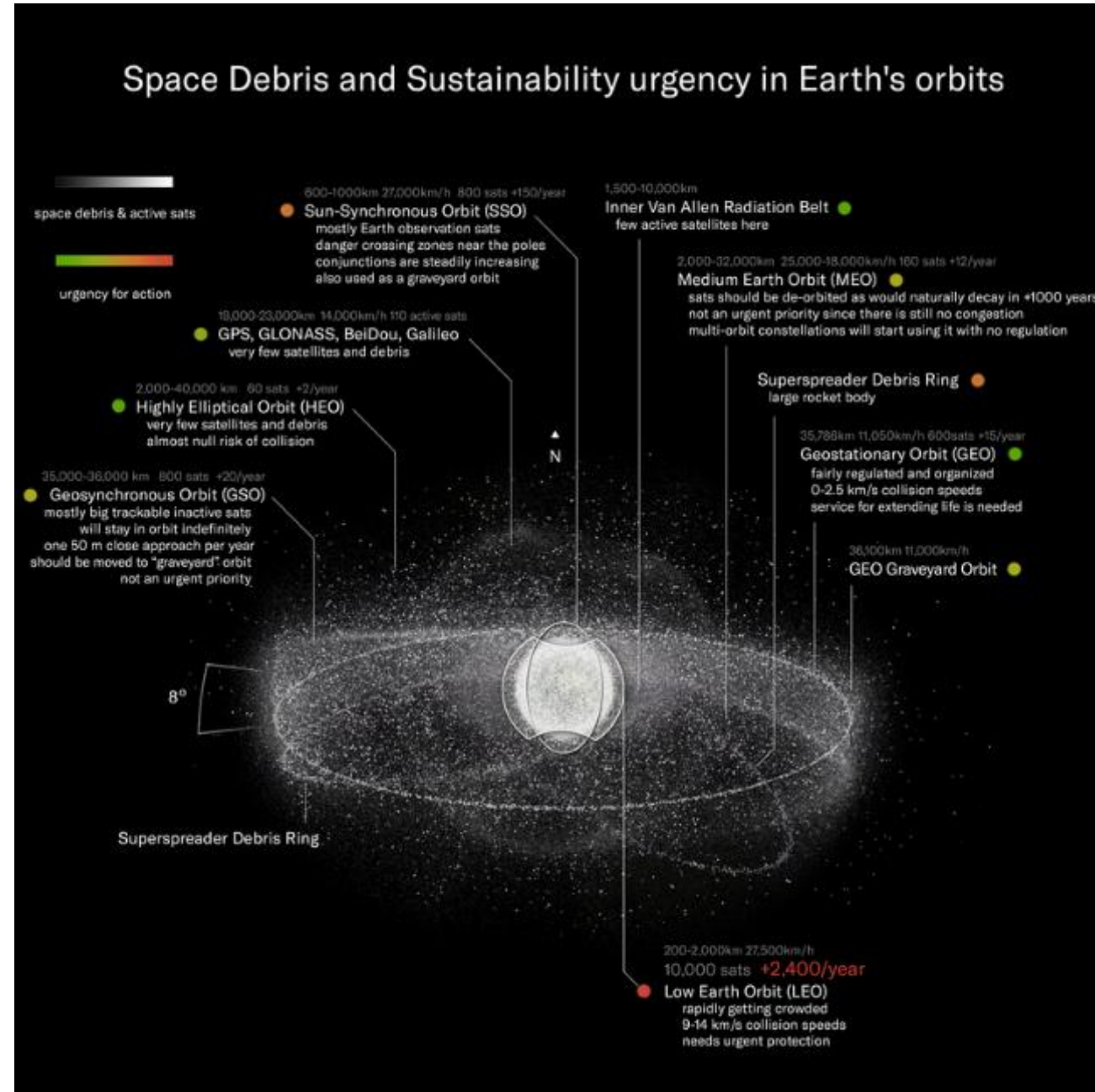


Space – The Essential Frontier

- 17 Sustainable Development Goals – 65 out of 169 of the sub-goals (38.5%) cannot be met without space for positioning, telemetry, and observation
- Shipping and aviation – 90% of global trade, 10.7% of global gdp
- Defence – ‘trigger happy’ if you can’t see what the neighbours are doing
- Investment - \$50bn of private capital since 2015 not going to be sent up ‘to be shredded’

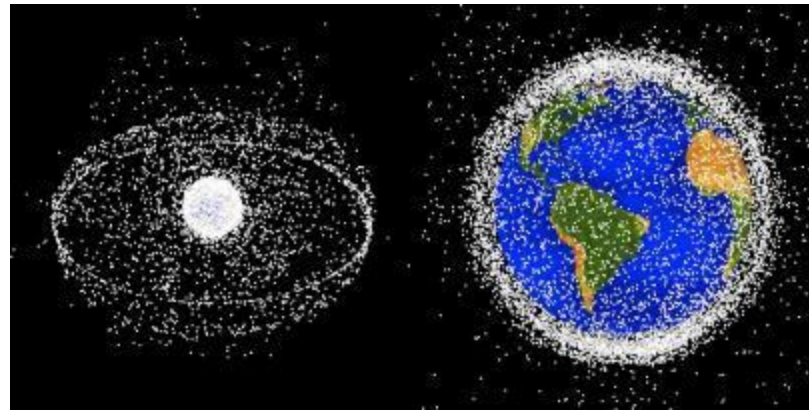


Space Junk - "Houston, we've had a problem here"



By The Numbers

- Number of rocket launches since 1957 - about 7,010 (excluding failures)
- Number of satellites these rocket launches have placed into Earth orbit - about 23,030
- Number of these still in space - about 15,280
- Number of these still functioning - about 12,500
- Number of space objects tracked by Space Surveillance Networks - about 42,930
- Number of break-ups, explosions, collisions, or fragmentation events - more than 650
- Number of objects estimated to be in orbit – 54,000 space objects greater than 10 cm (including 9,300 active payloads)
- 1.2 million space debris objects from greater than 1 cm to 10 cm
- 140 million space debris objects from greater than 1 mm to 1 cm
- Total mass of all space objects in Earth orbit - more than 14,700 tonnes



Elinor Ostrom – Self-regulation, Carrots & Sticks



(1)

**STRONG GROUP
IDENTITY AND
UNDERSTANDING
OF PURPOSE**



(2)

**FAIR
DISTRIBUTION
OF COSTS
AND BENEFITS**



(3)

**FAIR AND
INCLUSIVE
DECISION
MAKING**



(4)

**MONITORING
AGREED
UPON
BEHAVIORS**



(5)

**GRADUATED
SANCTIONS FOR
MISBEHAVIORS**



(6)

**FAST AND
FAIR
CONFLICT
RESOLUTION**



(7)

**AUTHORITY
TO
SELF-GOVERN**



(8)

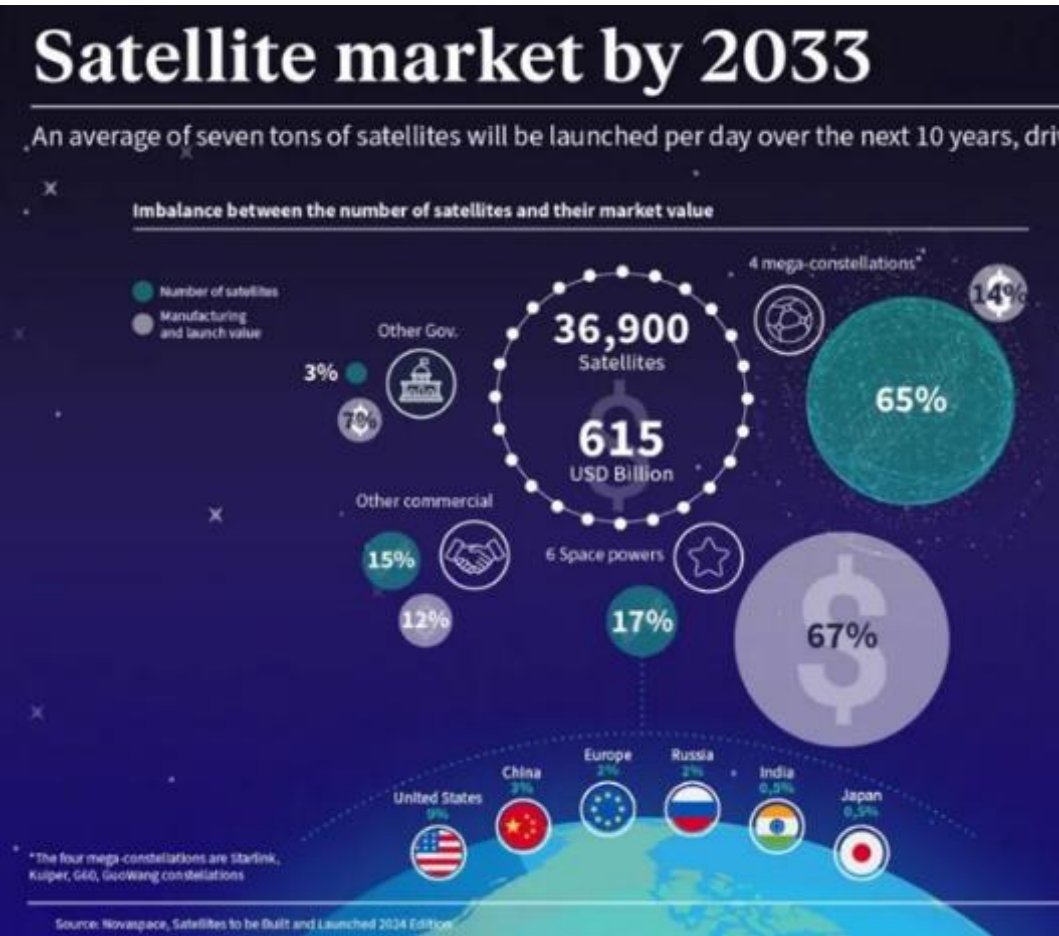
**APPROPRIATE
RELATIONS
WITH
OTHER GROUPS**

Why Should A Lord Mayor Care?

- Defence
- Rule of Law
- Open trade
- Access to skills & talent



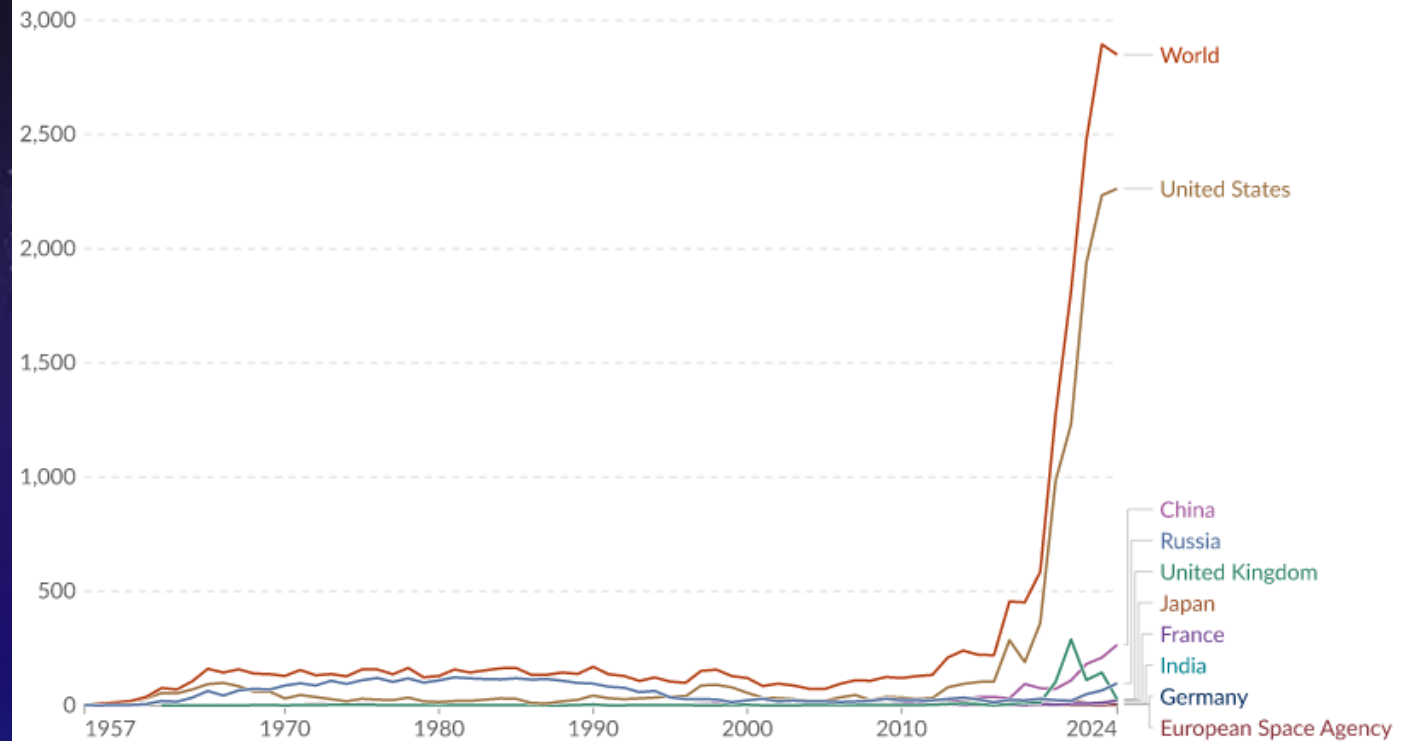
Follow The Money



Source: Nova.Space.com

Annual number of objects launched into space

This includes satellites, probes, landers, crewed spacecrafts, and space station flight elements launched into Earth orbit or beyond.



Data source: United Nations Office for Outer Space Affairs (2025)

OurWorldinData.org/space-exploration-satellites | CC BY

Note: Where they differ, launch attributions are based on the commissioning country, not the country conducting the operations.

Insurance Is The Key

“No plane would fly, no ship would sail, no bridge be built, no house be bought without insurance”

In conversation with a senior insurance professional



Look Around

- Space debris problem recognised - in 2022, The King (as The Prince of Wales) announced an ambition for his Sustainable Markets Initiative to create an 'Astra Carta' to act as a framework to inspire sustainability across the space industry, launched June 2023
- X-Prize developing competition awards
- Technical standards being deployed, aiming to go from 2.5% problem missions to 1% - though problem still grows
- Investment analysts increasingly asking questions about debris and Kessler syndrome/events



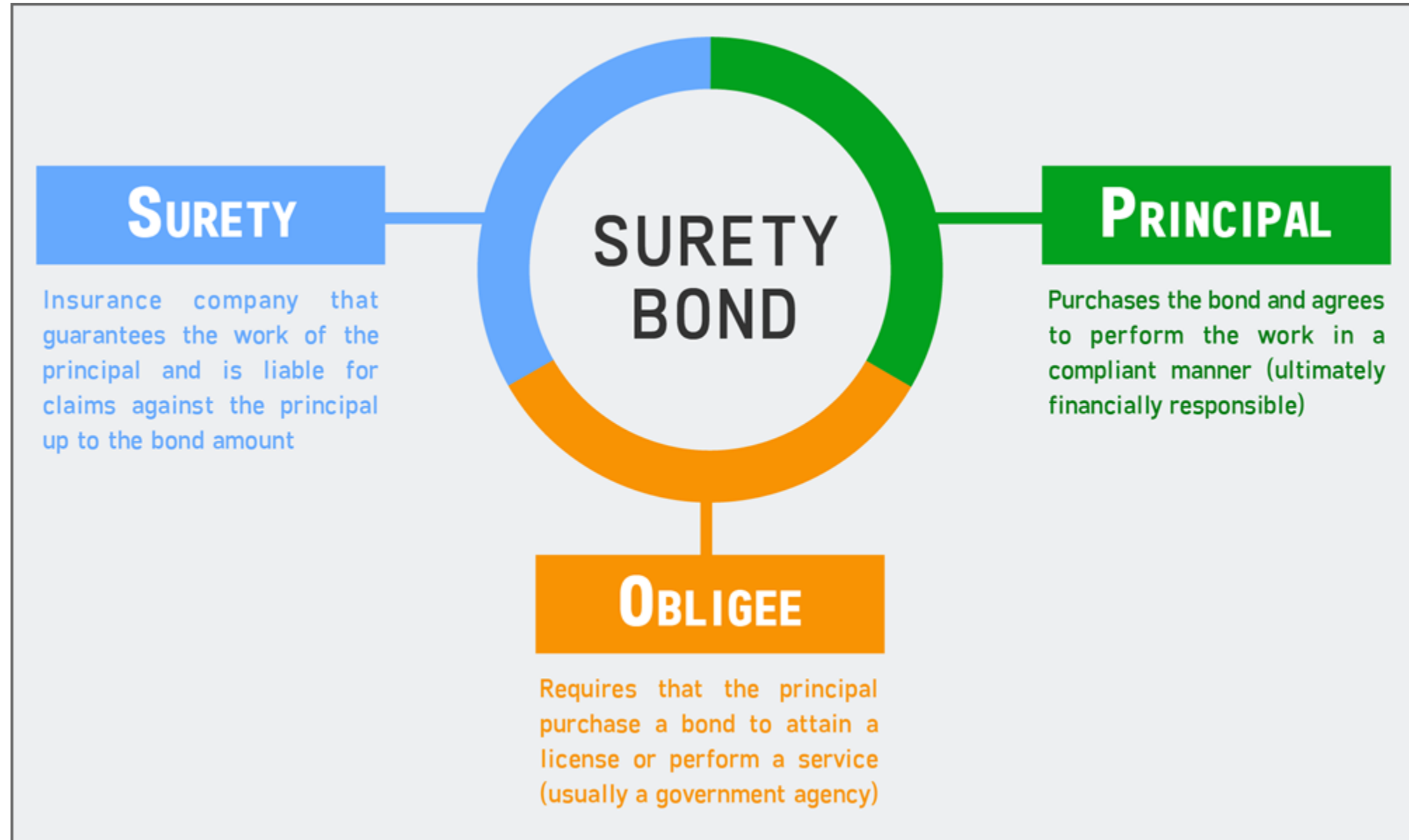
Look Ahead

- **Astroscale**: missions to culminate in 2026 with a demonstration of the US, UK, and Japan capability to rendezvous, dock with, and deorbit
- **ClearSpace-1**: commissioned by the European Space Agency (ESA), this mission will use a robotic arm to capture and de-orbit a derelict satellite from a congested region of LEO.
- **RemoveDEBRIS**: co-funded by the European Commission, successfully demonstrated technologies like nets and harpoons for capturing space debris in orbit.
- **ESA's e.Deorbit**: early mission concept that explored using robotic arms and nets to capture large debris objects.
- **ESA's CAT Mission**: demonstrate active debris removal technology rendezvousing with and capturing a standardized interface, **MICE**, on a target spacecraft.

*Design first,
standardised interfaces second,
then robotic arms, nets, harpoons, laser momentum transfer, foams,
...*



How Did We Address The Problem?



Progress So Far – Insurance

The Lloyd's & London Market has offered sufficient financial capacity. Six major underwriters in the global insurance market have put forward an 'Invitation to Treat' via AHJ Miller for up to US\$500 million per operator, so long as:

- “a spacecraft company clearly demonstrates it can de-orbit third party space debris”
- “the agencies regulating space launch make Spadribs mandatory”



AHJ Miller

Progress So Far - Industry

- Tokio Marine
- Facet Underwriting
- D-Orbit
- Shetland Space Centre, SaxaVord
- Space Port
- MIT Media Lab
- London Space Innovation Centre,
- Axion Capital
- DWC Space
- Astroscale UK
- World Economic Forum
- Seraphim Space
- Space Solar
- The D Group
- NewSpace Capital
- GHGSat



27 June 2024,
15:00 - 15:45

[Waste Of Space: The Problem With Space Debris
And The Challenges And Opportunities Associated
With Solving It](#)

Graham
Turnock

European
Space Agency

Webinar

12 June 2024,
11:00 - 11:45

[Clear Skies Ahead: Funding Space Debris Clean-up
Through An Offset Market](#)

Matthew
Wills

Sustain Space
Ltd

Webinar

Progress So Far - Governments

56 nations of the Commonwealth



Project Milestone Summary

- **5 October 2023** “*The 695th Lord Mayor’s Space Protection Initiative*” was launched at the International Astronautical Congress (IAC 2023) - [In-Orbit Servicing & Insurance Markets: A Symbiotic Approach](#)
- **5 December 2023** the Lord Mayor and Astroscale UK, host discussion of the opportunity for developing novel finance and insurance products to address the critical challenge of space debris.
- **6 January 2024** AHJ Miller provides ‘invitation to treat letter’ from six underwriters
- **17 January 2024** discussions continued at the World Economic Forum in Davos
- **April 2024** publication of World Economic Forum Report
- **5 June 2024** SPADRIBs were the focus of the Lord Mayor’s Science & Innovation banquet which saw Professor Manahel Thabet launch Commonwealth Space Collaboration Initiative, whilst Baroness Patricia Scotland, Secretary General of the Commonwealth of Nations, pledged the support of the 56 nations to the SPADRIBs initiative, publication of “[CommonSpace: Making Space Work For All](#)”
- **6 June 2024** World Economic Forum workshop at Mansion House, “[Financial Space Debris Mechanisms](#)”
- **October 2024** Commonwealth Heads of Government Meeting (CHOGM), Samoa
- **November 2024** United Nations General Assembly submission by Commonwealth
- **2025** ... several UN and Commonwealth agreements



What Is Our Goal?

To get the G7/G20 to announce:

“SPADRIBs will be a condition of launch from 202X”

“It is our intention that governments will require proof of adequate financial means for retiring unused satellite and launch vehicle materials before permitting launch, orbit, registration, or ground station use.”

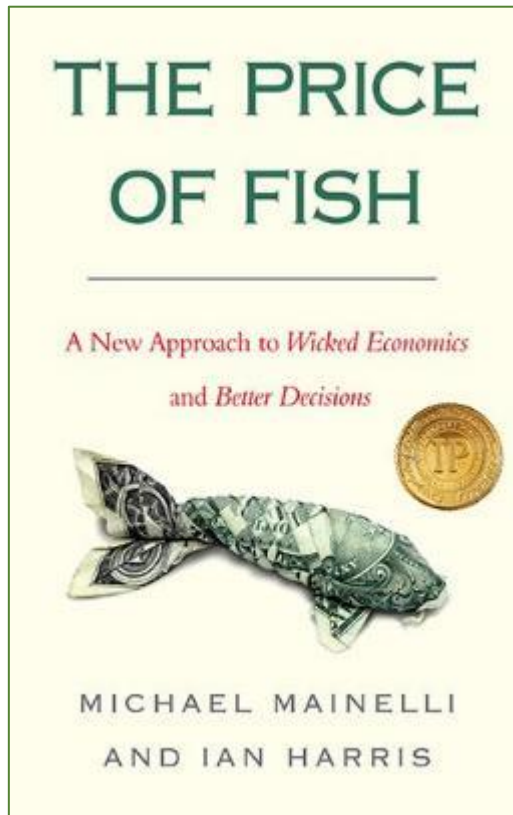


How You Can Help!

- Engaging large operators to help build a sustainable market
- Encourage governments to understand that industry wants this 'governance of the commons'
- Bring finance, especially insurance, to the regulatory and standards table early on
- Start modelling - frequency risk, multiple launches, retrieval and removal costs, LEO timelines, etc.
- Letters of support always welcome



When Would We Know Our Commerce Is Working?



Thank you!

***“If you have trust, I shall give you trust;
If you have no trust, I shall take it away.”***

Comments, Questions & Answers(?)

